Important Note
This is for information to all the students/teachers that CBSE has made some changes in the syllabus for the examination 2018. For the convenience of our students we have published a supplementary edition containing the related changes along with change in unit no's. This will be exclusively free of cost for all those students who have already purchased our books before the release of new syllabus for the session 2017–18.
SYLLABUS
PHYSICAL EDUCATION
(As per the latest syllabus issued by CBSE for the session 2017-18) Max. Marks: 70
Class – XII–Theory

Unit—I : Planning in Sports
- Meaning & Objectives Of Planning
- Various Committees & its Responsibilities (pre; during & post)
- Tournament —Knock—Out, League Or Round Robin & Combination
- Procedure To Draw Fixtures —Knock—Out (Bye & Seeding) & League (Staircase & Cyclic)
- Intramural & Extramural—Meaning, Objectives & Its Significance
- Specific Sports Programme (Sports Day, Health Run, Run For Fun, Run For Specific Cause & Run For Unity)

Unit—II : Sports & Nutrition
- Balanced Diet & Nutrition: Macro & Micro Nutrients
- Nutritive & Non—Nutritive Components Of Diet
- Eating For Weight Control—A Healthy Weight, The Pitfalls Of Dieting, Food Intolerance & Food Myths
- Sports nutrition & its effect on performance (fluid & meal intake, pre, during & post competition)
- Food supplement for children

Unit—III : Yoga & Lifestyle
- Asanas as preventive measures
- Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardha Matsyendrasana
- Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardha Matsyendrasana
- Asthma: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana
- Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana
- Back Pain: Tadasana, Ardha Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana

Unit—IV : Physical Education & Sports for Differently—Abled
- Concept of Disability & Disorder
- Types of Disability, its causes & nature (cognitive disability, intellectual disability, physical disability)
- Types of Disorder, its cause & nature (ADHD, SPD, ASD, ODD, OCD)
- Disability Etiquettes
- Advantage of Physical Activities for children with special needs
- Strategies to make Physical Activities assessable for children with special need.

Unit—V : Children & Sports
- Motor development & factors affecting it
- Exercise Guidelines at different stages of growth &Development
- Advantages & disadvantages of weight training
- Concept & advantages of Correct Posture
- Causes of Bad Posture
- Common Postural Deformities—Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scolioses
- Corrective Measures for Postural Deformities

Unit—VI : Women & Sports
- Sports participation of women in India
- Special consideration (Menarch & Menstural Disfunction)
- Female Athletes Triad (Oestoperosis, Amenoria, Eating Disorders)
- Psychological aspects of women athlete
- Sociological aspects of sports participation

Unit—VII : Test & Measurement in Sports
- Computation of Fat Percentage—Slaughter—Lohman Children Skinfold Formula:
Triceps & Calf Skinfold (Male 6 to 17 yrs—% body fat = (0.735×sum of skinfold) + 1.0
(Female 6 to 17 yrs—% body fat = (0.610× sum of skinfold) +5.0

- Measurement of Muscular Strength—Kraus Weber Test
- Motor Fitness Test—AAPHER
- General Motor Fitness—Barrow three item general motor ability (Standing Broad Jump, Zig Zag Run, Medicine Ball Put—For Boys: 03 Kg & For Girls: 01 Kg)
- Measurement of Cardio Vascular Fitness—Harvard Step Test/Rockport Test—
- Computation of Fitness Index: Duration of the Exercise in Seconds x 100
  \[
  5.5 \times \text{Pulse count of 1} - 1.5 \text{Min after Exercise}
  \]
- Rikli & Jones -Senior Citizen Fitness Test
  1. Chair Stand Test for lower body strength
  2. Arm Curl Test for upper body strength
  3. Chair Sit & Reach Test for lower body flexibility
  4. Back Scratch Test for upper body flexibility
  5. Eight Foot Up & Go Test for agility
  6. Six Minute Walk Test for Aerobic Endurance

Unit—VIII : Physiology & Sports
- Gender differences in physical & physiological parameters.
- Physiological factor determining component of Physical Fitness
- Effect of exercise on Cardio Vascular System
- Effect of exercise on Respiratory System
- Effect of exercise on Muscular System
- Physiological changes due to ageing
- Role of physical activity maintaining functional fitness in aged population

Unit—IX : Sports Medicine
- Concept, Aims & Scope of Sports Medicine
- Sports injuries: Classification, Causes & Prevention
- First Aid -Aims & Objectives
- Management of Injuries:
  - Soft Tissue Injuries : (Abrasion, Contusion, Laceration, Incision, Sprain & Strain)
  - Bone & Joint Injuries: (Dislocation, Fractures: Stress Fracture, Green Stick, Communuated, Transverse Oblique & Impacted)

Unit—X : Kinesiology, Biomechanics & Sports
- Projectile & factors affecting Projectile Trajectory
- Newton’s Law of Motion & its application in sports
- Aerodynamics Principles
- Friction & Sports
- Introduction to Axes & Planes
- Types of movements (Flexion, Extension, Adbuction & Adduction)
- Major Muscles involved in running, jumping & throwing

Unit—XI : Psychology & Sports
- Understanding Stress & Coping Strategies (Problem Focussed & Emotional Focussed)
- Personality; its definition & types -Trait & Type (Sheldon & Jung Classification) & Big Five Theory
- Motivation, its type & techniques
- Self-esteem & Body Image
- Psychological benefits of exercise
- Meaning, Concept & Types of Aggressions in Sports

Unit—XII : Training in Sports
- Strength—Definition, types & methods of improving Strength -Isometric, Isotonic & Isokinetic
- Endurance-Definition, types & methods to develop Endurance-Continuous Training, Interval Training & Fartlek Training
- Speed —Definition, types & methods to develop Speed -Acceleration Run & Pace Run
- Flexibility—Definition, types & methods to improve flexibility
- Coordinative Abilities –Definition & types
- Circuit Training & High Altitude Training; Introduction & its impact
Contents

Curriculum 2017-18: Changes and new topics/units

Unit–1: Planning in Sports 5
• 1.2 Various Committees and its Responsibilities (Pre, during and post)

Unit–2: Sports & Nutrition 5
• 2.5 Food supplement for children

Unit–3: Yoga & Lifestyle (New) 6
• 3.1 Asanas as preventive measures
• 3.2 Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana
• 3.3 Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana
• 3.4 Asthma: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana
• 3.5 Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardh Chakrasana, Bhujangasana, Sharasana
• 3.6 Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana

Unit–4: Physical Education & Sports for Differently-Abled (New) 19
• 4.1 Concept of Disability & Disorder
• 4.2 Types of Disability, its causes & nature (cognitive disability, intellectual disability, physical disability)
• 4.3 Types of Disorder, its cause & nature (ADHD, SPD, ASD, ODD, OCD)
• 4.4 Disability Etiquettes
• 4.5 Advantage of Physical Activities for children with special needs
• 4.6 Strategies to make Physical Activities assessable for children with special needs.

Unit–5: Children & Sports (New) 27
• 5.1 Motor development & factors affecting it
• 5.2 Exercise Guidelines at different stages of growth & Development
• 5.3 Advantages & disadvantages of weight training
• 5.4 Concept & advantages of Correct Posture
• 5.5 Causes of Bad Posture
• 5.6 Common Postural Deformities—Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis
• 5.7 Corrective Measures for Postural Deformities

Unit–6: Women & Sports 36
• 6.1 Sports Participation of Women in India
• 6.2 Special Consideration (Menarche, Menstrual Dysfunction)
• 6.3 Female Athletes Triad (Osteoporosis, Amenorrhea and Eating Disorders)

Unit–7: Test & Measurement in Sports 39
• 7.1 Computation of Fat Percentage (Slaughter-Lohman Children Skinfold Formula)
• 7.2 Measurement of Muscular Strength-Kraus Weber Test
• 7.3 Motor Fitness Test-AAHPER
• 7.4 General Motor Fitness-Barrow three item general motor ability
• 7.5 Measurement of Cardio Vascular Fitness-Harvard Step Test/Rockport Test
• 7.6 Computation of Fitness Index: Duration of the Exercise in Second x 100/5.5 x Pulse count of 1-1.5 Min after Exercise

Unit–9: Sports Medicine 50
• 9.1 Concept, Aims & Scope of Sports Medicine
• 9.2 First Aid-Aims and Objectives

Unit–10: Kinesiology, Biomechanical & Sports 51
• 10.2 Newton’s Law of Motion and its Application in Sports
• 10.3 Aerodynamics Principles
• 10.5 Introduction to Axes & Planes
• 10.6 Types of movements (Flexion, Extension, Abduction & Adduction)
• 10.7 Major muscles involved in running, jumping & throwing

Unit–11: Psychology & Sports 55
• Personality types according to Carl G. Jung
• 11.6 Meaning, Concept & Types of Aggressions in Sports

Unit–12: Training in Sports 57
• 12.6 Circuit Training & High Altitude Training, Introduction & its impact.

Curriculum 2016-17: Changes and Deletions

1. Unit II: Adventure Sports and Leadership Training.
2. Unit III: Sports and Nutrition
   • Eating Disorders-Anorexia Nervosa and Bulemia
   • Effect of Diet on Performance
3. Unit IV: Posture
   • Merge with Unit V
4. Unit IV: Children and Sports
   • Factors affecting Motor Development
   • Physical and Physiological Benefits of Exercise on Children
   • Activities and Quality of Life
5. Unit VI: Women and Sports
   • Ideology
6. Unit VII: Test and Measurement in Sports
   • Measurement of Flexibility-Sit and Reach Test
7. Unit IX: Sports Medicine
   • Impact of Surface and Environment on Athletes
8. Unit X: Biomechanics and Sports
   • Mechanical Analysis of Walking and Running
1.2 Various Committees and Responsibilities (Pre, during & post)

(A) Pre Meet Works: These works are done before the start of tournament. These tasks require lot of planning in a systematic way. These works are generally performed by the physical education teachers of an institution.

(i) To arrange and plan the schedule of tournament and finalizing the date of tournament.

(ii) To make arrangements like marking of tournament field for various tournaments and equipment required for the tournament.

(iii) To plan the budget, finances and other payments etc. and their approval from the higher authorities.

(iv) To form various committees and arrangement of officials and briefing their duties to various committee members.

(v) To confirm the number of participants in each event.

(vi) To arrange medals, trophies and certificates for the prize winners, guests, etc. for the ceremonial function.

(vii) To arrange refreshment for the players and officials, etc.

(B) During Meet Works: The success of a tournament depends upon the smooth systematic follow up of the given schedule. These tasks are mentioned below:

(i) To check all the arrangements, particularly marking of play field and equipment, etc.

(ii) To apply the schedule of the events as per given programme.

(iii) To supervise and direct various committees when in need.

(iv) It offers number of opportunities for healthy atmosphere of recreation to the students, as students take part in various events according to their interest.

(v) To supervise and check the smooth functioning of officials.

(vi) To bring good coordination among different committees.

(vii) To give refreshment and meals to officials and all the participants.

(viii) To prepare score sheet and concerned records of the participants.

(ix) To make announcements and progress of the event.

(x) To provide first aid to injured athletes if required.

(C) Post Meet Works: These works are performed when the scheduled programme of the meet ends.

(i) To present medals, trophies and certificates to the position holders in prize distribution ceremony.

(ii) To make press note and overall report of the meet and send it to the concerned ones.

(iii) To return the borrowed equipment and material to the concerned ones.

(iv) To complete documents and release the payments of the officials and other payments.

(v) To collect the records from different committees and winding up of all the things from all concerned.

(vi) To make the exact report of finances.

EXERCISE

1. Define during meet works. (1 mark)

2. Describe pre meet work. (3 marks)

3. Explain pre, during and post responsibility of various committees. (5 marks)

2.5 Food Supplement for Children

Food supplements are concentrated sources of nutrients taken as a dietary top-up. They are given in addition to the regular diet. Food supplements are vitamins, minerals, herbs and many other products. They can come as pills, capsules, powders, drinks and energy bars. Food supplements can add missing nutrients to diet.

To attain higher level of fitness food supplements are required. However, they have both advantages and disadvantages.
ADVANTAGES OF FOOD SUPPLEMENTS
The following are the advantages of food supplements:

A. Provides Additional Nutrients
Normally, balanced diet has the nutrients which are required. Taking additional supplements can provide additional benefits especially when diet is lacking any nutrients.

B. Develops Immunity
Food supplements can also prevent a variety of diseases and health conditions. For example, pregnant women are advised to take folic acid to prevent birth defects.

C. Improves Physical Fitness
Food supplements can contribute to improved muscular strength, endurance and overall physical performance, they are therefore commonly taken by athletes to improve their performance. Amino acids are required for the growth of the muscles. But all food supplements should be taken under the strict advice of dietician.

DISADVANTAGES OF FOOD SUPPLEMENTS
The following are the disadvantages of food supplements:

A. Adverse Effects
Food supplements can cause adverse effects if they are consumed in excessive amounts. For example consuming excessive amounts of vitamin A may cause liver damage, reduced bone strength and headaches. Excess of zinc taken as diet supplement may cause nausea, vomiting and organ damage.

B. Drug Interactions
Dietary supplements may interact with already prescribed medicine. For example if someone taking blood thinning medication and excessive intake of vitamin K supplements may reduce its effectiveness and increase risk for blood clots. Even chemotherapy being administered to a cancer patient may experience its ineffectiveness when that person is taking food supplements comprising vitamins E and C.

EXERCISE
1. What is food supplement for children? (1 mark)
2. Describe any two advantages of food supplements for children (1 mark)
3. Write advantages & disadvantages of food supplement for children (3 marks)
4. Explain any two advantages and disadvantages of food supplements for children (5 marks)

MEANING OF YOGA
The word yoga has been derived from the Sanskrit word ‘yuj’ which means to join individual soul with the soul of Divine. It is a comprehensive system linking body, breath, mind, intelligence, wisdom and spirit. Yoga helps in creating balance and harmony in body. Yoga creates symmetry throughout the body, making one strong and flexible and balanced. Yoga also teaches to balance the mental urge to push, control, and be assertive with the impulse to yield, submit and be passive. Thus Yoga helps in attaining a balanced attitudinal equilibrium.

Pranayama is considered as the science of breath because the body gets energy through respiratory system. The other systems of the body are also directly related with Prana. Pranayama thus refers to extension of breath and its control. The humans absorb Prana (Breath) through fresh air in three ways.

Normal Breathing: In this kind, humans absorb normal quantity of Prana.
Deep Breathing: The amount of prana is more absorbed.
Yogic Breathing: Large amount of prana is absorbed and stored in the body which can be used in case of emergencies like diseases.

IMPORTANCE OF YOGA
Yoga is not simply physical exercise but it gives relief to physical and mental ailments. The importance can be understood from the following quotation:

Bhagavad Gita “Through constant practice of yoga, one can overcome all difficulties and eradicate all weaknesses. Pain can be transmitted into bliss, sorrow into joy, failure into success and sickness into perfect health. Determination, patience, persistence lead us towards our goal.”

The benefits of yoga are explained below:
(A) Physical Ailments: The regular practice of yogic asanas can prevent many diseases like constipation, cold, cough, insomnia, asthma, arthritis, diarrhoea, acidity, etc.
(B) Postural Deformities: Many asanas can prevent and cure postural deformities. The deformation of spine leads to many postural diseases which can be prevented through regular practice of Asanas.

(C) Hygienic Value: Many kriyas like Dhoti, Neti, Nauli, etc., clean various internal organs of the body. Dhoti kriya is helpful in cleansing digestive tract. The regular practice of Neti prevents colds.

(D) Mental Relaxation: Mental fatigue is relieved to a great extent through regular practice of yoga. A person remains free from anger, anxiety and emotional disturbances. It is well explained in Bhagwad Gita that when the mind and body are working together harmoniously due to yogic discipline, we can find calm and peace of mind at every moment.

(E) Will-power and Confidence: Through meditation, mind can be trained to concentrate in one direction. All the distractions are eliminated and person gets mental power which is essential requisite of will power and confidence.

Yoga often prolongs life because all the systems of body become efficient. Nowadays, even western people have started practicing yoga. The yoga is preventive and curative for many diseases.

3.1 Asanas as Preventive Measures

Asanas can be defined as a physical yoga posture or position that is designed to improve the physiological functions of the body. Asanas are the essence of yoga. They develop strength and endurance, improving circulation and energy flow, cleansing organs and other systems, and expanding muscles and joints. All these benefits of the asanas are integral part of yoga.

Asanas plays vital role in reducing fatigue, muscle tension and stress. It also improves balance, flexibility and strength. The body posture is directly related to sports efficiency and it gets improved with yoga.

V AJRASANA

Vajrasana is also as the diamond pose. It is a kneeling pose. The name is derived from Sanskrit word Vajra which means diamond or thunderbolt.

**Procedure**

Vajrasana is performed by following steps:

**Step 1:** First of all the soles are kept near the anus. Place the thighs on the legs one over the other and the soles on the hips.
**Step 2:** The calves must touch the thighs. Toe and knee should touch the floor. The body weight should be put on the knees and ankles.
**Step 3:** The spine should be kept straight and eyes must be closed.
**Step 4:** The right palm must be kept on right knee and left palm on left knee.
**Step 5:** Inhale slowly then exhale.

In the beginning this Vajrasana is done 5 minutes. The time should be increased gradually to 15 minutes.

**Benefits**

1. It gives relief to constipation, acidity and facilitates digestion process.
2. It helps people who are suffering from gas belching and frequent farts.
3. It helps in relieving back pain, stomach disorder and urinary problems.
4. It improves blood circulation.

**Contraindications**

1. It is not advisable for a person suffering from joint pain.
2. People suffering from spinal column ailments, especially on the lower vertebrae should not attempt this pose.
3. The people suffering from hernia, intestinal ulcers and other diseases of the small and large intestine should practice this pose under expert guidance and advice only.

HASTASANA

Hastasana is derived from Sanskrit word hasta which means hands. This asana is practiced as Urdhva Hastasana and also know as upward salute. Urdhva means upward.

**Procedure**

Urdhva Hastasana is performed by following steps:

**Step 1:** To start take position of the mountain pose or the tadasana by standing with feet together and arms by side.
**Step 2:** Weight evenly across the arches and balls of feet.
**Step 3:** Try to straighten legs as much as possible.
**Step 4:** Slowly raise the arms directing towards the ceiling.
Step 5: Along with the arms the palms also should be above head facing each other.
Step 6: The arms should be straight.
Step 7: Look upwards.

**Benefits**

These are some amazing benefits of Urdhva Hastasana.
1. It stretches the entire body
2. It helps in improving digestion.
3. Relieves stress and anxiety.
4. Improves body posture.
5. Increase the capacity of the lungs.
6. Improves blood circulation.
7. It eases sciatica.
8. Strengthen arms and shoulders.

**Contraindication**

Avoid this pose in case of neck and shoulder pain.

**TRIKONASANA**

Trikonasana is derived from the Sanskrit words *trikona* which means triangle. It is also called as triangle pose. It is a standing posture which includes deep stretch to the whole body parts.

**Procedure**

Step 1: Stand with the feet one leg-length apart and knees should be straight.
Step 2: Turn right foot completely to the outside and the left foot less than 45 degree to the inside. Both the heels must be in the line with the hips.
Step 3: Spread out the arms to the sides and parallel to the floor keeping palms facing down. The trunk is extended as far as is comfortable to the right while arms remain parallel to the floor.
Step 4: The trunk is fully extended to the right and then right arm is dropped so that the right hand reaches the front of the right foot.
Step 5: After this left arm is extend vertically. The spine and trunk are softly twisted clockwise by using the extended arms as a lever. In this posture the spine remains parallel to the floor.
Step 6: After the arms are stretched away from one another, the head is often turned to gazing at the left thumb resulting in slightly intensifying the spinal twist.
Step 7: This position is held for 5 to 10 breaths then side is changed.

**Benefits**

1. Helps in developing flexibility of back muscles, chest and shoulders.
2. Develops stretch ability of the spine.
3. Improves strength to the thighs and calves.
4. It helps in relieving backache, gastritis, indigestion, acidity and flatulence.
5. It stimulates the nervous system and alleviates nervous depression, strengthens the pelvic area.

**Contraindications**

1. People suffering from migraine, diarrhea or neck and back injuries are advised not to perform this asana.
2. Those with high blood pressure may do this pose but without raising their hand overhead, as this may further raise the blood pressure.

**ARDHA MATSYENDRASANA**

This asana is named after the great yogi Matsyendranath. The name is derived from the Sanskrit words *ardha* meaning half, *matsya* meaning fish, *endra* meaning king.

**Procedure**

1. Firstly kneel down with legs together. Resting on heels.
2. Then sit to the right of your feet as in picture.
3. Lift left leg over right and place the foot against the outside of the right knee. After this bring right heel in close to hips. The spine must remain erect.
4. Stretch arms out to the sides at shoulder level. Then twist to the left side.
5. Bring the right arm down on the outside of the left knee and hold the left foot in the right hand by placing left hand on the floor behind. Exhaling, twist as far as possible to the left. Then look over the left shoulder.

**Benefits**
1. It increases flexibility of spine.
2. Removes the wastes products of the body and improves digestion.
3. Improves functioning of heart, kidneys, liver, spleen and lungs.
4. It helps in getting rid of fatigue, sciatica, backache and menstrual discomfort.
5. Releases excess toxins and heat from tissues and organs.

**Contraindications**
1. People who have gone through surgeries of heart, abdomen or brain should avoid practice of this asana.
2. It should be avoided during pregnancy.
3. It must be performed with care in case of people suffering from peptic ulcer or hernia.
4. It must not be practiced in case a person is having severe spinal problems.

**BHUJANGASANA**
The name of bhujangasana is derived from Sanskrit words भुजांगा meaning snake or serpent. Bhujangasana is the stretching yogic exercise of the front torso and the spine. It resembles with the final stage when the cobra is ready to attack its prey by raising its hood.

**Procedure**
Step 1: Lie down in prone position by keeping legs together.
Step 2: Put palms besides shoulder and the head should rest on the floor.
Step 3: Inhale and raise head up to navel region and try to see the roof.
Step 4: This position is to be maintained till 10 to 60 seconds. Steadily inhaling and exhaling must continue.
Step 5: Return to the original position slowly with deep exhalation.
Step 6: It is performed for 3 to 5 times.

**Benefits**
1. It helps in developing flexibility of the spine and leads to curing backache.
2. This posture helps to compress the kidney thus removes the stagnated blood thereby helps in improving the efficiency of the kidneys.
3. It helps to reduce stress. This pose gives a good massage to the adrenal gland. Hence it secretes more adrenaline.
4. It helps in minimizing the risk of rheumatism as cortisone secretion is regulated by the practice of this asana.
5. Due to proper massage to the organs of abdominal region such as stomach, pancreas, liver and gallbladder the digestion is improved.
6. Bhujangasana regulates thyroid gland thus helps to maintain a good health.
7. This pose helps to expand the chest thus helps in normal breathing.

**Contraindications**
1. This asana must not be performed by a person who is suffering from peptic ulcers, hernia, intestinal tuberculosis and hypothyroidism.
2. A person having abdominal injuries should avoid practice of this asana.
3. The person having problems of sciatica, slip-disc and ulcerative colitis should take extra precautions while performing this asana.
4. During pregnancy this asana should be avoided.

**PASCHIMOTTANASANA**
The name of this asana is derived from the Sanskrit words पश्चिम which means west or back or back of body, and उट्तान which means intense stretch or straight or extended.

**Procedure**
1. Sit down straight with legs together by stretching in front. Keep head, neck and spine erect.
2. The palms should rest on respective knees.
3. After this bend head and trunk slowly forward to catch the toes with the thumb, index and middle fingers without bending knees.
4. Take a deep breath and exhale slowly. Try to touch head to both knees.
5. Bend the arm and try to touch the elbow on the floor.
6. Exhale completely and holding the breath and stay in this posture for a few seconds.
7. After few seconds slowly return to starting position.
8. Breathe normally.
9. Repeat this for 3-4 times.

**Benefits**
1. It helps in relieving stress.
2. Reduces fatty deposits in the abdomen.
3. Minimizes anxiety, anger and irritability.
4. Improves the flexibility of the spine.
5. Helps to minimize constipation and cures digestive disorders.
6. Tones the abdominal pelvic organs.
7. This asana is recommended especially for women after delivery.
8. Relieves headache, migraine and eye strain.

**Contraindications**
1. During pregnancy this asana should be avoided.
2. Person suffering from slip disc or sciatica problem and asthma should avoid this asana.
3. Ulcer patients should not practice this asana.

**PAVANMUKTASANA**
Pavanmukt asana is derived from two Sanskrit words *Pavana* which means wind and *mukta* which means to release.

**Procedure**
1. Lie on supine position keeping feet together and arms beside body.
2. Bring right knee towards chest and press the thigh on abdomen with clasped hands.
3. Breathe in and lift head and chest off the floor and touch chin to right knee.
4. Hold and take deep, long breaths in and out.
5. While exhaling, tighten the grip of the hands on the knee and increase the pressure on the chest. As you inhale, loosen the grip.
6. After exhaling come back to the ground and relax.
7. Repeat this pose with the left leg and then with both the legs together.

**Benefits**
1. It helps in strengthening the back and abdominal muscles.
2. Massages the intestines and other organs in the abdomen.
3. Develops digestion and release of gas.
4. Enhances blood circulation in the hip joints and eases tension in the lower back.

**Contraindications**
1. Avoid practicing this asana if people are facing high blood pressure, heart problem, hyperacidity, hernia, slip disc, neck and back problems.
2. Avoid during the period of pregnancy.
3. Anyone suffering from hernia or piles should avoid this asana.

**SUKHASANA**
The name of sukhasana is derived from the Sanskrit word *Sukham* which means delight or bliss.

**Procedure**
Step 1: Sit down normally on the floor. Stretch out legs ahead in front.
Step 2: After this cross legs and broaden the knees, in order to put both feet under the opposite knee.
Step 3: After that bend knees along with folded legs.
Step 4: Keep feet loose in order that the external edges lay on the floor and the inner curves are settled beneath the inverse leg.
Step 5: The thighs must be with crossed legs ought to frame a little triangle. Keep some space between feet and pelvis. Place hands on the knees as shown in the picture.
Step 6: Now sit with hips in a neutral position. Attempt to hold a breath and after that gradually bring down back on to the floor.
Step 7: Keep hands on knees.

Benefits
1. Broadens collarbones and chest.
2. It calms the mind.
3. Enhances condition of peacefulness.
4. It helps in minimizing anxiety, stress and mental tiredness.
5. It helps in improving body posture.
6. It helps in reducing fatigue.
7. It strengthens back.

Contraindications
1. This asana doesn't have excessively numerous contraindications. However individuals who are experiencing backache shouldn't stay in this position for over 5 minutes.
2. Person suffering from knee injury is not advised to sit in this position for long time.

CHAKRASANA

The name of this asana is derived from an addition of two different words, i.e., Chakra which means a wheel and Asana.

Procedure
Step 1: Lie down on the floor (Yoga mat) looking upwardly.
Step 2: Fold legs and keep it down below hips. Make sure that sole of the feet touches the floor.
Step 3: Bring both the hands and keep it beneath the shoulders.
Step 4: Take deep breath and keep hands and legs on the floor. Then slowly raise hips, shoulder and the head from the floor.
Step 5: Then bend your back as much as possible.
Step 6: Stay on the same posture for a minute.

Benefits
1. The chest enhances and the lungs get more oxygen.
2. It reduces the stress and tension.
3. This asana helps in strengthening the back and increases the elasticity of the spine.
4. It reduces the fat in abdomen area and tones the digestive system.
5. It regulates the endocrine glands and maintains the metabolism normally.
6. It also helps in stimulating the process of the liver, spleen and kidneys.

Contraindications
1. People suffering from Diarrhea and Hernia should avoid this asana.
2. People having heart problems must do this asana after consulting a doctor.
3. This asana is not safe for the pregnant women.
4. People having pain in wrist, ankles and spine should avoid this yoga asana as it may be harmful for these body parts.
5. Those persons suffering from hypertension must not practice this asana.

GOMUKHASANA

The name of gomukhasana is derived from the Sanskrit words Go meaning cow and Mukha meaning head. This asana stretches several parts of the body simultaneously, including ankles, thighs, hips, chest, neck, arms and hands.

Procedure
Step 1: Slide knees together in front and stacking the right knee directly on the top of left.
Step 2: Sit back in-between feet which should be equidistant from hips.
Step 3: Support weight evenly in the midst of sitting bones.
Step 4: Extend left arm up. Then, bring left hand down to the center of back.
Step 5: Reach right arm out to the same side and parallel to the floor. Then rotate the arm inward. Thumb will turn first towards the floor until palm faces above.
Step 6 : Take a deep breath and, while exhaling sweep right arm behind and in the hollow of lower back.
Step 7 : Keeping spine long and hold hands behind back. Then, lift left elbow toward upward direction. Then draw right elbow toward the floor. Keep left arm close to head.
Step 8 : Now release arms, uncross legs, and repeat Gomukhasana with the left knee on top and left elbow pointing down.

**Benefits**
1. This asana helps in relaxing a person.
2. It stimulates the kidneys.
3. Gomukhasana is helpful in relieving ailments like diabetes and high blood pressure.
4. Since practicing gomukhasana leads to development of the muscles of the lower back, hips and the knees. So, gomukhasana is beneficial for backache, sciatica and rheumatism.

**Contraindications**
1. This asana should not be practiced in case of neck, knee, hip and shoulder injury.
2. Don't go beyond over personal abilities.

**PARVATASANA**
Parvatasana is one of the important seated yoga postures. As the pose resembles a mountain, it is called Parvatasana (Mountain pose).

**Procedure**
Step 1 : Firstly sit down on the floor keeping cross legged position. The legs are kept apart a little more than the hip width.
Step 2 : Bring hands in front so that palms face towards the performer.
Step 3 : Exhale and move hands over head. Keep your fingers interlocked and hands stretched upwards.
Step 4 : Pull torso in upward direction and stretch it as much as high.
Step 5 : Hold this position for a little longer and breathe normally.
Step 6 : Come down in original position.
Step 7 : Repeat the asana for about 8–10 times.

**Benefits**
1. Since it gives a full body stretches so it improves the blood circulation.
2. It helps in reducing mental fatigue and also improves the memory and concentration.
3. It strengthens the weak muscles of the body and thus prevents any injury.
4. It improves the health of internal organs.
5. It helps in reducing the respiratory problems like asthma.
6. The regular practice of this pose prevents rheumatic stiffness and arthritis.
7. It helps in losing body weight.

**Contraindications**
1. Don't overstrain the knees.
2. The neck should be kept straight to avoid any forward movement.
3. Avoid hunching of the back during sitting position.
4. It can cause hunch back and stiff shoulder due to wrong way of doing this asana.

**MATSYASANA**
The name Matsyasana is derived from Sanskrit word Matsya which means fish. Matsyasana is also known as fish pose.

**Procedure**
Step 1 : Lie on back on the floor (Yoga mat) with knees bent and feet on the floor.
Step 2 : Breathe in and lift pelvis slightly off the floor. Then slide hands, palms down, below hips.
Step 3 : Then rest hips on the back of your hands and keep the same position while this asana is performed.
Step 4 : Tuck forearms and elbows up close to the sides of torso.
Step 5: Breathe in and press forearms and elbows firmly against the floor.
Step 6: Then press shoulder blade into back during inhalation. Lift upper torso and head away from the floor.
Step 7: After this release head back onto the floor. Depending on how high your arch is and lift chest, back of head must rest on the floor.
Step 8: Keep minimal amount of weight on head so that there is not too much pressure on neck.
Step 9: Keep knees bent or straighten legs out onto the floor.
Step 10: Stay in this position for 15 to 30 seconds, breathing smoothly.
Step 11: Breathe in and lower torso and head back down to the floor.

Benefits
1. It strengthens the muscles of your upper back and the back of neck.
2. It helps in improving posture and provides relief from respiratory disorders.
3. Matsyasana also strengthens the spine and helps to prevent backache and pain.

Contraindications
1. A person suffering from hypertension must avoid this asana.
2. Migraine and insomnia patients should also avoid this asana.
3. Individuals suffering from serious lower-back or neck injuries should not practice Matsyasana.

TADASANA
The word is derived from the Sanskrit word Tada, which means Palm tree. Tadasana is the beginning and ending asana of Surya Namaskar according to Ashtanga yog.

Procedure
Step 1: Stand straight on the floor. Then take a small gap between feet.
Step 2: After deep inhalation both the arms are raised.
Step 3: Keep arms upward by interlocking fingers.
Step 4: Come on the toes by raising heels concurrently.
Step 5: Feel the pressure of stretching from toes to fingers.
Step 6: Try to maintain this pose along with slow and deep breathing.
Step 7: Return to the original position with deep exhalation.
Step 8: Perform number of rounds as per capacity but having relaxation for a while after each round.

Benefits
1. It strengthens the lungs.
2. This asana activates the nerves of the entire body.
3. It improves strength of vertebral column.
4. Helps in improving digestion.
5. Develops the strength of arms and legs.
6. It reduces the problems of flat foot.

Contraindications
1. Person suffering from headaches, low blood pressure and insomnia are advised not to practice this asana without consulting the yoga instructor.
2. During pregnancy this asana should be avoided.

ARDHA CHAKRASANA
The name is derived from the Sanskrit words Ardha meaning half and Chakra which means wheel.

Procedure
Step 1: In the start stand straight with feet together and arms alongside.
Step 2: Give weight equally on both the feet.
Step 3: After inhalation extend arms overhead, palms facing each other.
Step 4: Exhale, then gently bend backwards pushing the pelvis forward. Keep the arms
in line with the ears. Elbows and knees must be kept straight. Head up and chest must be lifted towards the ceiling.

Step 5: Hold and inhale then come back up.
Step 6: Then exhale and bring the arms down and relax.

Benefits
1. Improves the strength of front upper torso.
2. Develops the tone of the arms and shoulder muscles.

Contraindications
1. Person suffering with serious hip or spinal problems should avoid this asana.
2. Patients of high blood pressure and brain ailments should avoid this asana.
3. Peptic or duodenal ulcers and hernia patients should also avoid this asana.
4. During pregnancy, this asana should be avoided.

SHAVASANA
This asana is derived from Sanskrit word *shava* which means corpse. This pose looks like sleeping pose. It is very simple and everyone can do this asana.

Procedure
Step 1: Lie flat on back, like a sleeping pose and legs should be separated.
Step 2: Keep arms at the side and palms facing up. Just relax.
Step 3: Close eyes and breathe deeply and slowly through the nostrils.
Step 4: Start concentrating from head to feet. This shows that a person doing this asana is consciously relaxing each part of the body.
Step 5: Those having good concentrations can practice for a long time, however others can practice for 3-5 minutes.

Benefits
1. It relaxes whole body.
2. Helps in releasing stress, fatigue, depression and tension.
3. Improves concentration.
4. Helps in curing insomnia.
5. It calms the mind and improves mental health.
7. It is beneficial for those suffering from neurological problem, asthma, constipation, diabetes and indigestion.

Contraindications
1. This asana is absolutely safe and can be practiced by anyone and everyone, unless the doctor has advised not to lie on back.
2. Someone with severe acidity may find lying on the back very uncomfortable as the food pipe may cause irritation.

VAKRASANA
Vakrasana is derived from Sanskrit word *Vakra* which means twisting. It is simplified form of Ardhamatsyendrasana.

Procedure
Step 1: Sit down stretching legs forward on the floor. Keep hands beside thighs.
Step 2: Bend right and keep left leg straight and stretched.
Step 3: Keep the left foot beside the right knee and the left knee raised upward.
Step 4: Inhale and raise the arms shoulder high, keeping the elbows straight.
Step 5: After exhaling, twist to the left, place the right arm by the outer side of the left knee.
Step 6: Take the left hand behind the back keeping the palms on the floor.
Step 7: Hold on the position as long as comfortable.
Step 8: Repeat with other side also.

Benefits
1. It Increases the elasticity of the spine and tones the spinal nerves.
2. Helps to get relief in stiffness of vertebrae.
3. Massages the abdominal organs.
4. Reduces belly fat.
5. Regulates the secretion of digestive juices useful for different digestive disorders.
6. Flab on the lateral side of the abdomen gets reduced.
Contraindications
1. Avoid this asana incase person is suffering from severe back pain.
2. This asana is also not recommended for people suffering from ulcer and hernia.

SHALABHASANA
The name of this asana is derived from the Sanskrit word *Shalabh* which means for Locust or grasshopper (type of insect). While doing Shalabhasana the complete body shape seems like a locust or grasshopper structure thus this posture is additionally known as Locust pose.

Procedure
Step 1: Lie flat on stomach, with the legs and feet together, toes pointing back.
Step 2: Interlace fingers and place them under body. Stretch the chin forward and place it on the ground.
Step 3: Inhale and push the hands against the ground. Then lift both the legs up using the lower back muscles.
Step 4: Hold the position for as long as comfortable without getting any strain. Then breathe normally.
Step 5: Exhale and lower the legs.

Benefits
1. It is beneficial in all the disorders associated with lower end of the spine.
2. It helps in minimizing backache and sciatica pain.
3. Useful for reducing unwanted fats around abdomen, waist, hips and thighs.
4. This asana can cure cervical spondylitis and spinal cord ailments.
5. It strengthens wrists, hips, thighs, legs, hips, lower abdomen and diaphragm.

Contraindications
1. Persons having cardiac problems and hypertension must avoid this asana.
2. In case of peptic ulcer, the asana should not be practiced.
3. Hernia patients should avoid this asana.

3.2 Obesity : Procedure, Benefits and Contraindications for Vajrasana, Hastasana, Trikonasana, Ardha Matsyendrasana

OBESITY
The major cause of obesity is poor lifestyle. Obesity leads to many health problems. More than half of the US population today is considered obese. Factors like genetics and environment can contribute to obesity, but there is no doubt that your lifestyle also plays a big role. If you have been gaining pounds lately, then chances are that your lifestyle could be causing your weight gain. Here are some ways that your lifestyle could be making you obese. Obesity does not just happen overnight rather it develops gradually from improper diet and poor lifestyle choices.

PREVENTION AND MANAGEMENT
The following are the methods to prevent and manage obesity:

(A) Regular Exercise
Sedentary lifestyle leads to Obesity. Regular exercise helps in fighting obesity. In addition to regular exercise the habit of evening stroll and walk to the market instead of taking the vehicle and use the stairs instead of the elevator can help a lot to burn calories. Whenever people are free they tend to watch TV, browse the internet or play computer games instead of doing regular exercise. Habit of cycling also reduces obesity.

(B) Avoid Eating Regularly Fast Food
Nowadays people take fast food regularly. This has increased the number of obese people. Due to busy lifestyle cooking own food is avoided and fast food is given preference and this leads to obesity. Instead of cooking, ordering a fast food from restaurants is much more convenient. The worst part is that most of the fast foods are having ingredients of more energy, total fat, saturated fat, carbohydrates and added sugars. Hence in lifestyle one must have habit to avoid fast food regularly.

(C) Avoid Drinking too much Alcohol
Alcohol contains a lot of calories, and heavy drinkers are often to be obese. In a lifestyle avoid drinking which can reduce obesity.
(D) Proper Diet
The unhealthy food choices are examples of bad lifestyle. Overeating habit leads to obesity. By eating fruits and unrefined carbohydrates one can reduce obesity. Obesity during the childhood can lead to obesity related health problems in later life. The unhealthy lifestyle continues till adulthood and leads to a big problem.

3.3 Diabetes: Procedure, Benefits and Contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardha Matsyendrasana

DIABETES
The Diabetes is also related with lifestyle. It can be managed by the following ways:

(A) Food
Healthy eating is a major factor of good lifestyle. The management of diabetes largely depends on type of food a person is eating. Eating well-balanced meal can prevent diabetes.

(B) Proper Coordination of Meals and Medication
Too little food in comparison to diabetes medications especially insulin may lead to hypoglycaemia and can cause dangerously low blood sugar. However excessive intake of food may cause increase in blood sugar level leading to hyperglycaemia. A person having healthy lifestyle can easily manage Diabetes.

(C) Regular Exercise
Regular exercise can help to manage diabetes management plan. Whenever work out is done the sugar (glucose) is used to obtain energy. The regular exercise can improve body's response to insulin. During active lifestyle such as housework, gardening or walking and cycling can also lower blood sugar level. Drink plenty of water while exercising because dehydration can affect blood sugar levels.

3.4 Asthma: Procedure, Benefits & Contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottanasana, Matsyasana

ASTHMA
Asthma is caused due to constriction of airways. In this condition extra mucus is also produced. Ultimately this leads to shortness of breath and trigger coughing and wheezing. Generally the symptoms of asthma range from minor to major. The following are the symptoms of asthma:

(i) Shortness of breath
(ii) Stiffness in chest and pain
(iii) Infrequent coughing and sneezing
(iv) Wheezing sound
(v) Increased difficulty in breathing

Asthma is mainly allergy induced. Many allergens trigger asthma. Some time occupational environment can also lead to asthma as working places may have chemical fumes, gases or dust that can also trigger allergens and can cause asthma. It is also observed that few people suffer from exercise induced asthma. Respiratory infections can also be a cause for asthma. Certain medications, including beta blockers, aspirin, ibuprofen and naproxen may cause asthma. Strong emotional situation can also trigger asthma.

PREVENTION AND MANAGEMENT OF ASTHMA
Mainly prevention is initiated by avoiding the triggers of asthma. Methods of its prevention are given ahead.

(a) By using air conditioners
The windows of the air conditioned houses are mainly closed and this reduces the entry of airborne pollens that can cause asthma.

(b) Minimizing dust
Minimize dust in the house and at working places. For example by removing carpeting and installing hardwood can reduce the dust.
(c) **Clean regularly**
    Keep your home and work place clean. This reduces the dust. Use of mask while cleaning can also prevent asthma.
The asthma can be managed by following ways:

(A) **Regular Exercise**
    Regular exercise develops circulatory and respiratory system that helps in relieving symptoms of asthma.

(B) **Avoid Obesity**
    It is well known that being obese can worsen symptoms of asthma. Obese are often at higher risk of many health problems. By avoiding obesity, asthma can be controlled to a great extent.

(C) **Eat Plenty of Fruits and Vegetables**
    Eating plenty of fruits and vegetables may develop lung function and that may reduce symptoms of asthma. Many food items are rich in protective nutrients. They are the antioxidants that boost the immune system.

(D) **Control Acidity**
    Some time the acid reflux causes heartburn and that may damage lung airways and worsen asthma symptoms. Controlling acidity can reduce the symptoms of asthma.

(E) **Breathing Techniques**
    The breathing exercises may reduce the symptoms of asthma. Practice of yoga increases fitness and reduce stress which may lead to reduce the symptoms of asthma.

(F) **Relaxation Techniques**
    Relaxation techniques such as meditation reduce stress and this can be helpful in controlling asthma.

**3.5 Hypertension : Tadasana, Vajrasana, Pavanmuktasana, Ardha Chakrasana, Bhujangasana, Shavasana**

**HYPER-TENSION**

Hyper-tension is also known as high blood pressure. Healthy lifestyle changes are important for lowering blood pressure. Lifestyle plays an important role in treating your high blood pressure. If blood pressure is controlled by healthy lifestyle it can avoid, delay or reduce the need of medication.
The following are the methods to prevent and manage Hyper-tension:

(A) **Exercise Regularly**
    Regular exercise can lower blood pressure to a great extent. It is a well known fact that at least doing exercise for 30 to 60 minutes every day can lower your blood pressure by 4 to 9 mm/Hg. Even if a person is diagnosed with pre hyper-tension, the exercise can avoid hyper-tension.

(B) **Eating healthy diet**
    Eating a diet that is rich in whole grains, fruits, vegetables, low-fat dairy products and low fat and cholesterol can lower blood pressure by up to 14 mm/Hg. The proper eating plan to reduce hyper-tension is known as the Dietary Approaches to Stop Hypertension (DASH diet.)

    In healthy lifestyle the following are the dietary suggestions as DASH diet:
    (i) Sodium intake should be minimised and it should not be more than 2,300 mg a day.
    (ii) Reduction of saturated fat to not more than 6% of daily calories and total fat to 27% of daily calories.
    (iii) When using fats while cooking select monounsaturated oils, such as olive or canola oils.
    (iv) Consume more whole grains and vegetables.
    (v) Consume fresh fruits and vegetables every day.
    (vi) Use nuts, seeds, or legumes in daily diet.
    (vii) Consume modest amounts of protein (not more than 18% of total daily calories). Fish, skinless poultry, and soya products are the best protein sources.

    A healthy lifestyle promotes a habit of eating proper diet which can control hyper-tension to a great extent.

(C) **Proper Sleeping Habits**
    Insufficient sleep may raise hyper-tension. People sleeping late night can often lead to hyper-tension as stress hormone levels increase with sleeplessness. So proper sleep is important constituent of healthy lifestyle and can reduce blood pressure.

(D) **Reducing Stress**
    A person who practises Yoga and relaxation techniques such as meditation may control stress. Even playing games can also reduce stress. The reduction in stress can also reduce hyper-tension.
(E) Reduction in Consumption of Alcohol
If excessive alcohol is consumed regularly it can lead to hyper-tension. The permissible limit is 148ml of wine, 335ml of beer, 45 ml of liquor. Excessive drinking can lead to hyper-tension.

(F) Avoid Tobacco Products
It is a well known fact that cigarette smoking increases blood pressure. The nicotine in tobacco can raise 10 mm/hg of blood pressure. Smoking throughout the day leads to rise in blood pressure. Avoiding tobacco products can help in controlling hyper-tension.

3.6 Back-Pain : Tadasana, Ardha Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana
BACK-PAIN
Back-Pain is also related to lifestyle. The prevention and management can be done in following ways:

(A) Sedentary Lifestyle
The lethargic people often avoid exercise can cause or worsen back pain because of increased stiffness and weakened muscles. The strengthening exercises for the back muscles always support the spine and prevent Back-Pain.

According to Dr. Finkel, “Movement and exercise also keep the spine healthy, flexible and strong. Gentle forms of exercise, such as yoga, pilates, water therapy, riding a stationary bike or walking, are especially helpful.”

(B) Poor Posture
Incorrect sitting posture can cause low back pain or worsen existing pain. The incorrect sitting posture like slouching or leaning on chair can lead to stress at spine which can lead to back-pain. The best sitting position for your back is to align it against the chair back.

(C) Incorrect Lifting Style
In daily life a person has to lift lot of heavy things. Lifting in incorrect method can cause back-pain. The weight is lifted by extension of knee joint than extension of spine. In proper lifestyle a person must understand the correct lifting style which can minimise the occurrence of back-pain.

(D) Lose Weight
By maintaining a healthy weight one can minimise the occurrence of back-pain. A person having overweight may shift his center of gravity and throw off posture. Exercise and nutritious diet can reduce overweight and help to prevent back-pain.

(E) Wear Proper Shoes
The back-pain can be caused due to faulty shoes. Walking for long distance while wearing high heals can cause the problem of back pain. Flat shoes with good arch support can help in minimising back-pain.

(F) Right Sleeping Habit
The back must be given support while sleeping. The mattress on which a person sleeps must not be too firm and not too soft, either. Sleeping habit on back or stomach strains the back. It is always better to sleep on side. This habit of sleeping will reduce strain in back and will reduce the chances of back-pain.

EXERCISE

QUESTIONS CARRYING 01 MARK
1. Define yoga.
2. Write any one benefit of yoga.
3. What do you mean by asana?
4. What is Vajrasana?
5. What is diabetes?
6. Write about asthma.
7. Describe the meaning of hypertension.
8. What is Tadasana?
9. What is Vakrasana?
10. Write any two benefits of Hastasana.
11. Write any two contraindications of Trikonasana.
12. Write any two advantages of Bhujangasana.

QUESTIONS CARRYING 03 MARKS
13. Elaborate importance of yoga.
14. Explain the benefits of yoga.
15. Elaborate the procedure of Ardha Matsyendrasana.
16. Write any three benefits of Sukhasana.
17. Explain any three benefits of Pavan Muktasana.
18. What is the procedure of Parvatasana?
19. How diabetes can be controlled?
20. Give any three methods to prevent asthma.

QUESTIONS CARRYING 05 MARKS
22. Discuss the advantages of yoga.
23. Explain the procedure and benefits of Vajrasana.
24. Describe the procedure and benefits of Hastasana.
25. Write about the procedure and contraindications of Trikonasana.
26. Explain the procedure and benefits of Chakrasana.
27. Elaborate the benefits of Matsyasana and Gomukhasana.
4.1 Concept of Disability & Disorder

Prior to the scientific enlightenment disability was viewed differently in the different parts of the world. Some viewed it as curse of the God for the sins committed in the past and others viewed it as an act of demons. It was only with the scientific enlightenment that more pragmatic biological approach was adopted to understand the concept disability, its reasons, the problems faced by the people with disabilities and the course of action to ameliorate the problems. It is only in the twentieth century that a major shift toward understanding the disability as medical as well as social issue was undertaken and two models of understanding disability were coined, one as "Social Model" and the other as "Medical Model".

Disability is caused by an impairment that may vary from physical to intellectual, cognitive or both or mix of all such impairments which prohibits a person to perform with the same efficiency as others in the same age group. Disability may also be associated with sensory or developmental aspects and may occur at the time of birth or at later stage.

Disability means inability to do certain physical or mental work. When the capacity to perform any physical or mental work decreases that stage is called disability.

Any abnormal condition of the body and mind whether congenital or acquired may be called disability.

According to W. H. O., “Disability is a restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being.”

Types of Disability

Disability can broadly be classified into two categories:

A. Structural Disability

It is related to the bony structure of the body, generally these are postural deformities. Such deformation of the body may be acquired or congenital. The reasons may be accident, inadequate diet, wrong habits of sitting while working, etc.

Some examples of structural disabilities are as follows:

(i) Kyphosis: It is caused by an exaggeration of the normal dorsal curvature of the spine resulting in hump of the back.

(ii) Lordosis: It is caused by forward exaggeration in the lumbar region resulting in prominent abdomen and stoop in the upper part of the body.

(iii) Scoliosis: It is caused due to an exaggeration of lateral curvature of the spine.

B. Functional Disability

In this type of disability body organs are affected, generally these faults occur due to chronic diseases and sometime the reason may be congenital.

According to WHO, A functional disability is any long term limitation in activity resulting from a condition or health problem." It can be categorised as under.

(i) Hearing impairment: It occurs where a person is unable to hear completely or partially. It is further classified on the basis of severity i.e mild, moderate and high.

(ii) Visual impairment: It can be considered as an inability to see at all or partial loss in the vision of a person.

(iii) Motor impairment: It is loss or malformation or abnormality in skeletal, muscular or neurological systems responsible for the body motion.

(iv) Organic impairment: Disorder and abnormality in the internal organs of the body forming various system such as respiratory, digestive, endocrine system etc.

4.2 Types of Disability, its causes and nature (cognitive disability, intellectual disability, physical disability)

COGNITIVE DISABILITIES

This category includes the people who have problems associated with memory, thinking, remembering, learning disorders and problems associated with perceiving things. The common causes are related to birth injuries such as birth asphyxia or head injuries sustained at later stage in life. Some commonly known types and causes of cognitive/language impairment are:

(a) Mental Retardation: A person is considered mentally retarded if he has an IQ below 70 (average IQ is 100) and if they have difficulty in functioning independently.
Those considered mildly retarded who have an IQ between 55 and 69 and achieve 4th to 7th grade levels. They usually function well in the community and can hold semi-skilled and unskilled jobs.

(b) **Language and Learning Disorders**: This includes people or special children who have problem in listening, speaking, reading, writing, reasoning and mathematical calculations.

(c) **Head Injury and Stroke**: These are the people who have suffered head injuries or those suffering strokes. These injuries usually result in physical impairments, cognitive impairments or both.

(d) **Alzheimer's Disease**: This is related to the progressive degeneration of brain/nervous system which leads to progressive intellectual decline, confusion and disorientation.

(e) **Dementia**: This is caused due to obstructions of blood flow towards brain which leads to mental malfunctioning. It is progressive and often begins with loss of memory, learning, attention and judgment making.

The cognitive impairments are varied but fall into the generalized categories of memory impairment, difficulty in solving problems and more profound in case of complex problems. This includes difficulty in recognizing and retrieving information. Perception problems include difficulty taking in, attending to, and discriminating sensory information. Difficulties in problem solving includes recognizing the problem, identifying, choosing and implementing solutions, and evaluation of outcome. Conceptual difficulties can include problems in sequencing, generalizing previously learned information, categorizing, cause and effect, abstract concepts, comprehension and skill development. Language impairments can cause difficulty in comprehension and/or expression of written and/or spoken language.

### INTELLECTUAL DISABILITIES

Intellectual disability means that a child learns and develops more slowly than other children. But having an intellectual disability doesn't mean a person can't learn. Ask anyone who knows and loves a person with an intellectual disability! Some children having Autism, Down syndrome, or Cerebral Palsy may be described as having an intellectual disability.

**American Association of intellectual and developmental disability** "Intellectual disability is a disability characterized by significant limitations in both intellectual functioning and in adaptive behavior, which covers many everyday social and practical skills. This disability originates before the age of 18."

Intellectual disabilities can occur because of brain injury or a problem prevents the brain from developing normally. A serious head injury can hurt the brain and cause intellectual disabilities at any point during life. Some of these disabilities are temporary and others can be permanent. Sometimes intellectual disabilities are from hereditary.

### PHYSICAL DISABILITIES

A person with a physical disability is controlled by his physical ability to perform an activity independently such as walking, bathing, toileting, etc. A person can be physically disabled due to following reasons:

(a) **Congenital**: A child may have physical disability since birth or the disability developed at a later stage due to genetic problems.

(b) **Acquired**: A child may acquire the physical disability due accidents. Many times infections such as polio or diseases and disorders such as stroke or cancer may lead to physical disability.

The following are the problems faced by physically disabled:

(a) People with such disabilities more or less lead fairly normal and balanced life. However, that depends on the degree of disability. The physical disability again may vary from the type of disability i.e disability related to the limbs (limbs upper or lower limb) loss or disability as a result of neuro-motor disorders which leads to lack of coordination with different organs of the body or sensory organs i.e vision, hearing and speech etc.

(b) People with severe disabilities are not able to lead normal and independent life and often need support of the people around them or the people associated with them. They often face problem in doing their routine day-to-day activities. The problem associated with these disabilities to some extent can be overcome by assistive equipment and training.

(c) The performance of such people is affected by poor muscle control, weak muscles which if not put to exercise by physiotherapy become weaker with ageing. They face difficulty in verbal expression of their views and ideas as the speech is affected. They are not able to perform complex compound functions. People with problems in mobility are not able to perform the tasks which need mobility e.g boarding a moving bus or train or climbing stairs etc. Even while working on computers etc. they face problems in moving the pointer to the specific place and often face difficulty in working on keyboard or moving of mouse especially when more than one key is to be pressed at the same time.

People who are deaf or cannot hear and sometimes cannot speak, they often have to communicate only with sign language and can only be understood if the other person also understands the same language.
Causes of Disability: There are many reasons which may cause disability. These are explained as under:

(i) **Hereditry cause:** Some disabilities are known to be inherited such as spinal or muscular atrophy or dystrophy (disease related to weakness of muscles and nerve cells).

(ii) **Physical ailments or diseases:** Due to physical disease or ailments, some deficiency may develop which leads to permanent disability in a person e.g. small pox can cause blindness and some diseases can cause defects at the time of birth e.g. measles (rubella) can cause deafness in newborn babies.

(iii) **Mental factors:** This may be due to biological, psychological and environmental factors but sometimes it may be due to mental stress. Mind and body are interrelated therefore these mental effects, badly affects the physical condition of the body.

(iv) **Occupational environment:** Most of the disabilities occur due to occupational environment. There is great danger of respiratory disability if someone is exposed to toxic polluted air e.g. inhalation of asbestos fibers causes asbestosis. Even postural deformities can be caused because of incorrect sitting or standing while working e.g. Kyphosis is common disability in tailors.

(v) **Physical factors:** Many health hazards or disability occurs due to physical factors which include heat, cold, light, pressure, noise, radiations, etc. For example extremely cold climate can cause foot bite and heat cramps can be caused due to high temperature. Excessive noise at workplace or residential area can be a cause of deafness.

(vi) **Social Factors:** Some disabilities are acquired as a result of social environment and practices such as caste and class, racial division, male dominance, exploitation etc. The various social hazards arise if a person is not able to adjust in the society. He may face depression, tension, anxiety and insecurity.

(vii) **Chemical Factors:** Many disabilities arise due to chemical pollution. The chemical pollution may be due to fumes of the poisonous gases like carbon dioxide. It can cause headache and breathlessness. It mostly occurs in miners. There are many poisonous gases like carbon monoxide, sulphur dioxide, carbon bisulphide, etc. The poisonous chemical agents may enter the body through lungs and can cause permanent disabilities.

(viii) **Accident:** Accidents are definitely on increase and the types of accidents are road accidents, domestic accidents and occupational accidents. These accidents are major cause of disability e.g. head injury, cervical injuries are very common in road accidents. Loss of limbs has a disastrous effect on person’s physical, psychological and economical aspects of life. Accidents at workplaces especially agriculture, mining and construction etc. are the common place for the cause of disability.

(ix) **Diet Factors:** The most common cause of disability is malnutrition in economically weaker section e.g. where a mother does not get enough to eat when she is pregnant or when she was in her growing age. The malnutrition may cause rickets, anemia etc. which further develops inability to work as a normal being.

(x) **Drug addiction:** Drugs particularly inhibits the work efficiency of brain. The non-medical use of drugs has become a serious concern in many countries. Drugs like Cocaine, Heroin. LSD and Alcohol disturb neuromuscular coordination which can be a cause of physical disease or disability.

(xi) **Lack of Education:** Ignorance towards the prevention of disease is mostly due to illiteracy regarding poor sanitation, malnutrition, unprotected sex, vaccination etc. Knowledge of prevention and cure of diseases often helps to protect from the chances of disability. Lack of education can be a cause of disability due to work e.g. occupational disability can occur if the worker does not know about protective devices which can be used for his personal protection.

4.3 Types of Disorder, its cause and nature (ADHD, SPD, ASD, ODD, OCD)

**ADHD (ATTENTION DEFICIT HYPERACTIVITY DISORDER)**

ADHD is an attention deficit hyperactivity disorder generally developed in children that affect how well someone can sit still, focus, and pay attention. Children with ADHD have differences in the parts of their brains that control attention and activity. This leads to trouble focusing on some responsibilities and subjects. ADHD used to be called attention deficit disorder, or ADD for short. In 1994, it was renamed ADHD. Attention deficit hyperactivity disorder is a brain disorder marked by an ongoing pattern of inattention, hyperactivity and impulsivity. This interferes with functioning or development. ADHD include important functions such as attention, concentration, memory, motivation and effort, learning from mistakes, impulsivity, hyperactivity, organization and social skills. These are explained below:

**Inattention:** It means a child wanders off task, lacks persistence and has difficulty in sustaining focus, often fails to give close attention to details, or makes careless mistakes in school or at work. The child often has difficulty sustaining attention in tasks or play activities. Generally children do not follow instructions and fail to finish school work. They forget daily activities.

**Hyperactivity:** It refers to excessive motor activity and may present differently
depending on the child's age. In adults, it may be extreme restlessness or exhausting others out with constant activity. The child starts talking excessively.

**Impulsivity:** This refers to a child who makes hasty actions that occur in the moment without first thinking about them, even they may harm. An impulsive child may be socially disturbing and excessively interrupting others.

**Symptoms of ADHD**

Since ADHD involves many different problems like inattention, hyperactivity, and impulsivity it can have many symptoms which are listed below:

(a) Troubles in finishing assignments of school.
(b) Problem in focusing on instructions.
(c) Mainly forgetting things like homework.
(d) Chances of distractions are more.
(e) Problems in paying close attention.
(f) Increase in careless mistakes.
(g) Difficulty in organizing tasks and activities.
(h) Unnecessarily interrupting others.
(i) Fidgeting with hands or feet or having trouble sitting still.
(j) Restlessness increases.
(k) Talking a lot and having trouble in doing things quietly.

**Causes of ADHD**

(a) **Brain Functioning in ADHD:** It is well known that frontal lobe, basal ganglia, caudate nucleus, cerebellum, as well as other areas of the brain, play a significant role in ADHD because they are involved in complex processes that regulate behavior.

(b) **Heredity:** It is the most common cause of ADHD. Most of the children develop ADHD right from their birth.

(c) **Exposure to Toxic Substances:** Some of the studies have indicated that the mothers who smoked tobacco products or used alcohol during their pregnancy developed the behavior of ADHD in their children.

(d) **Brain Injury:** Injury to the brain can be the result of accident. Even brain stroke or disease can cause problems with inattention and poor regulation of motor activity and impulses.

**SPD (SENSORY PROCESSING DISORDER)**

Sensory Processing Disorder formally known as sensory integration dysfunction refers to the way the nervous system receives messages from the senses and turns them into appropriate motor and behavioral responses. It exists when sensory signals are either not detected or don't get organized into appropriate responses. A child suffering with SPD finds it hard to process and act upon information received through the senses. SPD is a complex neurological condition that impairs the functional skills of children. Sensory Processing Disorder misinterprets sensory information, such as touch, sound and movement. Children with SPD are at high risk for many emotional, social, and educational problems. They include the inability to make friends. They also get developed poor self-concept, academic failure, and being labeled clumsy and uncooperative. Later anxiety, depression, aggression, or other behavior problems can follow.

**Causes of SPD**

SPD can be caused by a variety of different things. The most common causes are traumatic birth injuries to the upper neck and brainstem regions that are caused by forceps delivery. It is experienced due to childhood falls. The improper development through excessive use of infant walkers and jumpers may develop ASD.
The following are the causes:

(a) **Genetic**: The sensory processing disorder can be inherited, although no genetic markers have yet been identified.

(b) **Physical**: It is observed that the individuals who experience sensory processing dysfunction have abnormal brain activity when exposed to certain stimuli. It is found that children with SPD have differences in their brain structure.

(c) **Environmental**: Even environmental factors may develop sensory processing disorder. The most prominent of such environmental factors includes not being exposed to appropriate amounts of stimulation during crucial developmental stages.

**ASD (AUTISM SPECTRUM DISORDER)**

Autism Spectrum Disorder refers to a range of conditions characterized by challenges with social skills, repetitive behaviors, speech and nonverbal communication, as well as by unique strengths and differences. It is a well known fact that there is not only one autism but many types, caused by different combinations of genetic and environmental influences.

ASD is generally found in the children of 2 and 3 years of age. In some cases, it can be diagnosed as early as 18 months. Autism needs parents with concerns to seek evaluation without delay, as early intervention can improve outcomes.

**Symptoms of ASD**

Autism is a neuro developmental condition which affects the brain's growth and development. It is a lifelong condition with symptoms that appears in early childhood. The following are the symptoms:

(a) Feels difficult with communication and interacting with others.
(b) Repetitive and different behaviours, moving their bodies in different ways.
(c) Unusual reactions to what they see, hear, smell, touch or taste.
(d) Preference for routines and dislike change.
(e) Autism can affects the way that individuals interact with others and how they experience the world around them.

**Causes of ASD**

The exact cause of autism spectrum disorder (ASD) is currently unknown. Mainly it is divided in two reasons and are explained below:

(a) **Genes**: It is believed that certain genes a child inherits from his parents could make them more vulnerable to ASD. Cases of ASD have been known to run in families. For example, younger siblings of children with ASD can also develop the condition, and it's common for identical twins to develop ASD. However no specific genes linked to ASD have been identified.

(b) **Environmental triggers**: It is believed that a person born with a genetic vulnerability to ASD only develops the condition if they’re exposed to a specific environmental trigger. Even premature birth can be a cause of ASD. Child being exposed in the womb of mother who take alcohol or to certain medication, such as sodium valproate may develop ASD. No conclusive evidence has been found linking pollution or maternal infections in pregnancy with an increased risk of ASD.

**ODD (OPPOSITIONAL DEFIANT DISORDER)**

Generally it is found that most of the children are oppositional from time to time, particularly when tired, hungry, stressed or upset. It is noticed that they may argue, disobey, and defy parents, teachers, and others. Oppositional behavior is often a normal part of development for two to three year old children and early adolescents. However, openly un-cooperative and hostile behavior becomes a grim worry when it is so recurrent and consistent that it stands out when compared with other children of the same age and developmental level and when it affects the child's social, family and academic life. The children suffering from Oppositional Defiant Disorder (ODD) often exhibit uncooperative, defiant, and hostile behavior.

**Symptoms of ODD**

(a) Frequent display of bad temperament.
(b) They argue excessively with adults.
(c) Active disobedience and refusal to comply with adult's request.
(d) Intentional attempts to annoy or upset others.
(e) Blaming others for their mistakes or misbehavior.
(f) Often being sensitive or easily annoyed by others.
(g) Always display repeated anger and resentment.

The symptoms are usually seen in multiple settings, but may be more noticeable at home or at school. One to sixteen percent of all school-age children and adolescents have ODD.

**Causes of ODD**

There is no known clear cause of oppositional defiant disorder. Contributing causes may be a combination of inherited and environmental factors and are explained ahead.
(a) Genetics: A child's natural disposition or temperament and possibly neurobiological differences in the way nerves and the brain function are inherited. It is believed that there is a strong genetic link to ODD development. Individuals with immediate family members who struggle with mental illness are more likely to have ODD than the members of the general population. Some common diagnoses in relatives of individuals with oppositional defiant disorder include bipolar disorders, personality disorders, and depressive disorders. Individuals with family members who also have ODD are at the highest risk.

(b) Environment: Problems with parenting that may involve a lack of supervision, inconsistent or harsh discipline, or abuse or neglect. Once an individual has a genetic risk of oppositional defiant disorder, certain environmental experiences, particularly during the developmental years of life, may add to the development of this disorder. Exposure to trauma, family conflict, inconsistent parenting, chaotic living, and chronic stress can all increase an individual's vulnerability to ODD.

OCD (OBSESSIVE-COMPELLUSIVE DISORDER)
Obessive-Compulsive Disorder is a common, chronic and long-lasting disorder in which a person has uncontrollable, reoccurring thoughts which are characterized as obsessions. The behaviors are characterized as compulsions that the person urges to repeat over and over. Obsessive-compulsive disorder is an anxiety disorder characterized by uncontrollable, unwanted thoughts and repetitive, ritualized behaviors someone feel compelled to perform.

OCD causes the brain to get stuck on a particular thought or urge. For example, a person may check the electricity switch 20 times to make sure it's really turned off.

Symptoms of OCD
Development of OCD may have symptoms of obsessions, compulsions, or both. They are divided into two parts and are explained below:

(a) Obsessions related
1. Fear of germs or contamination.
2. Unwanted forbidden or prohibited thoughts.
3. Aggressive thoughts towards others or self.
4. Possessive of having things symmetrical or in a perfect order.
5. Superstitions; excessive attention to something considered lucky or unlucky.

(b) Compulsions
1. Excessive cleaning particularly hand washing.
2. Ordering and arranging things in a particular and precise way.
3. Repeatedly checking on things, such as repeatedly checking to see if the door is locked or that the oven is off.
4. Compulsive counting.
5. Accumulating “junk” such as old newspapers or empty food containers.
6. Spending a lot of time on washing or cleaning or bathing.

Causes of OCD
Still the exact causes of OCD have not been identified. In 2001 World Health Organization (WHO) gave a mental health report estimated that OCD was among the top 20 causes of illness-related disability worldwide for people aged 15-44, and that OCD was the fourth most common mental illness after phobias, substance abuse, and major depression.

The following are the causes of OCD:

(a) Genetic Factors
OCD often seems to run in the family. It is found that parents, siblings and children of a person with OCD have a greater chance of developing OCD than does someone with no family history of the disorder. One study involving identical twins showed that if one twin develops OCD, the other is likely to follow, which suggests that the tendency to develop obsessions and compulsions may be genetic.

(b) Biological Factors
Biological causes and effects of OCD have revealed a link between OCD as insufficient levels of the brain chemical, serotonin. It is one of the brain's chemical messengers that transmit signals between brain cells. It plays a role in the regulation of mood, aggression, impulse control, sleep, appetite, body temperature and pain.

(c) Environmental
Environmental stressors may be a trigger for OCD in people with a tendency toward developing the condition. Traumatic brain injury (TBI) in adolescents and children has also been associated with an increased risk of onset of obsessive-compulsions.
(d) Behavioural
It is found that people with OCD associate certain objects or situations with fear, and that they learn to avoid the things they fear or to perform rituals that help reduce the fear. Once a connection between an object and the feeling of fear becomes established, people with OCD avoid the things they fear, rather than confront or tolerate the fear. For instance, the person who fears catching an illness from public toilets will avoid using them. When forced to use a public toilet, he or she will perform elaborate cleaning rituals, such as cleaning the toilet seat, cleaning the door handles of the cubicle or following a detailed washing procedure. Because these actions temporarily reduce the level of fear, the fear is never challenged and dealt with and the behaviour is reinforced.

4.4 Disability Etiquettes
ETIQUETTES FOR SPECIAL CHILDREN
Special children need special attention for which some rules and etiquettes are made. Generally good manners for dealing with special children with needs are generally the same as the rules for good etiquettes in the society. These guidelines pay attention to the specific issues which frequently arise for people with special children with needs in terms of those issues related to disability. The following are the etiquettes for special children with needs:

(a) Disability Etiquettes
   1. Always consider that he/she is a person, not a disable.
   2. Language to be used must be very nice and humble.
   3. Always offer for shake hand even if they have artificial arm. Simply this gesture will help them feel accepted and create a warmer environment for communication.
   4. For those the children with special needs cannot shake hands, lightly touch the individual on the shoulder or arm to welcome their presence.
   5. Always look at and speak directly to the person.
   6. Treat children with special needs with respect and make them feel a valuable member of the society.
   7. When giving directions for any task make sure that the things such as the weather, locations of ramps, and other physical obstacles may not hinder travel for individuals with disabilities.
   8. Never be rude. Always be polite.

(b) Speech Etiquettes
   1. Never assume that children with special needs as mentally retarded or mentally ill. Be patient in finding out which communication method works best for them.
   2. Always give complete attention when conversing with an individual who has difficulty in speaking.
   3. In case of crowded environment, take them to a quieter location to talk.
   4. Let them complete their own sentences. Be patient and do not try to speak for them. Do not pretend to understand; instead, tell them what you do understand and allow them to respond.
   5. Do not be corrective, but rather, encouraging.

(c) Etiquettes for children on wheelchair
   1. Keep in mind that Individual who use wheelchairs may require special assistance.
   2. Always do not automatically assist the individual without permission. It is okay to offer assistance. However, if the offer is not accepted, respect his/her request!
   3. Always think if you are speaking with an individual in a wheelchair for more than a couple of minutes, find a place where you can sit down to give the individual a more comfortable viewing angle.
   4. Never move, lean on, rock, or touch the wheelchair.

(d) Etiquettes for Hearing Disable
   1. Never shout at a hearing impaired person unless they request you to. Just speak in a normal tone but make sure your lips are visible.
   2. Look directly at and speak directly to the person rather than looking at other side. Remember that facial expressions and natural gestures enhance communication.
   3. Body language is very important which can help them to understand.
**Etiquettes for Visual Disable**

1. When walking with someone with a visual impairment, offer them your arm for guidance. They will likely keep a half-step behind to anticipate curbs and steps.

2. They expect to be treated with the same dignity and respect that you do.

**4.5 Advantage of Physical Activities for children with special needs**

It is well known that Physical Activities and Adaptive Sports have lot of benefits for children with special needs. Everyone wants to live healthy lifestyle in spite of disabilities. Children with physical disabilities often face challenges. Some have limited mobility and even they get tired more easily than other children. Many studies have revealed that if children with special needs actively participate in physical activity and sport leads to improvement of well-being and physical health. Children with intellectual disability may have additional physical disabilities which can result in below age-level performance in typical motor skills. Regular involvement in physical activities can help them to develop the skills they need.

It is observed that when children with special needs are encouraged to participate in frequent fitness measures often improves in everything from their hand-eye coordination and flexibility, to their muscle strength, endurance, and even cardiovascular efficiency. Children with special needs are children first with the same needs and desires as their peers. The difference is that some of these students need adaptations and extra support.

Children with special needs are entitled to participate in organized sports, physical education and recreational programs unless their presence puts them or someone else in danger. Many cities and towns now offer adaptive recreation classes and sports such as basketball, baseball, soccer, softball, swimming, bowling, tennis, etc.

Parents may be worried about allowing their child with special needs to participate in physical education activities. But children with special needs are more at risk of developing childhood obesity than their general education peers. So parents must encourage them for physical activities done under special trained personnel.

The following are the benefits of physical activity for children with special needs:

- (a) Improvement in muscle strength, coordination, and flexibility.
- (b) All individuals benefit from regular physical activity and children with special needs especially. We could all gain from these physical, mental and social benefits of being active.
- (c) Develops endurance, cardiovascular efficiency, and possibly increased life expectancy.
- (d) It improves better balance and motor skills.
- (e) Physical activities always help in decrease in secondary health complications like obesity, hypertension, cholesterol and diabetes.
- (f) Improvement in behavior, academics, self-confidence and building friendships.
- (g) Certainly have positive changes in their health, quality of life and boost to their self-esteem.
- (h) Improved appetite and also improved quality of sleep.
- (i) It reduces stress, anxiety and depression as physical activities acts as healthy outlet of physical energy.

**4.6 Strategies to make Physical Activities assessable for children with special needs**

Every child is unique and their specific needs vary from individual to individual. Children with special needs need participation in physical activities to make a healthy life. Many strategies are required to make physical activities accessible for children with special needs. These are explained below:

(a) **The Environment**

It is often observed that children struggling with learning often compare themselves with others and, so, may be easily offended and discouraged. Therefore is it very essential to provide calm, blame-free environment. The work area must be safe and quiet and free from distractions.

The environment for the children with special needs should be like that the child should be able to find what he needs without asking or hunting. He should be trained to put things back, obviously, to maintain order. This type of organization allows children to work more independently, reduces distractions. All the playing area should be safe to avoid injuries.

(b) **Planning the Schedule**

Children with special needs, need every day an opportunity to engage in something they enjoy and do well. This helps them to attain a necessary balance to their struggles in the areas of weakness. All the physical activities should be planned in a way so that it aims at long-range goals. While planning it must be kept in mind that the small goals must be set which are within the child's reach.
While strategic planning it should be kept in mind that the same group of muscles should not be given activity so long that the child becomes overly fatigued or discouraged. Planning must include daily exercises. Exercise helps in developing concentration as well as the development of coordination.

(c) **Teaching Strategies**
Main aim of planning teaching strategies should always have simple commands with as few words as possible. This helps the child to follow the instructions easily. Children with special needs always try to imitate the teacher so the teacher should demonstrate the skills to be learnt.

(d) **Strategy for Physical Education Teachers**
Teaching physical education to the children with special needs must be modified accordingly. Every child with special needs must have individualized education plan. All the physical education teachers must give training to children with special needs to correct physical conditions that can be improved with exercises.

**EXERCISE**

**QUESTIONS CARRYING 01 MARK**
1. Define Disability.
2. How WHO defined disability?
3. Define structural disability.
5. What is cognitive disability?
6. Define intellectual disabilities.
7. Write any cause of disability.
8. What is the full form of ADHD?
9. Write any two symptoms of ADHD.
10. Write any one cause of ADHD.
11. What do you mean by SPD?
12. What is the full form of ODD?
13. Write any two symptoms of ODD.
14. Write any one cause of OCD.
15. Enlist the disability etiquettes.
16. Write any one advantage of physical activity for children with special needs.
17. Give any one strategy to make physical activities assessable for children with special needs.
18. Write the concept of disability.

**QUESTIONS CARRYING 03 MARKS**
19. What is structural disability?
20. What do you mean by functional disability?
21. Write a short note on cognitive disability.
22. Explain intellectual disability.
23. Write any three causes of disability.
24. Write about ADHD.
25. What are the symptoms of SPD?
26. Explain the causes of ODD.
27. Describe OCD.
28. Write speech etiquettes.

**QUESTIONS CARRYING 05 MARKS**
29. Explain the concept of disability.
30. Define cognitive ability. Explain its causes.
31. Describe intellectual disability.
32. Explain ADHD. Also write its symptoms and causes.
33. Elaborate the symptoms and causes of OCD.
34. Write in detail about the disability etiquettes.
35. Explain the advantages of physical activities for children with special needs.
36. Describe strategies to make physical activities assessable for children for special needs.

---

**5.1 Motor Development and Factors Affecting it**
Sports develop physical skills in children. Sports not only promote physical fitness but also provide recreation. Development of sportsmanship also helps children in developing social qualities. The lessons learnt during children's sports will shape their bodies, values and behaviours for adult life.

**MEANING OF MOTOR DEVELOPMENT**
Motor development is referred as study of changes in movement behaviour. This deals with changes to the motor behaviour for whole span of life.

*According to Gallahue and Ozmun, “As a process, motor development involves the underlying biological, environmental, and task demands influencing both motor performance and movement abilities of individual from infancy through older adulthood. As a product, motor development may be regarded as descriptive or normative and is typically viewed in stages (infancy, childhood, adolescence, and adulthood) that reflect the particular interest of the researcher.”*
The motor development has two types of skills which are explained below:

A. Gross Motor Skills
Gross motor skills involve the large muscles of the body that enable such functions as walking, kicking, sitting upright, lifting, and throwing a ball. A child's gross motor skills depend on muscle tone and strength. Mainly the Gross Motor skills play an important role for activities like walking, maintaining balance, coordination, jumping and reaching.

B. Fine Motor Skills
Fine motor development involves skills of the muscles of the body such as fingers and hands. They consist of activities like writing, grasping small objects, fastening clothing, etc. These skills are also important in the field of sports as holding of badminton racket, lifting in volleyball, Spin bowling in cricket, etc. These skills are important in studies also as ability to eat, write legibly, use a computer, turn pages in a book, etc. depends on fine motor skills.

**MOTOR DEVELOPMENT IN CHILDREN**
Motor development only happens when the child is biologically and mentally ready for it. It is well known that the motor development progresses from gross motor skills to fine motor skills. There are four stages of motor development in children.

A. Infanthood
This period starts from birth and lasts till the age of 2 years. The motor skills begins at the age of 6 weeks. The infants start holding the head in upright position. At the age of 2 months the infant starts lifting arms. They start rolling from side to back at the age of 2 months. The grasping activity begins at the age of 3 months. At the age of around 7 months starts sitting and crawling. Then the infant starts pulling to stand at the age of 8 months. Infants start standing and walking at the age of about 11 months. Although the sequence of motor development is uniform in infants but differences may exist individually in the rate at which motor skills develop.

B. Early Childhood
Early childhood is the period between 2 to 6 years. This period is characterized by rapid motor developments. This is also known as pre-school years. At the age of 2 children learns to kick. Activity of throwing starts at the age of 2-3 years. Balance mechanism develops by the age of 3 years. Child starts walking like adults at the age of 4 years. The child tries to attempt running also. By the age of 4-5 years the child starts controlled running. The child starts running like adults at the age of 5 years. The children can hop and gallop skillfully, and jumping for longer distances at the age of 5 to 6 years.

C. Middle Childhood
This period refers to the age of 7 to 10 years. After the age of 7 years the child moves towards perfection of movements like running, jumping, throwing and catching. The later childhood leads to develop fine motor skills. At the age of 9 years, eye-hand coordination gets developed.

The following are assessed during this stage:

1. The running becomes faster but the speed cannot be maintained for longer distance.
2. The ability to jump vertically and horizontally improves.
3. The children of this period begin to throw further with a better technique and accuracy.
4. Nearly perfection in balancing and coordination is achieved in this period of age.

D. Later Childhood
The late childhood is from 11 to 12 years of age. This age is referred as the best phase of learning motor abilities. The fitness components also develop drastically during this age. The coordinative abilities continue to develop at faster pace during these years.
FACTORS AFFECTING MOTOR DEVELOPMENT

Heredity plays an important role for the motor development of children. Even environment is also vital during the years of motor development. The following are the factors affecting motor development:

A. Heredity: The motor development largely depends on the genetic factors. Many attributes like height, body weight, muscle mass, etc. are acquired from parents.

B. Environment: Children are surrounded by home and school environment. The informative and supportive attitude may improve the development of the children. Many studies have indicated the children exposed to poor and underprivileged educational environments tend to be at a higher risk of being negatively affected in terms of their development. Healthy environment provides encouragement and security which makes children confident and courageous. This leads to a better sensory development.

C. Physical Activity: Regular physical activities always promote motor development. The activities should be planned according to the age.

D. Nutrition: Proper nutrition always leads to good motor development. Even sensory motor development improves with nutrition. Children get stronger development if they get good nutritious food.

The nutrition can have a direct impact on a child’s development both physically and psychologically.

E. Immunization: Timely immunization of mother and child always facilitates better sensory motor development. Many diseases can also be prevented from proper immunization. These diseases often act as barriers for the harmonious development.

F. Opportunities: It is often found that children who get more opportunities to do more cocurricular activities, motor development is better in them. Better sporting opportunities give a better chance of motor development.

G. Proper Sleep: Proper sleep is needed by all individuals. Lack of sleep can lead to the accumulation of fatigue that can deteriorate the motor development.

H. Trauma: Any trauma happened during early childhood can cause negative effects on development of the children. The happening of a natural disaster, losing a family member, experiencing a chronic illness, etc. can have adverse impact on children's development.

I. Parental Interactions: It is observed that parents who spend time playing with kids can have a positive impact on their child's development. Parental interactions with children can have a largely positive or negative effect on child's development.

5.2 Exercise Guidelines at different stages of growth and Development

Regular physical activity always helps to improve overall health and fitness. To stay healthy or to improve health every individual has to go under physical activity regularly. The amount of physical activity need to do is determined by your age. The type of exercise and its intensity varies according to age and are explained below:

Exercise guidelines for children under five years

Infants: They should be encouraged to be active throughout the day. The type of activities for infants is like reaching and grasping, pulling and pushing, moving their head, body and limbs. Once infants can move around, they must be encouraged to remain active in a safe, supervised and nurturing play environment. Although newborn has little control of his muscles, he still enjoys the feeling of his limbs flexing, extending, twisting and moving through space. At the early age of one month, parents can begin exercising with newborn. Lay the baby on his back on the floor. Spread baby's arms out to the sides, bring them in across his chest, and spread them out again. With baby lying on his back, hold his feet or lower legs and gently push one leg up toward his chest while extending the other. Like this very light activities are given.

Toddlers: They can walk on their own and should be encouraged to walk at least 3 hours every day. This may include light activities like standing, moving, rolling and playing.

It's important to understand what kids can do and what skills are appropriate for this age. By age 2, toddlers should be able to walk and run well. They might be able to kick a ball and jump in place with both feet. By age 3, toddlers usually can balance briefly on one foot, kick a ball forward, throw a ball overhand, catch a ball with stiff arms, and pedal a tricycle.

Preschooler Children (3-5 years): Generally they play outside to develop physical skills. Basic activities such as spinning in circles, running and skipping require no fancy equipment. Children between the ages of 3 and 5 are typically vivacious and enjoy turning almost everything into a game. This innate playfulness is beneficial, because physical activity helps them develop the motor skills. Walking, jumping, leaping and climbing are just some examples of gross motor skills that children must work on to remain fit.

Exercise guidelines for children from 6 to 9 years

Children aged between 5-8 years should do at least 60 minutes of moderate to vigorous physical activity, spread throughout each day. Participation in various games can also be promoted. Swimming can be the best exercise.
Exercise guidelines for children from 10 to 14 years
Children from the age of 10 to 14 years can enjoy daily exercise. Even for healthy children aged 10 to 14 years the daily 60-minute guideline for physical activity is a minimum for health maintenance and proper development. Keep in mind that exercises should not be vigorous.

Exercise guidelines for children 15 to 18 years
It is recommended that teens get at least 1 hour of physical activity on most, preferably all, days of the week. Participating in games like skateboarding, in-line skating, yoga, swimming, dancing, etc can be included. Weight training, under supervision of a qualified adult, can improve strength can be performed under supervision. The following activities are included:

Aerobic: Most of the 60 or more minutes a day should be either moderate-or vigorous-intensity aerobic physical activity and should include vigorous-intensity physical activity at least 3 days a week.

Muscle-strengthening: As part of their 60 or more minutes of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least 3 days of the week.

Bone-strengthening: As part of their 60 or more minutes of daily physical activity, children and adolescents should include bone-strengthening physical activity on at least 3 days of the week.

5.3 Advantages and Disadvantages of Weight Training

WEIGHT TRAINING

Weight training exercises are known as exercises meant for strength training. These exercises comprise of fitness equipment such as dumbbells, barbell bars or gym equipment. Generally these exercises involve lifting of weights.

DIFFERENCE OF WEIGHT TRAINING AND WEIGHT LIFTING

They are often confused and are considered as one and the same. But they are quite different. Weight training is done to develop strength while weight lifting describes a competitive sport.

MYTH ABOUT WEIGHT TRAINING

There is a famous myth that children should not do any sort of weight training. Since children's bodies are still developing and lifting heavy weights can be stressful for young muscles. It is a well known fact that weight training is essential for people of all ages and children are no exception. Whether a child is athletic or not, strength training offers benefits to anyone who partakes. Children of 7 to 8 years of age may start lighter strength training activities. These exercises should be performed carefully and under a supervision.

ADVANTAGES OF WEIGHT TRAINING

The weight training exercises have following advantages:

A. Increase Muscle Strength: Weight training exercises always lead to increase in muscle mass. This increases strength of the muscles. The hypertrophy of the muscles is best achieved with weight training.

B. Increase Bone Strength: Weight training exercises improve the bone density. The increase in bone density makes the bones strong. Moreover many studies have quoted that the risk of osteoporosis is lower for people who do weight training exercises at least three times a week.

C. Effective Weight Control: The weight training exercises yield gain in muscle mass and also body begins to burn calories more efficiently. The more toned your muscles are the easier it is to control your weight. The weight training exercises reduce chances of getting obese.

D. Improves Quality of Life: Weight training exercises lead to better functioning of muscles. The movements like sitting, standing, running, walking, sleeping, lifting, pulling and other daily movements largely depend on conditioning of muscles. Even lifting weights can be easy for trained person.

E. Better Body Posture and Looks: The weight training exercises develop bones and muscles and this helps in possessing a good posture. The appearance and self esteem also improves.

F. Better Sports Performance: Weight training has significant benefits in gaining muscle strength, endurance and balance. These benefits enhance over all sports performance of the children.

DISADVANTAGES OF WEIGHT TRAINING

The weight training exercises have following disadvantages:

A. Injuries

There are chances that children may experience musculoskeletal injuries from weight training. The reasons for the occurrence of these injuries can be following:

(a) Improper use of equipment
(b) Faulty training techniques
(c) Excessive loading of too many weights or repetitions
(d) Lack of supervision
However these injuries can be prevented if the children do weight training exercises in a properly designed and well-supervised resistance training programme.

B. Muscle Cramps
Unsystematic weight training leads to stiffness caused by muscular cramps in muscles particularly in shoulders, elbows, waist and even legs. These cramps occur due to imbalance in the level of electrolytes and dehydration. The weight training programmes end up with sweating. This causes mineral imbalance and leads to muscle cramps.

5.4 Concept and advantages of Correct Posture
The health of a person depends on several factors. Healthy nutrition, cardiovascular fitness, and regular training are few of the better known factors that certainly change the human physique. However, there is one important element of physical change that is quite vital but that often goes unnoticed. That element is posture. Many people focus on balanced diet and regular exercise, which are very important, but often ignore the posture. Even if a person is having good diet and regular exercise but poses poor posture, will have a bad appearance.

MEANING OF POSTURE
The word posture comes from the Latin verb *ponere* which means to *put* or *place*. The arrangement of the body and its limbs is known as posture. It is also considered as position of the body parts and way of bearing one’s body. The good posture refers to three curves of spine in a healthy position.

The proper alignment of the body is important to possess a good posture. The spine is not straight. It has curves in the thoracic (upper) and lumbar (lower) regions. Any deviation of any of curve from its original place leads to postural deformity. A good posture refers to the stance which is attained when the joints are not bent and the spine is aligned and not twisted.

It is very essential for maintaining a healthy spine and muscle balance. Sitting hunched over all day at desk can cause muscles to tighten. The placement of legs and spine under increased pressure can lead to the chances of injury or strain. If a plumb line is hung from each ear lobe in a good posture, the plumb line will drop straight down from the ear lobe through the shoulder area, down the middle of the arm and through the ankle bone.

CORRECT STANDING POSTURE
Although standing is something we do every day. But most of us have never really given importance to the proper standing position. Many people are actually not aware that their standing habits can lead to their back and neck problems. Hence, it has become essential to know the correct standing posture. While standing, following points must be kept in mind:

1. The head must be kept straight. It should not be tilted forward, backward or sideways.
2. The earlobes should be in line with the middle of shoulders.
3. The shoulder blades should be kept back.
4. Keep chest in a forward position.
5. Stretch the top of the head toward the ceiling.
6. Keep the knees straight.
7. The stomach should be tucked in. The pelvis should not be tilted forward or backward.
8. The arches of the feet should be supported.

CORRECT SITTING POSTURE
Now-a-days, people sit for long time on computers and hence the correct sitting posture is also very important. While reading or studying, in incorrect sitting posture it can lead to postural deformities.

The following points should be kept in mind while sitting:

1. Always sit up with back straight and shoulders back. The buttocks should touch the back of the chair.
2. All three normal back curves should be placed normally while sitting.
3. Distribute the body weight evenly on both hips.
4. The knees should be bent at a right angle. Keep the knees even little higher than the hips. The use of a footrest or stool can be preferred. The legs should not be crossed.
5. Always keep the feet flat on the floor while sitting.
6. Try to avoid sitting in the same position for more than 30 minutes.

ADVANTAGES OF CORRECT POSTURE
The benefits of good posture make it a desirable factor to focus on. It considers the following advantages:

A. Effective Breathing
A good posture naturally enables to breathe properly. Good posture means that the lungs won’t be “squished” and this will improve thoracic capacity.
This leads to better breathing.

B. Improves Concentration and Thinking Ability
Due to better breathing, the thinking power increases as more oxygen is also available to the brain. Greater concentration and mental ability is there due to reduced pain and fatigue.

C. Improves the Personality
People with good posture look smarter and more attractive. A person having bad posture does not possess good looks. Good posture evokes grace and improves assertiveness in an individual.

D. Increases Self-confidence
A person possessing good posture becomes self-confident. He can walk, sit and stand smartly among the group.

E. Helps in Avoiding Orthopaedic Health Complications
A good posture results in avoiding several complications such as increased risks of slipped disc, back-aches, back-pain, pressure inside the chest, poor blood circulation. Good posture also reduces strain on the spine.

F. Increases Physical Fitness
The optimal organ development and muscle function for maximum energy, endurance, and vigour can be achieved in a person who possesses good posture. The correct alignment of joints and bones will result in less fatigue and body will require less energy to move around. A person remains physically active.

5.5 Causes of Bad Posture
Posture refers to the way that a person holds his or her position and body. There are many people who suffer from poor posture.

CAUSES OF POOR POSTURE
A. Heredity : Many postural deformities are acquired from parents. The incorrect shape of spine can be due to genes. So, heredity can be a cause of poor posture.
B. Age : The poor posture can be due to loss of muscle tone. When a person gets older he loses muscle tone and this leads to poor posture as shown in the picture given above.
C. Malnutrition : Malnutrition can lead to underdevelopment of bones and muscle tissues. Low nutrition and lack of vitamins and calcium can affect the bones and muscles. This results in weakening of skeleton and can lead to a poor posture.
D. Fatigue : Continuous overloading accumulates fatigue. In the condition of fatigue it becomes difficult to hold the body in good posture. Chronic fatigue can cause the spine and shoulders to sink lower and worsen posture.
E. Obesity : Carrying extra weight around the abdominal area can have problems with lower back being pulled forward by the weight of the stomach.
F. Low Self–Esteem : It is found that individuals possessing low self–esteem often keep their head down and shoulders forward. This can result in deformation of spine. It can become a bad habit and can lead to poor posture.
G. Poor Vision : It is found that poor eyesight may cause a person to lean forward to see the computer screen, book or television. This leads to cause shoulders to hunch and head forward. Later this causes poor posture.
H. Improper Clothing : It is an established fact that tight clothing and improper shoes affect posture. The tight clothing results in incorrect sitting, standing and walking. This habit can cause a poor posture.
I. Sedentary Lifestyle : Sedentary lifestyle leads to lack of exercise and results in weakness of muscles and joints. Lack of active lifestyle can cause a poor posture.
J. Occupational Environment : Occupational environment is also very important to keep a good posture. People who work at a desk and sit incorrectly all the day have a risk of developing poor posture, especially those who sit in front of a computer or watching TV for long hours. Like tailors tend to push their neck forward and hunch their shoulders, resulting in a poor posture.
K. Chronic Injuries : When you experience pain in your back or neck muscles or any other part of the body, you tend to overcome the pain by holding your body in a different position. When this posture is continued for a long time, it can become a daily habit. Hence, holding yourself differently can be due to some pain or muscle injury in any part of your body can cause poor posture.
L. Stress : The cause of stress can be physical or emotional from work or any problem like family, health worries. Stress initiates chemical responses in our bodies. Stress often yields chronic illness, weight gain and weak bones. This leads to poor posture.

5.6 Common Postural Deformities—Knock Knee, Flat Foot, Round Shoulders, Lordosis, Kyphosis, Bow Legs and Scoliosis
The common postural deformities are related to the bony structure of the body. Such deformities of the human body may be acquired or are congenital. The reason may be an accident, inadequate diet, wrong habits of sitting, standing and sleeping. Some of the postural deformities are explained below:

KNOCK KNEE
The knock knee is derived from the latin word Genu and Valgus which means Knee bent inward. The knock knee is also known as Genu Valgum. Knock knee is a condition in which the lower legs are positioned at an outward angle and the knees touch each other. The ankles are also separated. The knock knee is mostly caused by irregular growth of the lower leg bones and weak ligaments.

FLAT FOOT
The flat foot is also called as Pes Planus or Fallen arches. It is the condition in which the arch of the foot collapses downward. The entire sole of the foot comes into complete or near complete contact with the ground. The appearance of flat foot is common in children in case of obesity generally.
ROUND SHOULDERS
It is the postural defect in which the shoulders are protracted (drawn forward), the head is extended, and the chin pokes forward.
The shoulders are bent forward that gives a rounded form of the upper part of the back.

LORDOSIS
A normal spine, when viewed from behind appears straight. However, in case of Lordosis, the spine shows exaggeration of curvature of the back bones (vertebrae) in the lower back area. Mainly lordosis affects the lumbar region.
Lordosis is mostly occurs in obese people who have weak back muscles and heavy abdomen.

KYPHOSIS
It is caused due to excessive curvature of the spine at the back such as hunch back. The term kyphosis refers to an exaggeration of the outward or backward curvature of the mid-spine. Kyphosis occurs mainly in the thoracic spine. It also refers to a change in the posture that affects the upper back. This kind of change in posture can lead to chronic neck, shoulder and back pain, as well as difficulty in breathing.
The main symptom of kyphosis is the change in physical appearance and the development of a humped back or hunchback shape. It occurs due to poor posture along with weak back muscles and tight chest muscles.

BOW LEGS
Bow legs cause an increase in the curve of the legs and leave a gap between the knees. Bow leg is a condition in which the knees remain wide apart when a person stands with the feet and ankles together. Most of the infants are born bow legged because of their folded position in the uterus. The infant’s bowed legs begin to straighten once the child starts to walk and the legs begin to bear the body weight.
Severely bowed legs can be due to rickets. Rickets is caused by the vitamin D deficiency.

SCOLIOSIS
Scoliosis is a disorder caused due to an abnormal curve of the spine, or backbone in the lateral side. The spine has normal curves when looking from the side, but in case of scoliosis the curve is deviated to one side. Most of the people having scoliosis develop additional curves to either side and the bones of the spine twist. It is about two times more common in girls than boys. It can be seen at any age, but it is most common in those over 10 years old. People with scoliosis are more likely to have children with scoliosis. However in most of the cases, the cause of scoliosis is unknown.

5.7 Corrective Measures for Postural Deformities
The good posture displays the level of fitness of an individual. Good posture helps the muscles of the body to support the skeleton for better alignment. There are many reasons behind the poor posture which are listed below:
1. Injury
2. Disease and nutritional state
3. Bad habits
4. Muscle tension, muscle weakness
5. Mental attitude and stress
6. Heredity
7. Improper shoes
Physical activity often helps in building the strength of muscles of the body. Even the toning of muscle also develops with the regular physical activity.
The corrective exercises can cure the postural deformities to a great extent. Some of the exercises are explained below:

A. Back Exercises
Most of the postural deformities occur due to weakness of the back muscles. To put shoulders at original place some workouts of back strengthening are required. Lat pulls downs can improve the back.

B. Trunk Exercise
Twisting of trunk often strengthens the back and the abdomen. The lower back is also developed by this exercise.

C. Chest Exercise
Strengthening of the chest also helps in improving the posture. Three sets of 15 repetitions on a chest press, incline press or decline press are sufficient.

D. Leg Press
Do not ignore legs. Strengthening the lower part is also important to have a balanced posture. Leg press, hamstring curls and leg extensions must be done.

E. Aerobics
Regular aerobics can develop the cardiovascular system and this can help in reducing weight and improving posture. Walking, running, jumping, aerobics, etc., are very important for postural fitness.

CORRECTIVE MEASURES FOR KNOCK KNEES
A. Side Step-ups
Side step-ups are done on weight bench. Stand to right side facing the bench and arms in front of chest. Then place right foot on the bench, press down and lift the body in the air as shown in the picture. When right leg is straight, hold for a second, lower yourself and repeat. After doing 10 to 12 repetitions, switch sides.
B. Lying Abduction
It is done from a side-lying position. Lie on right side with legs stacked. Then lift left leg at a 45° angle to the floor and hold for a second. Slowly lower your leg, repeat for 10 to 12 repetitions and switch sides.

C. Wall Abductor Squeeze
These exercises are done with the help of an exercise ball as shown in the picture. Stand with right side facing the wall, and hold the ball against the floor at stomach height. After lifting right leg hold it for a second. Slowly release the pressure and repeat. After doing 10 to 12 repetitions, switch sides.

CORRECTIVE MEASURES FOR FLAT FOOT
A. Heel Stretch
Sit on the floor keeping feet flat on the floor. After this lift both feet's toes and feet except the heel. Hold in this position for 10-15 seconds. Repeat this exercise 5 times for both the feet as shown in the picture.

B. Using Proper Shoes
Wear shoes which have proper arch support. Wearing of high heels should be discouraged.

C. Twisting Feet
Sit with legs straight touching the floor. Lift right feet and touch the last toe finger of the left feet. This foot exercise is an effective stretching to build an arch.

CORRECTIVE MEASURES FOR ROUND SHOULDERS
A. Standing Chest Stretch
After standing near a wall, the right upper arm is lifted and kept parallel to the floor. Bend the elbow at right angle. Then place right forearm with palm facing front on the wall. Exhale, lean forward a little, and twist body to the left. Hold this stretch for 40 to 60 seconds, then relax. Like this repeat the exercise for other side also.

B. Supine Chest Stretch
Lie face-up on a exercise bench with your spine and head supported on the bench. Place both arms out to the sides at right angles from the body with palms facing up. Exhale and stretch arms toward the floor until comfortable position is achieved. Then stretch in chest muscles. Hold this position for 40 to 60 seconds.

CORRECTIVE MEASURES FOR LORDOSIS
A. Hip Flexor Stretch
Stretching the iliopsoas muscle, attain the position with one knee on the floor as shown in the picture. Gently push the hips forwards keeping the back upright until a complete stretch in performed. Hold for 20-30 seconds, repeat 3-5 times, several times a day.

B. Lower Back Stretch
Lie on back with the knees bent. Pull the knees in towards back, as far as comfortable. Hold for 20-30 seconds and repeat 3-5 times, several times a day.

C. Strengthening Abdominal Crunch
Lie on back with knees bent. After this gently slide hands up towards the knees and back down again, raising the head and shoulders off the floor. Repeat this exercise until you feel the abdomen muscles working hard. Rest for a minute and aim to do 2-3 sets.

D. Twisting Crunch
After lying on back with the knees bent and feet flat on the floor. The hands are placed on the sides of temples as shown in the picture. After rising the head, twist the upper body so that the right elbow moves towards the left knee. Return to the starting position and repeat, alternating between left and right twists. Start by performing 2 sets of 10 repetition and gradually increase towards 3 sets of 20.

E. Bridging Exercise
After lying on back with the knees bent and feet flat on the floor the hips are raised up as shown in the picture. Hold for 5-10 seconds, rest and repeat. Initially do 2 sets of 10 repetitions.

CORRECTIVE MEASURES FOR KHYPOSIS
A. Posture
Good posture while standing, sleeping, walking or sitting often protects for postural deformity like Khyposis. Many times we often bend our upper back including shoulders to avoid lower back pain. Avoiding this can protect Khyposis.

B. Stretching While Sitting on Chair
Sit straight in the chair keeping spine, hands and head straight. After this position start bending head down as much as you can do. This gives a stretch of the back muscles. Repeat this exercise 2-3 times a day for 2 weeks.

C. Strengthening Cervical Muscles
Isometric exercises are the best to strengthen the neck and shoulder muscles. The following exercise can be performed:
   (a) Press palms against forehead. After this slowly start pushing head. Hold at this position for for 5-6 seconds. Relax and repeat 3-4 times.
   (b) After attaching a rope to the seated cable row place both the feet on the footpads as shown in the picture. Then flex knees a little. Hold the rope in each hand and then pull it towards chin. Like this few sets of exercises are done.
EXERCISE

QUESTIONS CARRYING 01 MARK
1. Define motor development.
2. What is gross motor development?
3. What do you mean by fine motor development?
4. What are weight training exercises?
5. What are the exercise guidelines for infants?
6. Elaborate the motor development during infancy.
7. Elaborate the motor development during early childhood.
8. How heredity affects motor development?
9. Write any two advantages of weight training.
10. What do you mean by posture?
11. What is correct sitting posture?
12. Write any one advantage of good posture.
13. Write about one factor that affects posture.

QUESTIONS CARRYING 02 MARKS
14. Elaborate gross and fine motor skills.
15. Explain the motor developments during early childhood.
16. Elaborate the motor development during middle childhood.
17. Write any three factors affecting motor development.
18. What is the difference between weight lifting and weight training?
19. What do you mean by kyphosis?
20. Explain flat foot.
22. What is lordosis?
23. What is scoliosis?
24. Explain any three factors that affect posture.
25. Elaborate the concept of posture.
26. Describe any three factors that cause poor posture.

QUESTIONS CARRYING 05 MARKS
28. Discuss the factors affecting motor development.
29. What are the exercise guidelines for different stages of growth and development?
30. Elaborate the advantages and disadvantages of weight training for children.
31. Define posture. What are the advantages of good posture?
32. Write an essay on correct sitting and standing posture.
33. Explain the various postural deformities.
34. What are the various essential corrective exercises for bad posture?
35. Explain various factors that cause poor posture.
6.1 Sports Participation of Women in India
The first women athletes India sent were four women athletes to the Helsinki 1952 Olympics. In Athletics Nilima Ghosa and Mary D Souza while in swimming Dolly Nazir and Arti Saha represented in Helsinki Olympics. PT Usha became first Indian lady to enter the finals of any Olympic event. Though she could not win any medal but she entered the finals of 400 m Hurdles at 1984 Los Angeles Olympics. Unfortunately she lost Bronze Medal by 1/100th of a second. In the same Olympics four member squad of the 4 × 400m relay, P.T. Usha, M.D.Valsamma, Vandana Rao and Shiny Abraham secured seventh place. Later Anju Bobby George entered the finals of Women Long Jump at 2004 Athens Olympics.
In 2000 Sydney Olympic Games Karnam Malleshwari won bronze in weight lifting in the 69 kilogram category and became first Indian women to get medal in the Olympics. In London Olympics Saina Nehwal won Bronze Medal in Badminton in the women's singles. Mary Kom also won Bronze Medal in the Boxing. In Rio Olympics P.V. Sidhu won silver medal and Sakshi Malik won silver medal in Badminton and Wrestling respectively.

6.2 Special Consideration (Menarche, Menstrual Dysfunction)

MENARCHE
Menarche is known as first menstruation cycle of girl. First menstrual cycle does not mean that it is first ovulation. However, it shows that it is just a normal pattern of ovulation that will soon be established. The menarche starts at different ages and varies from individual to individual. Generally first menstruation is under 13 years. It is also a known fact that activities like Gymnastics delays menarche. Many studies have indicated that delayed menarche has advantage in certain sports.

MENSTRUAL DYSFUNCTION
Menstruation is the shedding of the lining of the uterus that occurs regularly in women from menarche to menopause. It produces bleeding from vagina that lasts for 3-7 days. It occurs in every 24-34 days. Half the length of menstrual cycle, an egg is released from an ovary. This egg travels through fallopian tube to the uterus. This process is known as ovulation. The average cycle of menstrual cycle is 28 days.
Menstrual dysfunction is characterized by disruptions. It has several types and is explained below:

(a) Eumenorrhea: It is known as normal menstrual function.
(b) Oligomenorrhea: Oligomenorrhea is termed as abnormally infrequent menstrual periods. A woman who regularly goes more than 35 days without menstruating may be diagnosed with oligomenorrhea. Young athletes who participate in sports or engage in heavy exercise can develop this condition.
(c) Amenorrhea: Amenorrhea is the absence of menstruation. Basically it has two types and known as primary amenorrhea and secondary amenorrhea.
   (i) Primary Amenorrhea: When a woman of 18 years of age or older do not have menarche are diagnose as primary amenorrhea.
   (ii) Secondary Amenorrhea: It happens in women who do not have normal menstrual cycle for months or even years. Over exercising can also be one of the causes of amenorrhea. Mostly women who have done intense training like distance running, cycling, body building, gymnastics and figure skating may face amenorrhea.

6.3 Female Athletes Triad (Osteoporosis, Amenorrhea and Eating Disorders)
Female Athletes Triad became apparent in 1990. It was considered that it is associated with disordered eating, secondary amenorrhea and bone mineral disorder. In 1997 American College of Sports Medicine made a report on Athletes Triad. These disorders can lead to diminishing of physical performance and cause of morbidity or mortality. It was suggested that imparting of knowledge of Athletes Triad can minimize the health hazards associated with it.
The factors of athlete triad are explained below:

OSTEOPOROSIS
Osteoporosis is characterized by low bone mineral contents. This leads to increased porosity of the bones. This results into increased bone fragility. The risk of bone fractures also increases. Osteoporosis is weakening of the bones due to the loss of bone density and improper bone formation. This condition can ruin athlete's career because it may lead to stress fractures and other injuries.
Inadequate physical activity may develop osteoporosis.

**Symptoms**

It remains unnoticed as it takes long time to develop and causes no specific symptoms in its early stage of bone loss. The following are the symptoms:

(a) **Back Pain**: Osteoporosis is usually caused by fractures of the spine and cause Back pain.

(b) **Bone Fracture**: The bones become fragile and due to small injury bone breaks. A bone fracture that occurs much more easily than expected.

(c) **Bad Posture**: Due to fractures of the spinal region caused by osteoporosis a person experiences stooped posture of the upper back.

**Causes**

(a) **Gender Differences**: It is found that women have more chances of developing osteoporosis than men because of hormonal changes that occur due to menopause. The oestrogen hormone is essential for healthy bones and after the menopause its levels fall. This can lead to a rapid decrease in bone density.

(b) **Thyroid Problems**: Imbalance of thyroxine hormone can cause bone loss. Hyperthyroidism causes osteoporosis.

(c) **Improper Diet**: Osteoporosis is more likely to occur in people who take improper diet. Sometimes severely restricting food intake to lose weight can also lead to weakness of bones. Low calcium intake is the main cause for the development of osteoporosis.

**AMENORRHEA**

Participation in vigorous exercises and not eating adequate calories can lead to decrease in the hormones that help to regulate the menstrual cycle. This can lead to irregular periods and may stop altogether. Of course, it's normal for teens to occasionally miss periods, especially in the first year.

**Symptoms**

The main sign of amenorrhea is the absence of menstrual periods. In addition to this some other symptoms like hair loss, headache, change in vision, development of facial hair and pain in the pelvic.

**Causes**

It can occur due to many reasons which are explained below:

Amenorrhea can occur for a variety of reasons. Some are normal during the course of a woman's life, while others may be a side effect of medication or a sign of a medical problem.

**EATING DISORDERS**

Disordered eating has become a major problem in female athletes. Most of them suffering from female athlete triad try to lose weight as they want to improve their athletic performance. The disordered eating occurs in players who want to improve their appearance in sports like in diving, figure skating, gymnastics, ballet, etc. This can lead to serious eating disorders like anorexia nervosa or bulimia nervosa. The athletes participating in endurance sports like cycling, distance running and swimming often may get developed disordered eating. Many sports have weight categories like in judo, boxing, taekwondo, wrestling, etc. so athletes try to lose body weight and get addicted to disordered eating.

**Symptoms**

Many symptoms generate in case of eating disorders. The symptoms comprise of behavioural, physical and psychological signs which are explained below:

(a) **Physical Symptoms**

1. Gets accumulation of fatigue.
2. Rapid weight loss in short period of time.
4. Sensitivity to the cold.
5. Irregular menstrual periods.
6. Signs of frequent vomiting.
7. Weakness, fainting and dizziness.

(b) **Psychological Symptoms**

1. Increased obsession with body shape, weight and appearance.
2. Fear of gaining body weight.
3. Increased anxiety.
4. Swings in mood.
(c) Behavioural Symptoms
1. Frequent trips to the bathroom during or shortly after meals.
2. Hesitation in social gatherings and isolation from friends.
3. Eating very slowly.

Causes
The exact cause of eating disorders is unknown. As with other mental illnesses, there may be many causes, such as:
(a) Genetics: Certain people may have genes that increase their risk of developing eating disorders. People with first-degree relatives—siblings or parents—with an eating disorder may be more likely to develop an eating disorder, too.
(b) Psychological and emotional problems: People with eating disorders may have psychological and emotional problems that contribute to the disorder. They may have low self-esteem, perfectionism, impulsive behavior and troubled relationships.
(c) Society: Success and worth are often equated with being thin in popular culture. Peer pressure and what people see in the media may fuel this desire to be thin.

Symptoms
The following are the symptoms of female athlete triad:
(a) Excessive weight loss
(b) No periods or irregular periods
(c) Accumulation of fatigue
(d) Lack of concentration
(e) Occurrence of stress fractures.
(f) Continuous dieting in spite of weight loss
(g) Obsession with food and weight
(h) Consumption of laxatives
(i) Dental cavities
(j) Low heart rate
(k) Low blood pressure

ANEMIA
Anemia is a condition in which a person does not have enough healthy red blood cells to carry adequate oxygen to tissues. There are many forms of anemia, each with its own cause. Loss of blood is the most common cause of anemia. Anemia can be temporary or long term, and it can range from mild to severe.
The treatment for anemia starts with taking supplements.
The following are the symptoms of Anemia:
- Fatigue
- Weakness
- Pale skin
- A fast or irregular heartbeat
- Shortness of breath
- Chest pain
- Dizziness
- Cognitive problems
- Cold hands and feet
- Headache

Initially, anemia can be so mild it goes unnoticed. But symptoms increase as anemia worsens.

6.4 Psychological Aspects of Women Athlete. (Read from 6.4 page no. 102 to 105 of the book)
6.5 Sociological Aspects of Sports Participation. (Read from 6.5 page no. 104 to 105 of the book)

EXERCISE

QUESTIONS CARRYING 01 MARK
1. How many women participated in Olympics held in 1900?
2. What do you mean by menarche?
3. What is Amenorrhea?
4. In which year Female Athletes Triad became apparent?
5. What is anemia?
6. Write any three symptoms of female athlete's triad?
7. How lack of education effect women's participation in sports?
8. Explain any two reasons for less participation of women in sports.
9. What do you mean by social stigma in connection with women's sports participation?

QUESTIONS CARRYING 03 MARKS
10. Explain any three reasons for less participation of women in sports.
11. Describe amenorrhea.
12. Write about osteoporosis.
13. What is menstrual dysfunction?
14. Explain disordered eating.
15. Enlist the symptoms of Female athlete's triad.

QUESTIONS CARRYING 05 MARKS
16. Write in detail about the causes for less participation of women in sports.
17. What do you mean by menarche and menstrual dysfunction?
18. Write an essay on female athlete's triad.
7.1 Computation of Fat Percentage (Slaughter-Lohman Children Skinfold Formula)

**SLAUGHTER-LOHMAN CHILDREN SKIN FOLD FORMULA**

Slaughter and Lohman designed a formula for finding out the body fat among the children of 8 to 10 years. To calculate body fat percentage skin fold measurements at triceps and calf are recorded. The following are the procedures to measure skin fold:

**Measurement of skin fold at Triceps**

Skin fold measurement for triceps is taken vertically on back of arm and in the center of top of shoulder point (Acromial Process) and elbow (Olecranon Process). The arm should be relaxed with the palm of the hand facing forwards. A vertical pinch, parallel to the long axis of the arm, is made at the landmark before skin fold caliper is used.

**Measurement of skin fold at Calf**

The medial calf skin fold site is one of the most common locations used for the assessment of body fat using skin fold calipers. The subject is advised to place his or her foot on a chair or box so that the knee is at approximately 90 degrees. A vertical pinch parallel to the long axis of the leg is given. At the largest circumference of calf and on the medial surface of the calf skin fold measurement is taken.

The skin fold equations shown below are used to predict body fat in children 8-18 years of age. By putting values of skin fold caliper of Triceps and Calf in the following equations calculates the body fat percentage:

- **Boys:** \( \% \text{ Body Fat} = 0.735 \times (\text{Triceps} + \text{Calf}) + 1.0 \)
- **Girls:** \( \% \text{ Body Fat} = 0.610 \times (\text{Triceps} + \text{Calf}) + 5.1 \)

7.2 Measurement of Muscular Strength - Kraus Weber Test

The Kraus Weber Test was introduced by Kraus and Hirschland and was administered on school children. This consists of following six tests:

**TEST–1**

**Purpose:** To measure the strength of the abdominal and Psoas muscles.

**Procedure:** The subject is advised to lie on spine and the hands to be kept behind the neck. The examiner holds the feet of the subject. After command the subject has to roll up to sitting position.

**Scoring:** If the subject is not able to lift his shoulders, zero mark is awarded. If without help he reaches to sitting position 10 marks are awarded.

**TEST–2**

**Purpose:** To measure the strength of the abdominal muscles.

**Procedure:** The subject is advised to lie on spine and the hands to be kept behind the neck while keeping knees bent. The examiner holds the feet of the subject. After command the subject has to roll up to sitting position.

**Scoring:** If the subject is not able to lift his shoulders, zero mark is awarded. If without help he reaches to sitting position 10 marks are awarded. The distance from spine to sitting position is marked from 0 to 10 marks.

**TEST–3**

**Purpose:** To measure the strength of the Psoas and lower back.

**Procedure:** The subject is advised to lie on spine on table and the hands to be kept behind the neck. The subject is advised to lift the legs to 10 inches above the table.

**Scoring:** Holding the legs for 10 seconds scores 10 points. Anything held less than 10 seconds is scored accordingly e.g. 5 seconds is recorded as 5 points and so on.
TEST–4
Purpose: To measure the strength of upper back.
 Procedure: The subject is advised to lie on prone position on table and the hands to be kept under the neck. A pillow is kept under abdomen. The examiner has to press the back and trunk of subject. The subject is advised to lift the legs to 10 inches above the table.
 Scoring: Holding the legs for 10 seconds scores 10 points. Anything held less than 10 seconds is scored accordingly e.g. 5 seconds is recorded as 5 points and so on.

TEST–5
Purpose: To measure the strength of lower back.
 Procedure: The subject is advised to lie on prone position on table and the hands to be kept behind the neck. A pillow is kept under abdomen. The examiner has to press the legs and hips of subject. The subject is advised to lift the upper body to 10 inches above the table.
 Scoring: Holding the legs for 10 seconds scores 10 points. Anything held less than 10 seconds is scored accordingly e.g. 5 seconds is recorded as 5 points and so on.

TEST–6
Purpose: To measure the strength of back and hamstring.
 Procedure: The subject is instructed to stand erect with bare feet. After putting feet together the subject is advised to touch hands to feet. The subject should stay for three seconds. Full 10 marks are given for complete touch. If subject is unable to touch by two inches is awarded 8 marks.

7.3 Motor Fitness Test - AAHPER

The AAHPER Youth Fitness Test was formed in 1965 in United States. This test was administered on school students of 17 year age.

METHOD
The students are advised to warm up before they participate in test. All the students must be medically fit. This test has six following items:

1. Pull ups for boys
2. Flexed arm stand for girls
3. Sit ups
4. Shuttle run
5. Standing long jump
6. 50 yard dash
7. 600 yard run-walk

PULL UPS FOR BOYS
Purpose: To measure arm and shoulder strength.
 Procedure: The bar is adjusted according to the height of student. The bar is held with palm facing away from him. The student is advised to raise body so that the chin reaches the level of bar. One score is awarded for each pull ups. One trial is given.

FLEXED ARM STAND FOR GIRLS
Purpose: To measure arm and shoulder strength.
 Procedure: The bar is adjusted according to the standing height of student. The bar is held with over
hand grasp. The student lifts her body with help of assistance of testing personnel so that her chin reaches bar level. The elapsed time is taken as score. The score is nearest second.

**Pull-Ups and Flex-Arm Hang**

<table>
<thead>
<tr>
<th>Percentile</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17+</th>
</tr>
</thead>
<tbody>
<tr>
<td>100th</td>
<td>27</td>
<td>20</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>95th</td>
<td>12</td>
<td>15</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>90th</td>
<td>10</td>
<td>12</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>85th</td>
<td>9</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>80th</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>75th</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>70th</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>65th</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>60th</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>55th</td>
<td>5</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>50th</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>45th</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>40th</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>35th</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>30th</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>25th</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>20th</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>15th</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>10th</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5th</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Sit-Ups**

**Purpose:** To measure abdominal strength and endurance

**Procedure:** The student is advised to lie on floor on his/her back keeping knees bent. The angle of knees should be around 90°. The feet are held by partner as shown in the picture. The student is further advised to put fingers interlocked and put behind the head. The student curls up and touches the elbows to knees. The score is counted as maximum number of sit ups in 60 seconds.

<table>
<thead>
<tr>
<th>Percentile</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17+</th>
</tr>
</thead>
<tbody>
<tr>
<td>100th</td>
<td>73</td>
<td>72</td>
<td>76</td>
<td>66</td>
</tr>
<tr>
<td>95th</td>
<td>55</td>
<td>57</td>
<td>55</td>
<td>54</td>
</tr>
<tr>
<td>90th</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>51</td>
</tr>
<tr>
<td>85th</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>49</td>
</tr>
<tr>
<td>80th</td>
<td>48</td>
<td>49</td>
<td>49</td>
<td>47</td>
</tr>
</tbody>
</table>
SHUTTLE RUN

Purpose: To measure speed and agility.

Procedure: Two parallel lines are marked 30 feet apart and two wooden blocks 2 × 4 inches are kept on one side of marked line. The student stands opposite to the line where wooden blocks are placed. On start the student runs towards wooden blocks and pick one of them. Then places the block on the line from where the test started. The student continues to run and similarly lift other block and place at starting line. The score is elapsed time for complete trial. The better of two trials is taken as final score.
STANDING LONG JUMP

**Purpose:** To measure power.

**Procedure:** The student is advised to stand on restraining line with feet close and he/she dips at the knee and swinging arms before jumping.

The student lands on both feet together. The distance from take off line to the heel is measured in inches. The best of three trials is recorded as final score.

---

**50 YARD DASH**

**Purpose:** To measure speed.

**Procedure:** The student is advised to run 50 yards and the time is recorded nearest to 10th of a second.

---

**600 YARD RUN-WALK**

**Purpose:** To measure endurance.

**Procedure:** The student is advised to run or walk for 600 yards and the time is recorded in minutes and seconds.

---

### Standing Long Jump

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Boys 14</th>
<th>Boys 15</th>
<th>Boys 16</th>
<th>Boys 17+</th>
<th>Girls 14</th>
<th>Girls 15</th>
<th>Girls 16</th>
<th>Girls 17+</th>
</tr>
</thead>
<tbody>
<tr>
<td>100th</td>
<td>9'0&quot;</td>
<td>9'0&quot;</td>
<td>9'2&quot;</td>
<td>9'10&quot;</td>
<td>7'5&quot;</td>
<td>8'0&quot;</td>
<td>7'7&quot;</td>
<td>7'6&quot;</td>
</tr>
<tr>
<td>95th</td>
<td>7'6&quot;</td>
<td>8'0&quot;</td>
<td>8'2&quot;</td>
<td>8'5&quot;</td>
<td>6'8&quot;</td>
<td>6'7&quot;</td>
<td>6'6&quot;</td>
<td>6'9&quot;</td>
</tr>
<tr>
<td>90th</td>
<td>7'2&quot;</td>
<td>7'7&quot;</td>
<td>7'11&quot;</td>
<td>8'2&quot;</td>
<td>6'5&quot;</td>
<td>6'3&quot;</td>
<td>6'3&quot;</td>
<td>6'6&quot;</td>
</tr>
<tr>
<td>85th</td>
<td>6'11&quot;</td>
<td>7'5&quot;</td>
<td>7'9&quot;</td>
<td>8'0&quot;</td>
<td>6'3&quot;</td>
<td>6'1&quot;</td>
<td>6'0&quot;</td>
<td>6'3&quot;</td>
</tr>
<tr>
<td>80th</td>
<td>6'10&quot;</td>
<td>7'3&quot;</td>
<td>7'6&quot;</td>
<td>7'10&quot;</td>
<td>6'0&quot;</td>
<td>5'9&quot;</td>
<td>5'11&quot;</td>
<td>6'2&quot;</td>
</tr>
<tr>
<td>75th</td>
<td>6'8&quot;</td>
<td>7'2&quot;</td>
<td>7'6&quot;</td>
<td>7'9&quot;</td>
<td>5'11&quot;</td>
<td>5'10&quot;</td>
<td>5'9&quot;</td>
<td>6'0&quot;</td>
</tr>
<tr>
<td>70th</td>
<td>6'6&quot;</td>
<td>7'0&quot;</td>
<td>7'4&quot;</td>
<td>7'7&quot;</td>
<td>5'10&quot;</td>
<td>5'9&quot;</td>
<td>5'8&quot;</td>
<td>5'11&quot;</td>
</tr>
<tr>
<td>65th</td>
<td>6'6&quot;</td>
<td>6'11&quot;</td>
<td>7'3&quot;</td>
<td>7'6&quot;</td>
<td>5'6&quot;</td>
<td>5'6&quot;</td>
<td>5'4&quot;</td>
<td>5'7&quot;</td>
</tr>
<tr>
<td>60th</td>
<td>6'4&quot;</td>
<td>6'10&quot;</td>
<td>7'2&quot;</td>
<td>7'5&quot;</td>
<td>5'7&quot;</td>
<td>5'6&quot;</td>
<td>5'6&quot;</td>
<td>5'9&quot;</td>
</tr>
<tr>
<td>55th</td>
<td>6'3&quot;</td>
<td>6'9&quot;</td>
<td>7'1&quot;</td>
<td>7'3&quot;</td>
<td>5'6&quot;</td>
<td>5'6&quot;</td>
<td>5'4&quot;</td>
<td>5'7&quot;</td>
</tr>
<tr>
<td>50th</td>
<td>6'2&quot;</td>
<td>6'8&quot;</td>
<td>7'0&quot;</td>
<td>7'2&quot;</td>
<td>5'4&quot;</td>
<td>5'5&quot;</td>
<td>5'3&quot;</td>
<td>5'5&quot;</td>
</tr>
<tr>
<td>45th</td>
<td>6'1&quot;</td>
<td>6'6&quot;</td>
<td>6'11&quot;</td>
<td>7'1&quot;</td>
<td>5'3&quot;</td>
<td>5'3&quot;</td>
<td>5'2&quot;</td>
<td>5'4&quot;</td>
</tr>
<tr>
<td>40th</td>
<td>5'11&quot;</td>
<td>6'5&quot;</td>
<td>6'9&quot;</td>
<td>7'0&quot;</td>
<td>5'2&quot;</td>
<td>5'2&quot;</td>
<td>5'1&quot;</td>
<td>5'0&quot;</td>
</tr>
<tr>
<td>35th</td>
<td>5'10&quot;</td>
<td>6'4&quot;</td>
<td>6'8&quot;</td>
<td>6'10&quot;</td>
<td>5'1&quot;</td>
<td>5'1&quot;</td>
<td>5'0&quot;</td>
<td>5'2&quot;</td>
</tr>
<tr>
<td>30th</td>
<td>5'8&quot;</td>
<td>6'3&quot;</td>
<td>6'7&quot;</td>
<td>6'8&quot;</td>
<td>4'11&quot;</td>
<td>5'0&quot;</td>
<td>4'10&quot;</td>
<td>5'0&quot;</td>
</tr>
<tr>
<td>25th</td>
<td>5'6&quot;</td>
<td>6'1&quot;</td>
<td>6'6&quot;</td>
<td>6'6&quot;</td>
<td>4'10&quot;</td>
<td>4'11&quot;</td>
<td>4'9&quot;</td>
<td>4'11&quot;</td>
</tr>
<tr>
<td>20th</td>
<td>5'4&quot;</td>
<td>5'11&quot;</td>
<td>6'4&quot;</td>
<td>6'4&quot;</td>
<td>4'9&quot;</td>
<td>4'9&quot;</td>
<td>4'7&quot;</td>
<td>4'9&quot;</td>
</tr>
<tr>
<td>15th</td>
<td>5'2&quot;</td>
<td>5'9&quot;</td>
<td>6'2&quot;</td>
<td>62</td>
<td>4'6&quot;</td>
<td>4'7&quot;</td>
<td>4'6&quot;</td>
<td>4'7&quot;</td>
</tr>
<tr>
<td>10th</td>
<td>50</td>
<td>56</td>
<td>5'11&quot;</td>
<td>5'10&quot;</td>
<td>4'4&quot;</td>
<td>4'5&quot;</td>
<td>4'4&quot;</td>
<td>4'4&quot;</td>
</tr>
<tr>
<td>5th</td>
<td>4'8&quot;</td>
<td>5'2&quot;</td>
<td>5'5&quot;</td>
<td>5'3&quot;</td>
<td>4'0&quot;</td>
<td>4'2&quot;</td>
<td>4'0&quot;</td>
<td>4'1&quot;</td>
</tr>
<tr>
<td>0</td>
<td>2'0&quot;</td>
<td>2'0&quot;</td>
<td>3'4&quot;</td>
<td>3'0&quot;</td>
<td>3'0&quot;</td>
<td>3'0&quot;</td>
<td>2'8&quot;</td>
<td>3'3&quot;</td>
</tr>
</tbody>
</table>

### 50–Yard Dash

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Boys 14</th>
<th>Boys 15</th>
<th>Boys 16</th>
<th>Boys 17+</th>
<th>Girls 14</th>
<th>Girls 15</th>
<th>Girls 16</th>
<th>Girls 17+</th>
</tr>
</thead>
<tbody>
<tr>
<td>100th</td>
<td>5.9</td>
<td>5.5</td>
<td>5.5</td>
<td>5.4</td>
<td>6.0</td>
<td>6.0</td>
<td>5.6</td>
<td>6.4</td>
</tr>
<tr>
<td>95th</td>
<td>6.2</td>
<td>6.0</td>
<td>6.0</td>
<td>5.9</td>
<td>6.8</td>
<td>6.9</td>
<td>7.0</td>
<td>6.8</td>
</tr>
<tr>
<td>90th</td>
<td>6.4</td>
<td>6.2</td>
<td>6.2</td>
<td>6.0</td>
<td>7.0</td>
<td>7.0</td>
<td>7.1</td>
<td>7.0</td>
</tr>
<tr>
<td>85th</td>
<td>6.5</td>
<td>6.3</td>
<td>6.3</td>
<td>6.1</td>
<td>7.1</td>
<td>7.1</td>
<td>7.3</td>
<td>7.1</td>
</tr>
<tr>
<td>80th</td>
<td>6.6</td>
<td>6.4</td>
<td>6.4</td>
<td>6.3</td>
<td>7.2</td>
<td>7.2</td>
<td>7.4</td>
<td>7.3</td>
</tr>
<tr>
<td>75th</td>
<td>6.8</td>
<td>6.5</td>
<td>6.5</td>
<td>6.3</td>
<td>7.3</td>
<td>7.4</td>
<td>7.5</td>
<td>7.4</td>
</tr>
<tr>
<td>70th</td>
<td>6.9</td>
<td>6.6</td>
<td>6.6</td>
<td>6.4</td>
<td>7.4</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>65th</td>
<td>7.0</td>
<td>6.6</td>
<td>6.6</td>
<td>6.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.6</td>
<td>7.5</td>
</tr>
<tr>
<td>60th</td>
<td>7.0</td>
<td>6.8</td>
<td>6.6</td>
<td>6.5</td>
<td>7.6</td>
<td>7.6</td>
<td>7.7</td>
<td>7.6</td>
</tr>
<tr>
<td>55th</td>
<td>7.1</td>
<td>6.8</td>
<td>6.7</td>
<td>6.6</td>
<td>7.7</td>
<td>7.7</td>
<td>7.8</td>
<td>7.7</td>
</tr>
<tr>
<td>50th</td>
<td>7.2</td>
<td>6.9</td>
<td>6.7</td>
<td>6.6</td>
<td>7.8</td>
<td>7.8</td>
<td>7.9</td>
<td>7.9</td>
</tr>
</tbody>
</table>
7.4 General Motor Fitness- Barrow three item general motor ability

General Motor Fitness: Barrow three items for general motor ability (Standing Broad Jump, Zig Zag Run & Medicine Ball Put- For boys: 03 KG & for Girls: 01 KG)

Harold M Barrow developed a test of motor ability for college men as well as for high school boys. The test battery comprised of three items which are explained below:

(1) Standing Broad Jump

**Purpose of the Test:** To measure Power mainly but also agility, speed and strength.

**Facilities and Equipment required:** One 5 × 12 feet mat marked with take off line and parallel lines 2 inches apart as shown in the diagram.

**Directions:** The subject is advised to stand just behind the take off line with feet together. Then by giving swing of arms and bending knees a jump is taken. Landing is done keeping feet together.

**Instructions:** The subject must crouch before jump. Before the jump is taken the arms are swung. Three trials are given.

**Scoring:** The final score is the distance in inches from the best jump.

### 600-Yard Run

<table>
<thead>
<tr>
<th>BOYS PERCENTILE SCORES BASED ON AGE/TEST</th>
<th>GIRLS PERCENTILE SCORES BASED ON AGE/TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCORES IN MINUTES AND SECONDS</td>
<td>SCORES IN MINUTES AND SECONDS</td>
</tr>
<tr>
<td><strong>Percentile</strong></td>
<td><strong>Percentile</strong></td>
</tr>
<tr>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>17+</td>
<td>17+</td>
</tr>
<tr>
<td>100th</td>
<td>100th</td>
</tr>
<tr>
<td>1'27&quot;</td>
<td>1'33&quot;</td>
</tr>
<tr>
<td>1'20&quot;</td>
<td>1'41&quot;</td>
</tr>
<tr>
<td>1'21&quot;</td>
<td>1'45&quot;</td>
</tr>
<tr>
<td>1'20&quot;</td>
<td>1'39&quot;</td>
</tr>
<tr>
<td>95th</td>
<td>95th</td>
</tr>
<tr>
<td>1'39&quot;</td>
<td>2'2&quot;</td>
</tr>
<tr>
<td>1'36&quot;</td>
<td>2'0&quot;</td>
</tr>
<tr>
<td>1'34&quot;</td>
<td>2'8&quot;</td>
</tr>
<tr>
<td>1'32&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>90th</td>
<td>90th</td>
</tr>
<tr>
<td>1'44&quot;</td>
<td>2'7&quot;</td>
</tr>
<tr>
<td>1'40&quot;</td>
<td>2'10&quot;</td>
</tr>
<tr>
<td>1'38&quot;</td>
<td>2'15&quot;</td>
</tr>
<tr>
<td>1'35&quot;</td>
<td>2'21&quot;</td>
</tr>
<tr>
<td>85th</td>
<td>85th</td>
</tr>
<tr>
<td>1'47&quot;</td>
<td>2'11&quot;</td>
</tr>
<tr>
<td>1'42&quot;</td>
<td>2'14&quot;</td>
</tr>
<tr>
<td>1'40&quot;</td>
<td>2'19&quot;</td>
</tr>
<tr>
<td>1'38&quot;</td>
<td>2'14&quot;</td>
</tr>
<tr>
<td>80th</td>
<td>80th</td>
</tr>
<tr>
<td>1'50&quot;</td>
<td>2'15&quot;</td>
</tr>
<tr>
<td>1'45&quot;</td>
<td>2'18&quot;</td>
</tr>
<tr>
<td>1'42&quot;</td>
<td>2'21&quot;</td>
</tr>
<tr>
<td>1'41&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>75th</td>
<td>75th</td>
</tr>
<tr>
<td>1'52&quot;</td>
<td>2'19&quot;</td>
</tr>
<tr>
<td>1'46&quot;</td>
<td>2'22&quot;</td>
</tr>
<tr>
<td>1'44&quot;</td>
<td>2'26&quot;</td>
</tr>
<tr>
<td>1'43&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>70th</td>
<td>70th</td>
</tr>
<tr>
<td>1'55&quot;</td>
<td>2'24&quot;</td>
</tr>
<tr>
<td>1'48&quot;</td>
<td>2'25&quot;</td>
</tr>
<tr>
<td>1'46&quot;</td>
<td>2'29&quot;</td>
</tr>
<tr>
<td>1'45&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>65th</td>
<td>65th</td>
</tr>
<tr>
<td>1'57&quot;</td>
<td>2'29&quot;</td>
</tr>
<tr>
<td>1'50&quot;</td>
<td>2'28&quot;</td>
</tr>
<tr>
<td>1'48&quot;</td>
<td>2'32&quot;</td>
</tr>
<tr>
<td>1'47&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>60th</td>
<td>60th</td>
</tr>
<tr>
<td>1'58&quot;</td>
<td>2'32&quot;</td>
</tr>
<tr>
<td>1'52&quot;</td>
<td>2'30&quot;</td>
</tr>
<tr>
<td>1'49&quot;</td>
<td>2'36&quot;</td>
</tr>
<tr>
<td>1'49&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>55th</td>
<td>55th</td>
</tr>
<tr>
<td>2'0&quot;</td>
<td>2'36&quot;</td>
</tr>
<tr>
<td>1'54&quot;</td>
<td>2'34&quot;</td>
</tr>
<tr>
<td>1'50&quot;</td>
<td>2'29&quot;</td>
</tr>
<tr>
<td>1'50&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>50th</td>
<td>50th</td>
</tr>
<tr>
<td>2'3&quot;</td>
<td>2'40&quot;</td>
</tr>
<tr>
<td>1'56&quot;</td>
<td>2'37&quot;</td>
</tr>
<tr>
<td>1'52&quot;</td>
<td>2'43&quot;</td>
</tr>
<tr>
<td>1'52&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>45th</td>
<td>45th</td>
</tr>
<tr>
<td>2'5&quot;</td>
<td>2'44&quot;</td>
</tr>
<tr>
<td>1'57&quot;</td>
<td>2'40&quot;</td>
</tr>
<tr>
<td>1'54&quot;</td>
<td>2'47&quot;</td>
</tr>
<tr>
<td>1'53&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>40th</td>
<td>40th</td>
</tr>
<tr>
<td>2'7&quot;</td>
<td>2'47&quot;</td>
</tr>
<tr>
<td>1'59&quot;</td>
<td>2'45&quot;</td>
</tr>
<tr>
<td>1'56&quot;</td>
<td>2'49&quot;</td>
</tr>
<tr>
<td>1'56&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>35th</td>
<td>35th</td>
</tr>
<tr>
<td>2'10&quot;</td>
<td>2'51&quot;</td>
</tr>
<tr>
<td>2'1&quot;</td>
<td>2'50&quot;</td>
</tr>
<tr>
<td>1'58&quot;</td>
<td>2'54&quot;</td>
</tr>
<tr>
<td>1'57&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>30th</td>
<td>30th</td>
</tr>
<tr>
<td>2'12&quot;</td>
<td>2'56&quot;</td>
</tr>
<tr>
<td>2'5&quot;</td>
<td>2'55&quot;</td>
</tr>
<tr>
<td>1'59&quot;</td>
<td>2'58&quot;</td>
</tr>
<tr>
<td>1'59&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>25th</td>
<td>25th</td>
</tr>
<tr>
<td>2'16&quot;</td>
<td>3'1&quot;</td>
</tr>
<tr>
<td>2'8&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'1&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>20th</td>
<td>20th</td>
</tr>
<tr>
<td>2'22&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'11&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'4&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>15th</td>
<td>15th</td>
</tr>
<tr>
<td>2'30&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'15&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'9&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'12&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>10th</td>
<td>10th</td>
</tr>
<tr>
<td>2'37&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'23&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'17&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'22&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>5th</td>
<td>5th</td>
</tr>
<tr>
<td>2'51&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'30&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'31&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>2'38&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>60&quot;</td>
<td>50&quot;</td>
</tr>
<tr>
<td>43&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>4'11&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>5'10&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

**Notes:**
- *0* is the minimum score possible, *58* is the maximum score possible.
- *50th* is the score at which 50% of the population scores below and *50th* is the score at which 50% of the population scores above.
- Percentile scores are calculated based on the scores of a national sample of boys and girls.
- The table above provides percentile scores for boys and girls based on age and test scores in minutes and seconds.

### Comprehensive Motor Fitness Test

Harold M. Barrow developed a comprehensive motor fitness test for college men which included the following items:

1. **Standing Broad Jump**: To measure power mainly but also agility, speed and strength.
2. **Zig Zag Run**: To measure speed and agility.
3. **Medicine Ball Put**: To measure power and coordination.

**Purpose of the Test:**

- **Standing Broad Jump**: To measure power mainly but also agility, speed and strength.
- **Zig Zag Run**: To measure speed and agility.
- **Medicine Ball Put**: To measure power and coordination.

**Facilities and Equipment required:**

- A 5 × 12 feet mat marked with take off line and parallel lines 2 inches apart.

**Directions:**

- The subject is advised to stand just behind the take off line with feet together.
- Then by giving swing of arms and bending knees a jump is taken. Landing is done keeping feet together.

**Instructions:**

- The subject must crouch before jump. Before the jump is taken the arms are swung. Three trials are given.

**Scoring:**

- The final score is the distance in inches from the best jump.

**Note:**

- Percentile scores are calculated based on the scores of a national sample of boys and girls.
- The table above provides percentile scores for boys and girls based on age and test scores in minutes and seconds.
Table–Standing Broad Jump
(T–Scores For High-School and junior High-School Boys)

<table>
<thead>
<tr>
<th>Grade</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>T-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>90-Up</td>
<td>97-Up</td>
<td>103-Up</td>
<td>105-Up</td>
<td>112-Up</td>
<td>80</td>
</tr>
<tr>
<td>75</td>
<td>86-89</td>
<td>92-96</td>
<td>98-102</td>
<td>101-104</td>
<td>107-111</td>
<td>75</td>
</tr>
<tr>
<td>70</td>
<td>82-85</td>
<td>88-91</td>
<td>93-97</td>
<td>97-100</td>
<td>103-106</td>
<td>70</td>
</tr>
<tr>
<td>65</td>
<td>77-81</td>
<td>83-87</td>
<td>88-92</td>
<td>92-96</td>
<td>97-102</td>
<td>65</td>
</tr>
<tr>
<td>60</td>
<td>73-76</td>
<td>78-82</td>
<td>83-87</td>
<td>88-91</td>
<td>93-96</td>
<td>60</td>
</tr>
<tr>
<td>55</td>
<td>69-72</td>
<td>73-77</td>
<td>79-82</td>
<td>83-87</td>
<td>88-92</td>
<td>55</td>
</tr>
<tr>
<td>50</td>
<td>65-68</td>
<td>69-72</td>
<td>74-78</td>
<td>79-82</td>
<td>83-87</td>
<td>50</td>
</tr>
<tr>
<td>45</td>
<td>61-64</td>
<td>64-68</td>
<td>69-73</td>
<td>75-78</td>
<td>78-82</td>
<td>45</td>
</tr>
<tr>
<td>40</td>
<td>56-60</td>
<td>59-63</td>
<td>64-68</td>
<td>71-74</td>
<td>74-77</td>
<td>40</td>
</tr>
<tr>
<td>35</td>
<td>52-55</td>
<td>54-58</td>
<td>59-63</td>
<td>66-70</td>
<td>69-73</td>
<td>35</td>
</tr>
<tr>
<td>30</td>
<td>48-51</td>
<td>50-53</td>
<td>54-58</td>
<td>62-65</td>
<td>64-68</td>
<td>30</td>
</tr>
<tr>
<td>20</td>
<td>43 Down</td>
<td>44 Down</td>
<td>48 Down</td>
<td>57 Down</td>
<td>58 Down</td>
<td>20</td>
</tr>
</tbody>
</table>

(2) Zigzag Run

Purpose of the Test: To measure agility mainly but also speed.

Facilities and Equipment required: One stop watch & 5 flags or cones as shown in the diagram given below.

Directions: First of all demonstration is given. The subject is advised to stand just behind the starting line. Then running is done in zig zag manner and three rounds are completed.

Instructions: The subject can take start from standing position. After the start running is done in a manner of figure of eight. Like this three circuits are completed.

Scoring: The final score is the time in seconds for three laps.

Table–Zigzag Run (T-Scores for High-School and Junior High-School Boys)

<table>
<thead>
<tr>
<th>Grade</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>T-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>20.1 Down</td>
<td>17.8 Down</td>
<td>20.2 Down</td>
<td>21.6 Down</td>
<td>21.5 Down</td>
<td>80</td>
</tr>
<tr>
<td>75</td>
<td>21.4-20.2</td>
<td>19.5-17.9</td>
<td>21.3-20.3</td>
<td>22.7-21.7</td>
<td>22.6-21.6</td>
<td>75</td>
</tr>
<tr>
<td>70</td>
<td>22.7-21.5</td>
<td>21.2-19.6</td>
<td>22.4-21.4</td>
<td>23.8-22.8</td>
<td>23.7-22.7</td>
<td>70</td>
</tr>
<tr>
<td>65</td>
<td>24.0-22.8</td>
<td>22.8-21.3</td>
<td>23.5-22.5</td>
<td>24.8-23.9</td>
<td>24.7-23.8</td>
<td>65</td>
</tr>
<tr>
<td>60</td>
<td>25.2-24.1</td>
<td>24.5-22.9</td>
<td>24.6-23.6</td>
<td>25.8-24.9</td>
<td>25.8-24.8</td>
<td>60</td>
</tr>
<tr>
<td>55</td>
<td>26.5-25.3</td>
<td>26.2-24.6</td>
<td>25.7-24.7</td>
<td>26.9-25.9</td>
<td>26.8-25.9</td>
<td>55</td>
</tr>
<tr>
<td>50</td>
<td>27.8-26.6</td>
<td>27.8-26.3</td>
<td>26.8-25.8</td>
<td>27.9-27.0</td>
<td>27.8-26.9</td>
<td>50</td>
</tr>
<tr>
<td>45</td>
<td>29.0-27.9</td>
<td>29.5-27.9</td>
<td>27.9-26.9</td>
<td>28.9-28.0</td>
<td>28.9-27.9</td>
<td>45</td>
</tr>
<tr>
<td>40</td>
<td>30.3-29.1</td>
<td>31.2-29.6</td>
<td>29.0-28.0</td>
<td>29.9-29.0</td>
<td>29.9-29.0</td>
<td>40</td>
</tr>
<tr>
<td>35</td>
<td>31.6-30.4</td>
<td>32.8-31.3</td>
<td>30.1-29.1</td>
<td>31.0-30.0</td>
<td>31.0-30.0</td>
<td>35</td>
</tr>
<tr>
<td>30</td>
<td>32.8-31.7</td>
<td>34.5-32.9</td>
<td>31.2-30.2</td>
<td>32.1-31.1</td>
<td>32.0-31.1</td>
<td>30</td>
</tr>
<tr>
<td>25</td>
<td>34.1-32.9</td>
<td>36.2-34.6</td>
<td>32.3-31.3</td>
<td>33.1-32.2</td>
<td>33.0-32.1</td>
<td>25</td>
</tr>
<tr>
<td>20</td>
<td>34.2 Up</td>
<td>36.3 Up</td>
<td>32.4 Up</td>
<td>33.2 Up</td>
<td>33.1 Up</td>
<td>20</td>
</tr>
</tbody>
</table>

(3) Six Pound Medicine Ball Put

Purpose of the Test: To measure mainly strength of arm and shoulder girdle but also to measure power of arm and shoulder girdle coordination, speed and balance.
**Facilities and Equipment required:** A space in the gymnasium hall with 90 × 25 feet. A 15 feet restraining line marked. One medicine ball weighing six pounds and one measuring tape.

**Directions:** First of all event is explained and demonstration is given. The subject is advised to put the ball but no throwing is not allowed. Three trials are given. But if the subject commits three faults then he must put put until he makes a fair put.

**Instructions:** The subject must take the position before the restraining line. No overstepping is allowed after restraining line. The medicine ball is put not thrown.

**Scoring:** The final score is the distance of the best put in nearest foot.

**Facilities and Equipment required:** A space in the gymnasium hall with 90 × 25 feet. A 15 feet restraining line marked. One medicine ball weighing six pounds and one measuring tape.

**Directions:** First of all event is explained and demonstration is given. The subject is advised to put the ball but no throwing is not allowed. Three trials are given. But if the subject commits three faults then he must put put until he makes a fair put.

**Instructions:** The subject must take the position before the restraining line. No overstepping is allowed after restraining line. The medicine ball is put not thrown.

**Scoring:** The final score is the distance of the best put in nearest foot.

### Table–Medicine Ball Put (T-Scores for High-School and Junior High-School Boys)

<table>
<thead>
<tr>
<th>Grade</th>
<th>T-Score</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>43-Up</td>
<td>45-Up</td>
<td>49-Up</td>
<td>50-Up</td>
<td>54-Up</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>38-42</td>
<td>43-44</td>
<td>46-48</td>
<td>47-49</td>
<td>51-53</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>35-37</td>
<td>40-42</td>
<td>44-45</td>
<td>44-46</td>
<td>48-50</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>33-34</td>
<td>37-39</td>
<td>41-43</td>
<td>42-43</td>
<td>46-47</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>33-34</td>
<td>37-39</td>
<td>41-43</td>
<td>42-43</td>
<td>46-47</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>30-32</td>
<td>34-36</td>
<td>38-40</td>
<td>39-41</td>
<td>43-45</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>27-29</td>
<td>31-33</td>
<td>35-37</td>
<td>37-38</td>
<td>40-42</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>25-26</td>
<td>28-30</td>
<td>32-34</td>
<td>34-36</td>
<td>37-39</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>22-24</td>
<td>25-27</td>
<td>29-31</td>
<td>32-33</td>
<td>34-36</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>19-21</td>
<td>23-24</td>
<td>27-28</td>
<td>29-31</td>
<td>31-33</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>17-18</td>
<td>20-22</td>
<td>24-26</td>
<td>27-28</td>
<td>28-30</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>14-16</td>
<td>17-19</td>
<td>21-23</td>
<td>24-26</td>
<td>25-27</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>12-13</td>
<td>14-16</td>
<td>18-20</td>
<td>22-23</td>
<td>22-24</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>11 Down</td>
<td>13 Down</td>
<td>17 Down</td>
<td>21 Down</td>
<td>21 Down</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

### 7.5 Measurement of Cardio Vascular Fitness–Harvard Step Test/Rockport Test

**HARVARD STEP TEST**

The Harvard Step test was developed by Brouha and his associates in 1943. This purpose of this test is to measure cardiovascular fitness. Key features of this test are that it is simple to conduct and requires minimal equipment.

**Equipment Required:**
1. Bench which is 20 inches/50.8 cm high
2. Stopwatch
3. Metronome

**Procedure:** The athlete is instructed to step up and down on the platform at a rate of 30 steps per minute for 5 minutes or until exhaustion. The athlete is advised to stop before five minutes if exhaustion occurs. The exhaustion is defined as when the athlete cannot maintain the stepping rate for 15 seconds and this can be administered by metronome. After the completion of stepping, the athlete is advised to step down. After this heart rate is measured between 1 to 1.5 minutes after finishing. The heart rate is the number of times the heart beats per minute. The heart rate can be measured by the method given below.

(a) **Manual Method:** The heart rate can be measured from any spot on the body at which an artery is close to the surface so that a pulse can be felt. The most common places for measuring the heart rate is at the wrist (radial artery) and the neck (carotid artery). The pulse rate is measured by placing index and middle fingers together on the opposite wrist, as shown in the diagram. The pulse can be felt and can be counted for one minute period. Even it can be measured for 10 seconds and by multiplying this figure by 6 we can get pulse rate.

(b) **Monitor Method:** A heart rate monitor or Electro cardiogram can be used to measure more accurate heart rate. This is particularly important during exercise where the motion of exercise often makes it hard to get a clear measurement.

A heart rate monitor consists of a transmitter and receiver. The transmitter is attached to a belt worn around the chest and the receiver is worn on the wrist like a watch.
The heart muscles transmit an electrical signal when they contract. This electrical activity can be detected through the skin. The transmitter part of the heart rate monitor is placed on the skin around the area that the heart is beating, and picks up this signal. The transmitter then sends an electromagnetic signal containing heart rate data to the wrist receiver which displays the heart rate.

Harvard step test is done in two ways as explained below:

A. **Short Form**
In this form only heart rate is counted from 1 to 1.5 minutes after finishing. However long form is used for better accuracy.

B. **Long Form**
In this form the heart rate is counted three times. Firstly heart rate is counted from 1 to 1.5 minutes after finishing. Then there is an additional heart rate counting at between 2 to 2.5 minutes, and between 3 to 3.5 minutes.

**COMPUTATION OF FITNESS INDEX**
The Fitness Index score is determined by the following equations.

**Fitness Index for Short Form** = \((100 \times \text{test duration in seconds})\) divided by \((5.5 \times \text{pulse count between 1 and 1.5 minutes})\)

**Fitness Index for Long Form** = \((100 \times \text{test duration in seconds})\) divided by \((2 \times \text{sum of heart beats in the recovery periods})\)

**Example of Scoring Fitness Index**
For example the test was conducted for an individual and following readings were recorded:

Total duration of stepping 300 seconds

The number of heart beats between

1-1.5 minutes = 95
2-2.5 minutes = 85
3-3.5 minutes = 75

**Short form Fitness Index Score**
FI Score = \((100 \times 300) / (5.5 \times 95) = 57.4\)

**Long form Fitness Index Score**
FI Score = \((100 \times 300) / (2(95 + 85 + 75)) = 58.8\)

Then by using following table the cardiovascular fitness is determined:

<table>
<thead>
<tr>
<th>Gender</th>
<th>Excellent</th>
<th>Above average</th>
<th>Average</th>
<th>Below Average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>&gt;90</td>
<td>80-90</td>
<td>65-79</td>
<td>55-64</td>
<td>&lt;55</td>
</tr>
<tr>
<td>Female</td>
<td>&gt;86</td>
<td>76-86</td>
<td>61-75</td>
<td>50-60</td>
<td>&lt;50</td>
</tr>
</tbody>
</table>

The score 58.8 describes that the person is having below average cardiovascular fitness.

**Advantages**
1. This test requires minimal equipment.
2. It bears low cost.
3. It can be self-administered.
4. Requires small place to administer.
5. Larger groups can be tested.

**Disadvantages**
1. It is easy to perform for taller people as compared to people having shorter height.
2. Obese people cannot perform well.

Since it is strenuous test so it should be conducted only after cardiac fitness.

**ROCKPORT WALKING TEST (for Cardiovascular Fitness)**

**Rockport 1-mile Walk Test:** The participant is instructed to walk fast enough so that their heart rate is above 120 beats per minute.

\[ \text{VO}_{2\max} = 132.853 - 0.3877(\text{age in years}) - 0.0769(\text{weight in pounds}) - 3.2649(\text{walk time in minutes and seconds}) - 0.1565(\text{heart rate-beat/minute}) + 6.315(\text{gender}) \]
Computation example
Assume the following reading for a person:
- Age: 42 year
- Body weight: 160 pounds
- Time: 13 minutes and 54 seconds = 13.9 minutes
- Heart rate: 140 beats/minute
- Gender: male = 1 Female = 0

By putting the values in the equation given above the VO\textsubscript{2} max is calculated as below:

\[
\begin{align*}
\text{VO}_2 \text{ max} & = 132.853 - 0.3877(42) - 0.0769(160) - 3.2649(13.9) - 0.1565(140) + 6.315(1) \\
& = 36.93749 + 6.315 = 43.25249 \\
\end{align*}
\]

\[
\text{VO}_2 \text{ max} = 43.25 \text{ (Rounded off)}
\]

The following table is used to calculate the aerobic fitness. The above calculated score for men says that the person possess good aerobic fitness.

<table>
<thead>
<tr>
<th>Age (yrs.)</th>
<th>WOMEN</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Poor</td>
<td>Poor</td>
<td>Fair</td>
<td>Average</td>
<td>Good</td>
<td>Very Good</td>
<td>Excellent</td>
</tr>
<tr>
<td>20-24</td>
<td>&lt; 27</td>
<td>27-31</td>
<td>32-36</td>
<td>37-41</td>
<td>42-46</td>
<td>47-51</td>
<td>&gt; 51</td>
</tr>
<tr>
<td>25-29</td>
<td>&lt; 26</td>
<td>26-30</td>
<td>31-35</td>
<td>26-40</td>
<td>41-44</td>
<td>45-49</td>
<td>&gt; 49</td>
</tr>
<tr>
<td>30-34</td>
<td>&lt; 25</td>
<td>25-29</td>
<td>30-33</td>
<td>24-37</td>
<td>38-42</td>
<td>43-46</td>
<td>&gt; 46</td>
</tr>
<tr>
<td>35-39</td>
<td>&lt; 24</td>
<td>24-27</td>
<td>28-31</td>
<td>32-35</td>
<td>36-40</td>
<td>41-44</td>
<td>&gt; 44</td>
</tr>
<tr>
<td>40-44</td>
<td>&lt; 22</td>
<td>22-25</td>
<td>26-29</td>
<td>30-33</td>
<td>34-37</td>
<td>38-41</td>
<td>&gt; 41</td>
</tr>
<tr>
<td>45-49</td>
<td>&lt; 21</td>
<td>21-23</td>
<td>24-27</td>
<td>28-31</td>
<td>32-35</td>
<td>36-38</td>
<td>&gt; 38</td>
</tr>
<tr>
<td>50-54</td>
<td>&lt; 19</td>
<td>19-22</td>
<td>23-25</td>
<td>26-29</td>
<td>30-32</td>
<td>33-36</td>
<td>&gt; 36</td>
</tr>
<tr>
<td>55-59</td>
<td>&lt; 18</td>
<td>18-20</td>
<td>21-23</td>
<td>24-27</td>
<td>28-30</td>
<td>31-33</td>
<td>&gt; 33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age (yrs.)</th>
<th>MEN</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Poor</td>
<td>Poor</td>
<td>Fair</td>
<td>Average</td>
<td>Good</td>
<td>Very Good</td>
<td>Excellent</td>
</tr>
<tr>
<td>25-29</td>
<td>&lt; 31</td>
<td>31-35</td>
<td>36-42</td>
<td>43-48</td>
<td>49-53</td>
<td>54-59</td>
<td>&gt; 59</td>
</tr>
<tr>
<td>30-34</td>
<td>&lt; 29</td>
<td>29-32</td>
<td>35-40</td>
<td>41-45</td>
<td>46-51</td>
<td>52-56</td>
<td>&gt; 56</td>
</tr>
<tr>
<td>40-44</td>
<td>&lt; 26</td>
<td>26-31</td>
<td>32-35</td>
<td>26-41</td>
<td>42-45</td>
<td>47-51</td>
<td>&gt; 51</td>
</tr>
<tr>
<td>50-54</td>
<td>&lt; 24</td>
<td>24-27</td>
<td>28-32</td>
<td>33-36</td>
<td>37-41</td>
<td>42-46</td>
<td>&gt; 46</td>
</tr>
<tr>
<td>55-59</td>
<td>&lt; 22</td>
<td>22-26</td>
<td>27-30</td>
<td>31-34</td>
<td>35-39</td>
<td>40-43</td>
<td>&gt; 43</td>
</tr>
</tbody>
</table>

Advantages
1. Due to low intensity of the test it can be administered to all ages.
2. It is easy to conduct and no specialized equipment is needed.
3. It can be self administered.
4. Larger groups can be accommodated.

Disadvantages
It is difficult for participants to walk instead of running as walking sometimes strain the muscles.
7.6 Computation of Fitness Index: Duration of the Exercise in Second × 100/5.5 × Pulse Count of 1-1.5 Min. after Exercise

The Fitness Index score is determined by the following equations.

- **Fitness Index for Short Form**
  \[
  \text{Fitness Index for Short Form} = \frac{100 \times \text{test duration in seconds}}{5.5 \times \text{pulse count between 1 and 1.5 minutes}}
  \]

- **Fitness Index for Long Form**
  \[
  \text{Fitness Index for Long Form} = \frac{100 \times \text{test duration in seconds}}{2 \times \text{sum of heart beats in the recovery periods}}
  \]

**Example of Scoring Fitness Index**

For example, the test was conducted for an individual and following readings were recorded:

- Total duration of stepping 300 seconds
- The number of heart beats between:
  - 1-1.5 minutes = 95
  - 2-2.5 minutes = 85
  - 3-3.5 minutes = 75

**Short form Fitness Index Score**

\[
\text{FI Score} = \frac{(100 \times 300)}{(5.5 \times 95)} = 57.4
\]

**Long form Fitness Index Score**

\[
\text{FI Score} = \frac{(100 \times 300)}{2 \times (95 + 85 + 75)} = 58.8
\]

**Norms as per Edward L. Fox**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Fitness Index (long form)</th>
</tr>
</thead>
<tbody>
<tr>
<td>excellent</td>
<td>&gt;96</td>
</tr>
<tr>
<td>good</td>
<td>83 - 96</td>
</tr>
<tr>
<td>average</td>
<td>68 - 82</td>
</tr>
<tr>
<td>low average</td>
<td>54 - 67</td>
</tr>
<tr>
<td>poor</td>
<td>&lt;54</td>
</tr>
</tbody>
</table>

7.7 Rikli and Jones-Senior Citizen Fitness Test (Read from 7.5 page no. 117 to 124 of the book)

**EXERCISE**

**QUESTIONS CARRYING 01 MARK**

1. What is Slaughter- Lohman children skinfold formula?
2. Enlist the items of Barrow motor ability test.
3. Name all the tests in Kraus-Weber test of fitness.
4. What is Kraus-Weber test of fitness?
5. List the test battery item of AAHPER youth fitness test.
6. Who developed Harvard step test?
8. What is Rock 1-Mile Walk test?
9. Who introduced the sit and reach test?
10. Rikli Jones test is administered to whom?
11. Discuss any two tests of Kraus-Weber test of fitness.
12. How strength of upper back is measured in Kraus-Weber test of fitness.
14. How shuttle run is organized in AAHPER youth fitness test?
15. What equipment is required for sit and reach flexibility test?

**QUESTIONS CARRYING 03 MARKS**

17. Explain any three items of AAHPER youth fitness test.
18. Explain any three items of Kraus-Weber Test of fitness.
19. How heart rate is measured?
20. Describe the method of sit and reach test.
21. Explain chair stand test for lower body strength.
22. Explain the procedure of six minute walk test.

**QUESTIONS CARRYING 05 MARKS**

24. Explain the Kraus-Weber test for muscular strength.
25. How AAHPER youth fitness test is conducted?
27. Describe How Rockport test is administered?
9.1 Concept, Aims & Scope of Sports Medicine

Concept of medicine has become a highly competitive activity. High level sports performance is an increasingly 'professional' activity. To achieve world class performance many allied areas are focused. One of them is Sports medicine. It renders sports-related medical services for athletes.

Sports medicine has vast area that aims for the prevention of injuries, cure of injuries and rehabilitation of athletes. Sports medicine is a specialty that deals with fitness and medical fields. Basically it is an attempt to prevent injury and helps in early recovery.

According to Bengt O. Eriksson, et. al. “Sports medicine concerns all those medical problems that may affect athlete, professional and amateur. As a result, sports medical medicine is involved to a greater or lesser degree with all the different medical specialties. One can say that, in essence, sports medicine is a trans-disciplinary specialty.”

Since sports medicine is multi-disciplinary, so no individual can be master of all the specialties in sports medicine. Therefore, sports medical assistance is given by a different set of specialists.

AIM OF SPORTS MEDICINE

Mainly the aim of sports medicine is concerned with the treatment of injuries resulting from athletic activities. However, it may aim to prevent injuries and conditioning of athletes. Sports medicine is an area of medical practice which covers three divisions which are explained ahead. (Further Read from page no. 142 to 143 of the book)

9.2 Sports Injuries : Classification, causes and prevention (Read from 9.4 page no. 145 to 148 of the book.)

9.3 First Aid-Aims and Objectives

First aid is the most important and immediate care given to a victim of an accident, injury, sudden illness or any other medical emergency. Many people hesitate to give first aid when it is required because of lack of knowledge. Proper first aid given timely can save a victim's life, especially when the victim is bleeding heavily. First aid also restricts the severity of the injury. The first aid treatment should be administered by the person who has the knowledge of first aid. He should reassure a victim to a hospital. If the first aider is confused he or she should not attempt because the wrong treatment can cause more damage.

AIMS

The aims of first aid are depicted by three P’s and are explained below:

(a) Preserve life : The first aim of first aid is to preserve life by carrying out emergency first aid procedures. The best example is in case of drowning, performing cardiopulmonary resuscitation (CPR). Preserving life should always be the overall aim of all first aiders. Keeping in mind that first aider should not put his or her life in danger.

(b) Prevent deterioration: The second aim of first aid is to prevent the victim's condition from deteriorating any further. For example, in case of compound fracture use of splints will prevent the fracture bone from moving.

(c) Promote recovery : Lastly the last aim of first aid is to promote recovery by arranging prompt emergency medical help. For example, rapidly cooling a burnt area will reduce the risk of long-term scarring and will encourage early healing.

Principles

First aid is defined as the immediate care given to an acutely injured or ill person. It can literally be life-saving so all of us should follow some basic principles. Following are some rules that cover common conditions and general practices:

(a) No panic: Panic always causes mistakes. The first aider must remain calm in case of giving first aid. This will help in settling down the victim.

(b) Do no harm: First aider must be sure that what he is going to do would not make matters worse. If he is not sure about the risk of harm of a particular intervention, then he should not do it. For example don't remove an embedded object like a knife as it can do more harm due to increased bleeding. Immobilization of simple and compound fractures and dislocations can help in further deterioration.

(c) CPR administration: CPR can save one's life. It keeps vital organs oxygenated until paramedics arrive. Timely CPR can play a vital role in saving victim's life. Restoration of respiration and circulation can be very helpful.

(d) Immediate medical help: It is observed that the risk of dying from a heart attack is greatest in the first 30 minutes after symptoms begin. Getting victim to the nearest emergency as quickly as can help in saving victim's life. The shorter time taken to shift the victim to the
emergency, the more likely the best treatment can be applied. Rescue and removal of the victim in the shortest possible time without aggravating existing health situation is the most important principle of first aid.

e) Don’t use hydrogen peroxide on cuts or open wounds: It is more irritating to tissue than it is helpful. Soap and water and some kind of bandage are best.

9.4 Management of Injuries  (Read from 9.5 on page no. 149 to 152 of the book)

EXERCISE

QUESTIONS CARRYING 01 MARK
1. Define sports medicine.
2. What is the aim of sports medicine?
3. Define first aid.
4. List the classification of sports injuries.
5. Define strain.
6. What do you mean by dislocation?
7. What is laceration?
8. Write any one method of prevention of sports injuries.
9. What is green stick fracture?
10. Write any one cause of sports injuries.
11. What is the concept of sports medicine?
12. Write scope of sports medicine.
13. List the classification of sports injuries.

QUESTIONS CARRYING 03 MARKS
14. How conditioning prevents injury?
15. Explain the meaning and concept of sports medicine.
16. Write aim and scope of sports medicine.
17. Explain the impact of environment on athletes.
18. What are the causes of sports injuries?
19. How sports injuries can be prevented?
20. What are the aims of first aid?
21. Explain the principles of first aid.

QUESTIONS CARRYING 05 MARKS
22. Define sports training. Explain its scope.
23. Write the impact of surfaces and environment on athletes.
24. Explain the classification of sports injuries.
25. Describe the cause of sports injuries.

UNIT 10  KINESIOLOGY, BIOMECHANICS & SPORTS

(Read unit heading as Kinesiology, Biomechanics and Sports on page no. 154 of the book)

10.1 Projectile & Factors affecting projectile's Trajectory (Read from 10.1 on page no. 154 to 156 of the book)

10.2 Newton's Law of Motion and Its Application in Sports

NEWTON’S LAWS OF MOTION

Sir Isaac Newton formulated the three laws of motion which are explained below:

NEWTON’S FIRST LAW OF MOTION

This law is also known as law of inertia. This law states that a body at rest will remain at rest and a body in motion will remain in motion at the same speed and in the same direction till any external force is applied on it to change that state.

Application in Sports

In equestrian, when the horse is in motion then rider also remains in motion along with the horse. But when the horse suddenly stops, the lower part of the rider comes to rest along with the horse but his upper part remains in the motion. To save himself from falling the rider, that is why, he falls forward.

In basketball, players on the court must keep in mind about dribbling because the ball will continue to bounce for some time if they lose control. If the ball bounces too far away from a player, his or her team can lose possession.

NEWTON’S SECOND LAW OF MOTION

This law states that the acceleration of an object is directly proportional to the force producing it and inversely proportional to its mass.

Application in Sports

While finishing a race, due to inertia (the tendency of an object is to remain in motion or at rest) runners struggle while stopping at the finish line because it requires a very sudden change in motion. Both shot-put and the discus throw involve the use of Newton's second law because the shotput, which is much heavier than the discus, has to be thrown with greater force than the discus so as to reach the same acceleration.

In cricket, while taking a high catch, the player is required to move his hands backwards while taking the catch. This
increases the time, thus decreasing the force required to stop the ball. This ensures that the player doesn't get hurt in the process.

**NEWTON'S THIRD LAW OF MOTION**

This law states that to every action, there is always an equal and opposite reaction.

*Application in Sports*

While swimming, the swimmer pushes the water backwards using his hands and thus attains a forward push due to an equal and opposite reaction from the water.

In sprint races, the starter blocks are based on Newton's third law, where the athlete is propelled forward during the start of the race due to a reaction from the starter blocks.

**10.3 Aerodynamics Principles**

Aerodynamics has vital applications not only in building a better aircraft but also in sports. It is well known that proper applications of aerodynamics to various games like baseball, soccer, tennis, athletics, swimming and many other sports can play important difference between winners and losers. At the world level when the difference between gold medal and silver medal is in fraction of a second, then principles of aerodynamics can play a vital role. Aerodynamics is related to the flow of air around a projectile, which can influence the speed and direction of the object.

Designing of sport gear reduces the friction with the air and water in order to excel in the field of sports. The best example is aerodynamic head guard in cycling. It is found that every cyclist has to conquer wind resistance. Common bicycles have very poor aerodynamics. However newer bicycles are being designed with better aerodynamics. Bicycle racers are aware of the problem of wind resistance. The basic aerodynamic principles are applied to a various individual sports, demonstrating how surface textures, form and shape of the equipment matters a lot for better performance.

Sports ball aerodynamics is associated with lateral deflection in flight which is known as swing, swerve or curve. It is well known in baseball, golf, tennis, cricket, volleyball and soccer. In these games the deflection is produced by spinning the ball about an axis perpendicular to the line of flight which generates the Magnus effect. It is well known that the aerodynamics of sports balls is sturdily dependent on the detailed development and behavior of the boundary layer on the ball's surface. A side force, which makes a ball swing through the air, can also be generated in the absence of the Magnus effect. In cricket the ball is released with the seam angled, which creates the boundary layer asymmetry necessary to produce swing.

In Baseball while pitching the ball is released with topspin about the horizontal axis. This results in a Magnus force that makes the ball curve faster towards the ground than it would under the action of gravity alone.

**10.4 Friction and Sports (Read from 10.4 on page no. 158–159 of the book)**

**10.5 Introduction to Axes and Planes**

Human body has axes and planes that are explained below:

**Axes**

An axis is a straight line around which an object rotates. The movement at the joint takes place in a plane about an axis. There are three axes of rotation which are explained below:

(a) **Frontal Axis**: It is an imaginary line that is running from side in the frontal plane. About this the anterior to posterior movement occurs. Movement in the sagittal plane is around the frontal axis of rotation. For example during flexion and extension of elbow, it is actually rotating around the frontal axis.

(b) **Sagittal Axis**: It passes horizontally from posterior to anterior and is formed by the intersection of the sagittal and transverse planes. It intersects the frontal plane at a right angle. Movement in the frontal plane is around the sagittal axis of rotation. In case of abduction and adduction at shoulder joint, the movement is in the frontal plane, but the humerus rotates around the sagittal axis which runs from front to back.
Longitudinal Axis: It passes vertically from inferior to superior and is formed by the intersection of the sagittal and frontal planes. Movements on the transverse plane take place on this axis e.g. gymnast performing a full spin.

Planes
Body planes are imaginary geometric planes used to segregate the body into various sections. Generally they are used in both human and zoological anatomy to explain the location or direction of bodily structures. There are three types of planes and are explained below:

(a) Frontal Plane: It divides the body into back and front portions. It also separates the anterior and posterior portions. It is also known as coronal plane. It is a vertical plane at right angles to a sagittal plane, dividing the body into anterior and posterior portions. Movements of abduction and adduction occur on the frontal plane. Lifting legs sideways is performed by the frontal plane. Jumping jacks are examples of cardiovascular exercises on the frontal plane of motion. To perform a jumping jack, stand up straight with feet shoulder-width apart and let arms hang down by sides. Jump up just off the ground and spread legs, while quickly raising arms high up over head until hands almost touch. Keep hands open with palms facing away during the first part of the movement. Bring feet back to shoulder width while quickly lowering arms back down to sides to finish the first jumping jack repetition.

(b) Sagittal Plane: It divides the body into left and right sides. The mid sagittal (median) plane is in the midline through the center of the body, and all other sagittal planes are parallel to it. While moving around sagittal plane the strength of muscles move parts of the body forward or backward. Extension and flexion is utilized. Generally most running, biking, rowing, and lifting movements make use of this plane. Biceps curls and squats are both the best examples of strength training exercises on the sagittal plane. Leg extensions and leg curls develop quadriceps and hamstrings respectively, the movement occurs only at the knee and forward and backward in the sagittal plane.

(c) Transverse Plane: It divides the body into superior and inferior (head and tail) portions. It is typically a horizontal plane through the center of the body and is parallel to the ground. This plane divides body into top and bottom halves in the transverse plane. Mostly movements of rotation are performed on the transverse plane of motion. Exercises that involve twisting happen on this plane. The oblique crunches or alternating cross jabs include exercises work on the transverse plane of motion.

10.6 Types of movements (Flexion, Extension, Abduction and Adduction)
Flexion and extension are movements that occur in the sagittal plane. They are characterized by increasing and decreasing the angle between two body parts around the joint.

FLEXION
It is described as bending parts around a joint that the angle between them decreases and the parts come closer to each other. For example bending of upper limb around the elbow joint. Flexion at the elbow is experienced by decreasing the angle between the ulna and the humerus. It refers to a movement that decreases the angle between two body parts. When the knee flexes, the ankle moves closer to the hips, and the angle between the femur and tibia gets smaller.

EXTENSION
Straightening or extending the parts at a joint that lead to increase of angle between the parts and move farther apart. It refers to a movement that increases the angle between two body parts. Extension at the elbow is increasing the angle between the ulna and the humerus. Extension of the knee straightens the lower limb. Abduction and adduction are two terms that are used to describe movements towards or away from the midline of the body.

ABDUCTION
It is known as moving body part away from the midline. For example, lifting the upper limb horizontally to form a right angle with the side of the body. It is a movement away from the midline. For example, abduction of the shoulder raises the arms out to the sides of the body.

ADDUCTION
It is characterized as moving a part toward the midline. For example, returning the upper limb from the horizontal position to the side of the body. The direction of the movement is towards the midline.
10.7 Major Muscles involved in running, jumping and throwing

To study detailed analysis of movement is very complex. The involvement of the muscles depends on the following points:

(a) A detailed explanation of the actual movements which occur at the joints involved.
(b) The plane or planes where movement is occurring.
(c) The particular muscles producing the movement.
(d) The function of the muscles involved as agonists, antagonist & fixators.
(e) The type of contraction i.e. isotonic or isometric, concentric or eccentric.
(f) The range of the muscle action.

MUSCLES INVOLVED IN RUNNING

The Running has mainly two phases and the involvement of the muscles differ accordingly. First phase is driving phase and second face is recovery phase.

During driving phase following muscle contribute:

(a) Gluteal muscles (gluteus maximus and gluteus minimus) and Hamstrings (biceps femoris, semimembranosus, semitendinosus) create extension & hyperextension at the hip joint.
(b) Quadriceps group of muscles (rectus femoris, vastus medialis, vastus lateralis and vastus intermedius) create extension of Knee.
(c) Gastrocnemius create plantar flexion at the ankle.

During recovery phase following muscle contribute:

(a) Iliopsoas create flexion at Hip.
(b) Hamstrings (biceps femoris, semimembranosus, semitendinosus) create flexion at Knee.
(c) Tibialis anterior create Dorsi flexion at Ankle.

MUSCLES INVOLVED IN THROWING

Throwing consists of two phases and the involvement of the muscles differ accordingly. First phase is preparatory phase and second face is throwing phase.

During preparatory phase following muscle contribute:

(a) Posterior deltoids and latissimus dorsi muscles create horizontal hyperextension at shoulder.
(b) Triceps brachii create extension at elbow.
During throwing phase following muscle contribute:
(a) Posterior deltoids and latissimus dorsi muscles create horizontal flexion at shoulder.
(b) Biceps brachii muscles create flexion at elbow.

MUSCLES INVOLVED IN JUMPING
(a) Gluteal muscles (gluteus maximus and gluteus minimus) and hamstrings (biceps femoris, semimembranosus, semitendinosus) create extension & hyperextension at hip.
(b) Quadriceps group of muscles (rectus femoris, vastus medialis, vastus lateralis and vastus intermedialis) create extension at knee. Gastrocnemius muscle creates planter flexion at the ankle.

EXERCISE

QUESTIONS CARRYING 01 MARK
1. What is aerodynamics?
2. Define axes.
3. What do you mean by planes?
4. What is flexion?
5. Define friction.
6. Name the muscles involved in running.
7. Explain abduction and adduction.
8. Describe flexion and extension.

QUESTIONS CARRYING 03 MARKS
9. Write about abduction and adduction.
10. Write about the major muscles involved in throwing.

QUESTIONS CARRYING 05 MARKS
11. Explain the aerodynamics principles.
12. Describe the concept of axes and planes.
13. Explain flexion, extension, abduction and adduction.
14. Explain the major muscles involved in running, jumping and throwing.
Personality Types according to Carl G Jung

Carl G Jung characterized personality types as below:

(a) **Judging - Perceiving**

The first and the primary criterion, Extraversion and Introversion represent the source and course of an individual's energy expression. An extravert's source and course is primarily practiced in the exterior environment. However an introvert has energy largely in their own world.

(b) **Sensing – Intuition**

This signifies the technique by which an individual perceives information. Sensing is a way in which an individual believes and understands the information he or she obtains directly from outside sources. Intuition represents the information an individual perceives from the ingenious or imaginative world.

(c) **Thinking – Feeling**

This signifies how an individual processes information. Thinking is taking a step in which an individual makes a decision chiefly through judgment and logic. Feeling is making a decision based on feelings and emotions.

(d) **Judging – Perceiving**

It portrays an individual's information in implementation way. It is a manner in which a person categorizes and arranges the events of life and follows the plans defined by him. Perceiving means that the individual is prone to improvise and identify alternative choices.

**BIG FIVE THEORY**

Modern view of dimensions of personality are referred as the "big five" personality traits. There is a significant literature supporting this five-factor model of personality. These five categories are usually described as follows:

A. **Extraversion**

The first dimension of personality is considered as extraversion. These display the characteristics such as excitability, sociability, talkativeness, assertiveness and high amounts of emotional expressiveness.

B. **Agreeableness**

This personality dimension includes attributes such as trust, altruism, kindness, affection, and other prosocial behaviours. They always show amicability.

C. **Conscientiousness**

The people having attributes of this dimension show high levels of thoughtfulness, good impulse control and goal-directed behaviours. Those high in meticulousness tend to be organized.

D. **Neuroticism**

Individuals possessing high neuroticism display emotional instability, anxiety, moodiness, irritability, and sadness.

E. **Openness**

This trait refers to imagination and insight. The individuals having openness tend to have a broad range of interests.

Types of Personality

*(Read from page no. 174)*

Sheldon Classified Types

*(Read from page no. 174 to 176)*

Role of Sports in Personality Development

*(Read from page no. 176 of the book)*

11.3 Motivation, Its Types and Techniques

*(Read from 11.4 page no. 177 to 178 of the book)*

Types and Techniques of Motivation

*(Read from page no. 178 to 180 of the book)*

11.4 Self Esteem and Body Image

*(Read from 11.5 page no. 180 to 185 of the book)*

11.5 Psychological Benefits of Exercise

*(Read from 11.6 page no. 185 to 186 of the book)*
II.6 Meaning, Concept and Types of Aggression in Sports

MEANING
Aggression in sports is an attribute that can have many negative as well as positive effects on performance. It is a malicious, vicious, nasty, or harmful behavior. It can be visible in physical actions, such as physical violence towards others, or in a more emotional way, such as cruel words or unkind behavior. Aggression can build up in an individual over time, due to anger, stress, or any negative circumstances. According to Baron & Richardson, “Aggression is defined as any form of behaviour directed toward the goal of harming or injuring another live being who is motivated to avoid such treatment”.

Concept
Generally aggression is taken as a negative psychological characteristic. On the other side many sports psychologist are in an opinion that aggression can improve sports performance.

Assertive behaviour becomes aggression and the player plays within the rules of the sport at a very high intensity, but has no objective to harm an opponent. Aggression is very important to excel in the field of sports. For example a rugby player uses aggression to tackle his opponent to win the ball. The player is not using his aggression to hurt the opponent but rather to win the ball back. A player demonstrates his aggression like a frustrated tennis player taking his anger out on his racket by smashing it down on the floor after a bad shot.

TYPES OF AGGRESSION IN SPORTS
In sport, aggression has been defined into two following types:

(a) Hostile Aggression: It is the type of aggression when the main aim is to cause harm or injury to opponent. Mainly in this type the player aims to cause injury to the other opponent. The best example can be experienced in cricket when a bowler throws a bouncer to intentionally disturb the attentiveness of a batsman. Even some of the cricketers have deliberately done this in the past with the intention to cause injury. Hostile aggression refers to a type of aggression in which the individual reacts aggressively to a situation.

(b) Instrumental Aggression: This type of aggression has the main aim to accomplish a goal by using aggression. It is experienced that many athletes use more instrumental aggression than hostile aggression. Mostly instrumental aggressive behaviour in sports is rewarded with success. Instrumental aggression is a type of aggression in which the individual deliberately acts in an aggressive manner in order to attain a particular goal.

The main difference between hostile and instrumental aggression lies in its goal. In hostile aggression, the goal is to cause harm or injury to opponent. However in instrumental aggression, the goal is to achieve something along with aggression.

EXERCISE
QUESTIONS CARRYING 01 MARK
1. What do you mean by aggression?
2. Explain the Jung’s classification of personality.
3. Explain the types of personality given by Sheldon.

QUESTION CARRYING 03 MARKS
4. Explain the types of aggression.

QUESTIONS CARRYING 05 MARKS
5. Explain the personality types given by Carl G Jung.
6. Define aggression. Explain its type.

12.6 Circuit Training and High Altitude Training: Introduction and its impact
Circuit training is an effective and organised form of doing physical exercises. It was developed by R.E.Morgan and G.T. Adamson, both from department of physical education, Leeds, England. It was first introduced in 1957. Later in 1979, Scholish modified the circuit training. He gave number of exercises which can be used in circuit training programme.
Circuit training can be utilized to develop strength, power, endurance, speed, agility, flexibility and neuromuscular coordination. Circuit training is more popular as compared to other training methods. Circuit training is a formal type of training in which an athlete goes through a series of selected exercises that are arranged in a circuit. Circuits can be set up inside or outside, even on top of roofs. There are usually 5 to 10 stations in a circuit.

The athlete performs exercise at each station for fixed number of repetitions or for fixed duration and then proceeds to the next station. Like this the athlete completes the circuit. A well-conditioned athlete is given faster and tougher exercises as compared to the beginners. Generally, the exercises are arranged in such a way that exercises for similar body parts do not follow one another sequentially.

An example of circuit training for the development of general strength is given here.

**Station No. 1. Bench press**
This exercise is done for the development of arms, shoulders and chest, as shown in fig. 1.

![Fig. 1](image1)

**Station No. 2. Dumb-bell Squat**
This exercise is done for the development of legs, as shown in the fig. 2.

![Fig. 2](image2)

**Station No. 3. Chinning the bar**
This is done for the development of shoulders and arms, as shown in the fig. 3.

![Fig. 3](image3)

**Station No. 4. Bench stepping**
This exercise is helpful for the development of legs, as shown in the fig. 4.

![Fig. 4](image4)
Station No. 5. Press up
This exercise is done for arms, shoulders and chest as shown in fig. 5.

Station No. 6. Sit-ups
This exercise is done for the development of abdominal muscles, as explained in fig. 6.

Station No. 7. Dumb-bell raising sideways
This exercise is performed for the development of arms and shoulders, as explained in fig. 7.

Station No. 8. Skipping
This exercise is done for the development of legs, as explained in fig. 8

**Circuit training can be done in two ways.**

**A. Circuit training done continuously**
In this type, an athlete performs exercises with the intensity below 60% of the maximum. Since the intensity is less, an athlete can perform exercises at all stations one after the other, without any recovery pause, that is why this method is called as continuous circuit training method.

**B. Circuit training done with intervals of insufficient recovery**
This method is done with higher intensity that is more than 60% of the maximum. Since the athlete does exercise at higher intensity, he requires intervals of rest in-between two stations.

**Classification of Circuit Training**
Circuit training can be explained in two ways according to nature of exercises done.

(i) **General Circuit Training**: In this type, different muscle groups are given exercises in rotation. General exercises are done according to this method. Method of General Circuit Training is given below:

<table>
<thead>
<tr>
<th>Duration</th>
<th>10 -12 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>3 days per week</td>
</tr>
<tr>
<td>No. of circuits to be performed</td>
<td>2</td>
</tr>
<tr>
<td>Total time</td>
<td>30 min.</td>
</tr>
<tr>
<td>Load</td>
<td>Maximum of 40 % to 55%</td>
</tr>
<tr>
<td>Repetitions</td>
<td>As many as possible in 30 sec.</td>
</tr>
<tr>
<td>Rest</td>
<td>15 seconds between each station</td>
</tr>
</tbody>
</table>

(ii) **Another example of circuit training.**

<table>
<thead>
<tr>
<th>Station No.</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Running (440 yds)</td>
</tr>
<tr>
<td>2</td>
<td>Push up or pull ups</td>
</tr>
<tr>
<td>3</td>
<td>Bent knee sit ups</td>
</tr>
<tr>
<td>4</td>
<td>Vertical jumps</td>
</tr>
<tr>
<td>5</td>
<td>Bicycling (3 min)</td>
</tr>
<tr>
<td>6</td>
<td>Hip stretch</td>
</tr>
<tr>
<td>7</td>
<td>Rope climbing</td>
</tr>
<tr>
<td>8</td>
<td>Bentover Rowing</td>
</tr>
<tr>
<td>9</td>
<td>Hamstring stretch</td>
</tr>
</tbody>
</table>
(iii) Specific Circuit Training: In this type, specific muscle groups are given exercise at every station. Exercises are also similar to the competitive stress. For example, skills of the game can also be learnt with the help of circuit training.

Example of specific circuit training designed to develop the skills of hockey:

<table>
<thead>
<tr>
<th>Station No</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hitting 10 balls continuously</td>
</tr>
<tr>
<td>2</td>
<td>Scooping 10 balls with full force.</td>
</tr>
<tr>
<td>3</td>
<td>Dribbling between 5 obstacles placed 6 feet apart.</td>
</tr>
<tr>
<td>4</td>
<td>Stopping 10 hits.</td>
</tr>
<tr>
<td>5</td>
<td>10 reverse flicks.</td>
</tr>
<tr>
<td>6</td>
<td>Dodging the opponent to the left 5 times and 5 times to the right.</td>
</tr>
</tbody>
</table>

In circuit training, load should be increased slowly and slowly with adaptations.

The load can be increased by following methods:

(a) By choosing difficult exercises.  
(b) By increasing the intensity of doing exercises.  
(c) By increasing the number of repetitions.  
(d) By increasing the number of stations in a circuit.  
(e) By completing the circuit continuously.

**Circuit training has different advantages which can be listed as below:**

(i) Total fitness is developed.  
(ii) It gives an interesting environment.  
(iii) Load can be increased from time to time.  
(iv) It can accommodate large groups.

**HIGH ALTITUDE TRAINING: INTRODUCTION AND ITS IMPACT**

**Introduction**

High Altitude Training is done by many athletes who want to increase endurance. Preferably it is done over 8000 feet above sea level. Generally it is done to prepare for the competition. It is a well known fact that people who live at high altitude generally have high concentration of circulating red blood cells that leads to increased endurance as compared to the people who reside at sea level.

During 1968 Mexico Olympics poor performance was experienced in distance running as well as in swimming events lasting over 2.5 minutes. The cause of poor performance was due to High Altitude of Mexico city which is 7546 feet above sea level. This indicated that there is reduction in oxygen transport at high altitude.

Athletes do training at high altitudes prior to competition to allow their bodies to produce extra red blood cells. After doing high altitude training for around 14 days they move to a competition at lower elevations to take advantage of their changed physiology.

**Impact of High Altitude**

At high altitudes the reduced air pressure, oxygen diffuses into red blood cells more slowly. To compensate for the decrease in oxygen, one of the body's hormones, erythropoietin (EPO), triggers the production of more red blood cells to aid in oxygen delivery to the muscles.

Training at high altitudes results to produce extra red blood cells. Then athletes head to a competition at lower elevations to take advantage of their changed physiology.

Many studies have indicated that the idea of taking advantage of the body's physiological changes at high altitude is as a "natural blood doping" effect. As the blood increases its red cell volume in response to a lower availability of oxygen, VO$_2$ max also increases.

**EXERCISE**

1. Define circuit training. (1 mark)
2. Write the techniques of high altitude training. (1 mark)
3. What do you mean by altitude training? (1 mark)
4. What is specific circuit training? (3 marks)
5. Write the characteristics of circuit training. (3 marks)
6. What is circuit training? (3 marks)
7. What is high altitude training? (5 marks)
8. Explain circuit training. (5 marks)
9. Explain the impacts of circuit training. (5 marks)