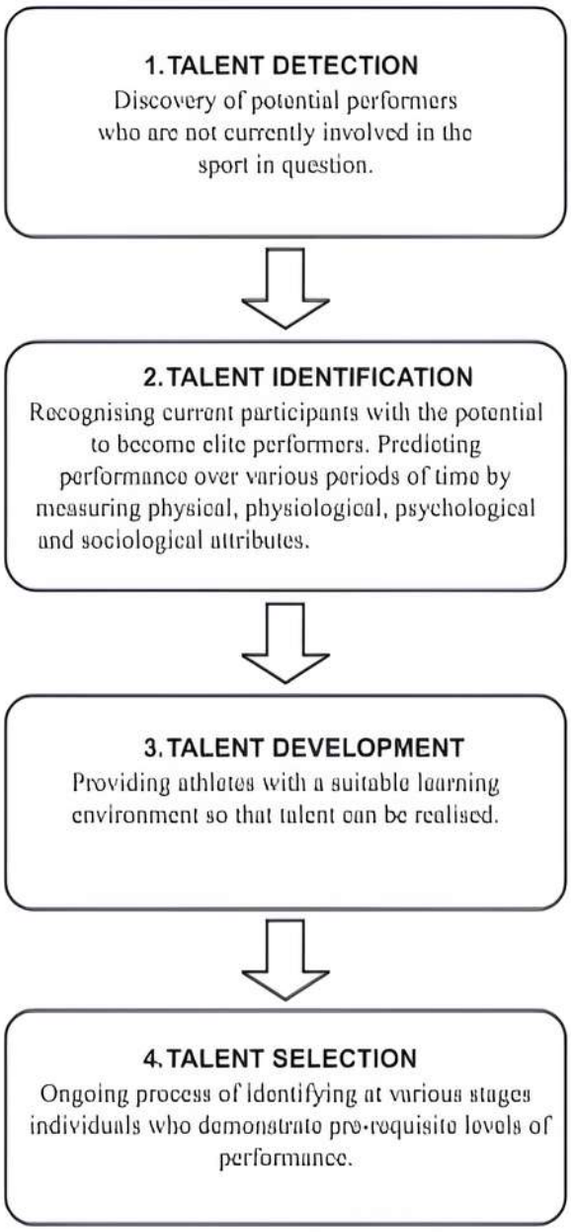
10 Training in Sports

Fastrack Revision

- **Talent Identification and Talent Development In Sports**



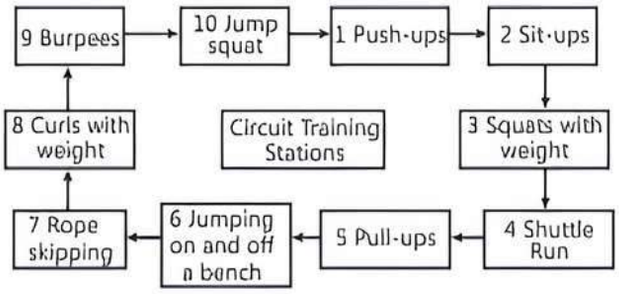
  - Talent identification can be defined as the process by which children are encouraged to participate in the sports at which they are most likely to succeed, based on results of testing selected parameters. Talent identification should occur when an athlete is not currently participating in athletics, but is identified as showing potential in an athletic event. It is the first step in the progression from beginner to successful international athlete. Talent identification processes start at a young age to ensure the individual receives the 10 years (or 10,000 hours) of deliberate practice that is widely recognised as a necessity on the pathway to elitism.
- **Strength:** Strength is the ability of a muscle or a group of muscles to exert a force against a resistance.
  - **Components of Talent Identification**
    Talent identification is usually based around a number of areas, these being:
    - Physical characteristics such as size, weight, height, body structure etc.
    - Physiological skills such as speed, strength, flexibility, endurance, agility and fitness.
    - Technical skills such as dribbling, passing, control and shooting, along with defensive skills.
    - Cognitive skills such as game understanding, desire to learn, maturation level and perception.
    - Psycho-behavioural skills such as attitude, desire and effort.
- **Training Cycles**
  - **Macro-cycle of Training:** A macro-cycle is an annual plan that works towards peaking for the goal competition of the year. There are three phases in the macro-cycle: preparation, competitive and transition. The entire preparation phase should be around 2/3 to 3/4 of the macro-cycle. The preparation phase is further broken up into general and specific preparation of which general preparation takes over half. An example of general preparation would be building an aerobic base for an endurance athlete. An example of specific preparation would be to work on the proper form to be more efficient and to work more on the final format of the sport.
  - **Meso-cycle of Training:** A meso-cycle represents a phase of training with a duration of between 2 – 6 weeks or micro-cycles, but this can depend on the sporting discipline. A meso-cycle can also be defined as a number of continuous weeks where the training programme emphasise the same type of physical adaptations, for example muscle mass and anaerobic capacity. During the preparatory phase, a meso-cycle commonly consists of 4 – 6 micro-cycles, while during the competitive phase it will usually consist of 2 – 4 micro-cycles depending on the competition's calendar. The goal of the plan is to fit the meso-cycles into the overall plan timeline-wise to make each meso-cycle end on one of the phases and then to determine the workload and type of work of each cycle based on where in the overall plan the given meso-cycle falls.
  - **Micro-cycle of Training:** A micro-cycle is typically a week because of the difficulty in developing a training plan that does not align itself with the weekly

calendar. Each micro-cycle is planned based on where it is in the overall macro-cycle. A micro-cycle is also defined as a number of training sessions, built around a given combination of acute program variables, which include progression as well as alternating effort (heavy *vs.* light days). The length of the micro-cycle should correspond to the number of workouts – normally there are 4-16 workouts. It takes for the athlete or fitness to adapt to the training program. When the athlete or fitness has adapted to the program and no longer makes progress, a change to one or more program variables should be made.

- **Types of Strength:** Various types of strength are:
  - **Maximum Strength:** It is the highest external resistance (most weight) an athlete can hold or lift for one rep at one point in time. It is needed by weightlifters and shot put throwers.
  - **Explosive Strength:** It is the ability of an individual to overcome resistance by means of high speed. It is a combination of both strength and speed. It is needed by javelin throwers, athletes and pole vaulters.
  - **Strength Endurance:** It is the ability of an individual to continue overcoming resistance even after the condition of fatigue. It is mostly seen in long distance races and cycling events.
- **Methods of Improving Strength:** Some of the methods of improving strength are:
  - **Isometric Exercises:** No visible movement and length of muscles remains same. For example, balancing on one foot, pressing against a wall, standing erect or maintaining an upright position, etc.
  - **Isotonic Exercises:** Visible movement and length of muscles changes. For example, running, jumping, weight lifting, etc.
  - **Isokinetic Exercises:** These involve specialised machines or dynamometers to maintain a constant speed of movement. For example, weight training machines (with spring or elastic resistance), etc.
- **Endurance:** Endurance is the ability to perform sports movement with the desired quality and speed under the condition of fatigue.
  - **Types of Endurance:** Endurance can be classified according to the nature of the activity and the duration of the activity.
  - **According to the Nature of the Activity:** On this basis, endurance can be general, specific and basic.
    - **General Endurance:** It characterises the ability of our whole body to tolerate endurance exercises and diminish fatigue.
    - **Specific Endurance:** It is the ability to tolerate fatigue in sport specific conditions.
    - **Basic Endurance:** It is characterised by low intensity and high volume exercises.
  - **According to the Duration of the Activity:** On this basis, endurance can be speed endurance, short-term, middle-term and long-term.
    - **Speed Endurance:** It is used to develop the coordination of muscle contraction.
    - **Short-term Endurance:** It is needed to resist fatigue in sports activities lasting from 45 sec. to 2 min.
    - **Middle-term Endurance:** It is needed for sports activities lasting from 2 to 11 minutes.
    - **Long-term Endurance:** It is needed in sports activities lasting for more than 11 minutes.
- **Methods to Develop Endurance:** There are various methods of improving endurance:
  - **Continuous Training Method:** In this method, the player performs running or any other sports activity for long period without having any rest or breaks in between. It is of three types:
    - Slow Continuous Training Method
    - Fast Continuous Training Method
    - Variable Continuous Training Method
  - **Advantages of Continuous Training**
    - Glycogen in muscles and liver increases.
    - Intensity can be increased for better outcome.
    - The number and size of mitochondria increases.
    - The efficiency of heart and lungs improves.
    - Under the condition of fatigue, it makes the individual strong minded and improves the determination and self-confidence.
  - **Interval Training Method:** In this method, the principle of effort and recovery is followed. It involves a series of high intensity workouts interspersed with recovery (rest) periods. It is considered as the best for development of endurance.
  - **Advantages of Interval Training**
    - Both respiratory and circulatory systems can be improved.
    - The athlete's improvement can be measured without difficulty.
    - Coach can give suggestions regarding any fault during recovery phase to athlete.
    - It helps an athlete to achieve the peak performance in a short time.
    - In short duration, more workouts can be performed.
- **Fartlek Training Method:** It is a combination of continuous and interval training. It involves periods of fast running intermixed with periods of slow running. It was developed by Gosta Holmer of Sweden in 1930s.
  - **Advantages of Fartlek Training**
    - Fartlek training allows adding a variety of intervals to the aerobic workouts, which helps to keep one stimulated.
    - Fartlek lets runners to enhance the aerobic and anaerobic training systems equally.
    - Fartlek can be particularly modified and personalised to fit the requirements of diverse types of athletes and games.
    - For people, fartlek is a grand alternative because the fat burning part makes it an extremely efficient exercise.
    - Implementing Fartlek on a regular basis keeps the body physically powerful as much as necessary to uphold the technicalities of racing.
- **Speed:** Speed is the ability to cover distance in minimum possible time. It enables an athlete to perform an activity with adequate velocity and in appropriate time.
- **Types of Speed:** Some of the major types of speed are:
  - **Movement Speed:** It is the ability to do a movement in minimum time.

- **Locomotor Ability:** It is the ability to maintain the maximum speed for a maximum time or distance.
- **Reaction Ability:** It is the capability to respond to an action or a signal quickly and efficiently.
- **Acceleration Ability:** It is the ability to achieve maximum speed from a stationary position or a low speed phase in a particular and very less amount of time.

- **Methods to Develop Speed:** There are two methods to develop speed:
  - **Acceleration Run:** Acceleration runs are usually practised to develop speed especially in attaining maximum speed from a stationary position.
  - **Pace Run:** Pace run means running the whole distance of a race at a constant speed. In pace runs, an athlete runs the race with uniform speed, generally 800 m and above.
- **Flexibility:** Flexibility is the ability to perform a joint action through a range of movements. Flexibility tends to deteriorate with age.
- **Types of Flexibility:** There are two types of flexibility:
  - **Active Flexibility:** It is performed without external help or self-movement of a part of the body to maximum range. Active flexibility is of two types: static and dynamic.
  - **Passive Flexibility:** Ability of joint to move in maximum range with external help. For example, stretching with the help of a partner.
- **Methods to Improve Flexibility:** Various methods of improving flexibility are:
  - **Dynamic Method:** This form prepares the body for physical exertion and sports performance.
  - **Static-stretching Method:** It includes holding a stretch position with just the strength of the muscles.
  - **Ballistic Method:** It involves some form of rapid movement of a limb to force it beyond its normal range of motion.
  - **Proprioceptive Neuromuscular Facilitation Technique:** It involves slow stretching of the muscles through a joint's full range of motion to the point of resistance and/or discomfort.
- **Coordinative Abilities:** The ability to perform smooth and accurate movements including different parts of the body are called coordinative abilities.
  - **Types of Coordinative Abilities:** Orientation ability, differentiation ability, reaction ability, balance ability and coupling ability are the various types of coordinative abilities.
- **Circuit Training:** Circuit training is a training method to improve mobility, strength and stamina. It comprises of 6 to 10 strength exercises, in which each exercise is performed for a specified numbers of repetitions or for a set time before moving on to the next exercise.
  - A typical circuit training diagram of 10 stations is given below:



  - Following points are important to increase load in circuit training:
    - Number of repetitions can be increased per exercise.
    - Frequency can be increased.
    - Additional load can be increased.
    - Interval between exercises can be reduced.
  - **Importance of Circuit Training**
    - It can be performed indoors or outdoors.
    - A wide range of exercises to select from which maintains the athlete's enthusiasm.
    - The coach can easily supervise the training.
    - It is an ideal balance between strength and conditioning thus helpful in disease prevention.
    - It is a great way to do a whole body workout in a short period of time.

Practice Exercise

Multiple Choice Questions

Q 1. The ability of body to overcome resistance is called:

a. endurance b. strength
c. speed d. flexibility

Q 2. Take-off in long jump is an example of ..... strength. *(CBSE SQP 2022-23)*

a. explosive b. maximum
c. strength endurance d. static

Q 3. If a muscle contracts and changes its length to produce force, the contraction type is: *(CBSE 2020)*

a. isotonic b. isometric
c. isokinetic d. None of these

Q 4. What do you mean by iso and metric? *(CBSE SQP 2023-24)*

a. Iso means constant and metric means length.
b. Iso means change and metric means size.
c. Iso means constant and metric means velocity.
d. Iso means size and metric means constant.

Q 5. Jumping on the spot is an example of ..... *(CBSE SQP 2022-23)*

a. Isometric
b. Isotonic
c. Isokinetic
d. Isokinesthetic

Q 6. Which of the following is an advantage of doing isokinetic exercise?

a. They strengthen the muscles throughout their range of motion.
b. They can be performed anywhere and require no special equipment.
c. They are simple to perform and do not require coaching.
d. They develop both explosive strength and strength endurance.

Q 7. ..... is the ability to perform sports movement with the desired quality and speed under conditions of fatigue.

a. Endurance b. Speed
c. Flexibility d. Strength

Q 8. Which of these is a type of endurance?

a. Static b. Dynamic
c. Specific d. Relative

Q 9. Which of these is a type of endurance on the basis of duration of an activity?

a. General endurance b. Basic endurance
c. Speed endurance d. Specific endurance

Q 10. Interval training method is based on the principle of:

a. overload b. effort
c. effort and recovery d. recovery

Q 11. Fartlek training was developed in: *(CBSE 2020)*

a. Sweden b. USA
c. India d. UK

Q 12. Interval training method is a training of:

a. bones b. heart
c. lungs d. joints

Q 13. Which of these sports activities is an example of middle term endurance?

a. Marathon race b. 800 m race
c. Steeple chase race d. 5000 m race

Q 14. Which of the following is a type of speed?

a. Reaction ability b. Locomotor ability
c. Acceleration ability d. All of these

Q 15. Acceleration runs are used to improve: *(CBSE SQP 2020-21)*

a. strength b. endurance
c. speed d. flexibility

Q 16. ..... ability is important in games and sports such as sprint races, hockey and football.

a. Reaction b. Locomotor
c. Movement d. Acceleration

Q 17. Which of the following factors, does NOT determine flexibility? *(CBSE 2023)*

a. Joint Structure b. Previous Injury
c. Efficiency of Lungs d. Age and Gender

Q 18. ..... flexibility is the ability to do movements for a longer distance without external help.

a. Active b. Reaction
c. Passive d. Coupling

Q 19. Which amongst these is not a method to improve flexibility? *(CBSE SQP 2020-21)*

a. Ballistic b. Static stretching
c. PNF d. Fartlek

Q 20. Which type of coordinative ability is required in games like judo and wrestling? *(CBSE 2023)*

a. Orientation ability b. Coupling ability
c. Adaptation ability d. Differentiation ability

Assertion & Reason Type Questions

Directions (Q. Nos. 21-26): *There are two statements marked as Assertion (A) and Reason (R). Read the statements and choose the appropriate option from the options given below:*

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
c. Assertion (A) is true, but Reason (R) is false.
d. Assertion (A) is false, but Reason (R) is true.

Q 21. Assertion (A): Explosive strength is a combination of strength and speed abilities.
Reason (R): It is used in swimming, long distance races and cycling events.

Q 22. Assertion (A): Work is not done in isometric exercises.
Reason (R): These exercises are performed on specially designed machines.

Q 23. Assertion (A): Long-term endurance is needed in sports activities lasting from 2 to 11 minutes.
Reason (R): Sports activities such as marathon races require such type of endurance.

Q 24. Assertion (A): For improvement of performance in long distance running, continuous training is effective.
Reason (R): Continuous method of training improves basic endurance.

Q 25. Assertion (A): Fartlek training method was developed by Gosta Holmer in 1930's.
Reason (R): Fartlek training method lays emphasis on both aerobic and anaerobic systems.

Q 26. Assertion (A): Circuit training is an excellent way to improve mobility, strength and stamina.
Reason (R): In this method, the player performs an activity for long period with low intensity without having any rest or breaks in between.

Answers

1. (b) Strength
2. (a) Explosive strength
3. (a) Isotonic
4. (a) Iso means constant and metric means length.
5. (b) Isotonic

6. (d) They develop both explosive strength and strength endurance.
7. (a) Endurance
8. (c) Specific
9. (c) Speed endurance
10. (c) effort and recovery
11. (a) Sweden
12. (b) heart
13. (c) Steeple chase race
14. (d) All of these
15. (c) speed
16. (d) Acceleration
17. (c) Efficiency of Lungs
18. (a) Active
19. (d) Fartlek
20. (b) Coupling ability
21. (c) Assertion (A) is true, but Reason (R) is false.
22. (c) Assertion (A) is true, but Reason (R) is false.
23. (d) Assertion (A) is false, but Reason (R) is true.
24. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
25. (b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
26. (c) Assertion (A) is true but Reason (R) is false.

Case Study Based Questions

Case Study 1

Read the following passage and answer the following questions.

Mr Gopichand is a renowned badminton coach. When he started his academy, he selected our school badminton players and designed a training programme. During the training, he noted that few players were good in defense but due to lack of endurance and strength, they were unable to play up to the last moment. He used various methods to enhance their endurance and strength.

Q 1. Isotonic exercise helps in enhancing:
a. endurance
b. strength
c. Both a. and b.
d. None of the above

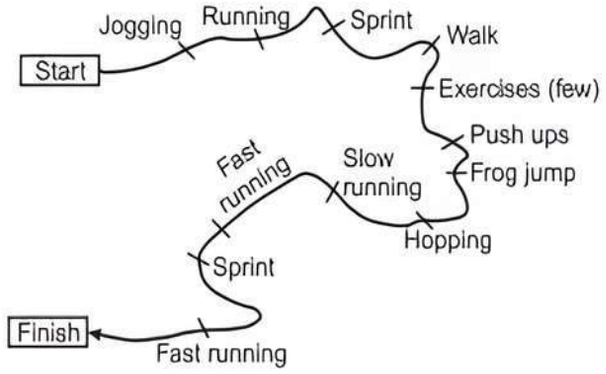
Q 2. High pressure over muscles can be seen in ..... exercises.
a. isometric b. isotonic
c. Both a. and b. d. ballistic

Q 3. ..... training method is considered as the best method to develop endurance. *(CBSE 2023)*
a. Interval b. Continuous
c. Fartlek d. Pace runs

Answers

1. (c) 2. (c) 3. (a)

Case Study 2



Based on the above given fixture, answer the following questions:

Q 1. From the given picture, it is identified as ..... training method.
a. pace runs b. fartlek
c. isometric d. isotonic

Q 2. This training method was developed by:
a. Gosta Holmer b. Fartlek
c. Johnson d. Morgan

Q 3. The above training method helps in increasing the .....
a. strength b. speed
c. endurance d. flexibility

Q 4. In the above training method, ... plays an important role.
a. support b. coach
c. guidance d. self-discipline

Q 5. The Swedish word meaning 'speed play' is .....
a. citius b. fartlek
c. pace d. altius

Answers

1. (b) 2. (a) 3. (c) 4. (d) 5. (b)

Very Short Answer Type Questions

Q 1. Define strength.
Ans. Strength is the ability of a muscle or a group of muscles to exert a force against resistance.

Q 2. Define explosive strength. *(CBSE SQP 2020)*
Ans. Explosive strength is defined as the ability to overcome resistance by means of high speed. It is a combination of both strength and speed.

Q 3. What is strength endurance?
Ans. Strength endurance is defined as the ability to overcome resistance or to act against resistance under conditions of fatigue. It is used in long distance races, swimming and combative sports.

Q 4. Suggest any two isometric exercises for shoulders region. *(CBSE 2015)*
Ans. Isometric exercises for shoulders are:
(i) Pushing against the wall.
(ii) Holding push-up position.

Q 5. What are isotonic exercises?

Ans. Isotonic exercises are those exercises in which movements can be seen directly and work is done. Length of the muscles is increased by isotonic exercises. Running, jumping on the spot and weight training exercises are best examples of isotonic exercises.

Q 6. Define endurance. *(CBSE SQP 2020)*

Ans. Endurance is the ability to perform sports movement with the desired quality and speed under the condition of fatigue.

Q 7. Which method will you suggest to develop endurance? *(CBSE 2019)*

Ans. The methods used to develop endurance are:

(i) Continuous training method
(ii) Interval training method
(iii) Fartlek training method

Q 8. Define general endurance.

Ans. General endurance enables a sportsperson to perform different types of activities for a long duration without getting excessively fatigued. These activities may be aerobic or anaerobic in nature.

Q 9. Define speed endurance in terms of endurance.

Ans. Speed endurance is the ability to resist fatigue in activities lasting up to 45 seconds. For example, 400 m sprint.

Q 10. What is continuous training method?

Ans. In this method of training, an activity is carried out with no break or pause in between for an extensive period with low intensity. Cross country race is the best example of continuous training method.

Q 11. List any two advantages of interval training method.

Ans. Two advantages of interval training method are as follows:

(i) It helps an athlete to achieve his/her peak performance in short time.
(ii) More workout can be performed in a short duration.

Q 12. What does the term 'Fartlek' mean and who developed this training method? *(CBSE 2017)*

Ans. Fartlek is a swedish term that means 'speed play'. Gosta Holmer developed Fartlek training in 1930s.

Q 13. Define speed.

Ans. Speed is the capacity of an individual to perform successive movements of the same pattern at a fast rate.

Q 14. "Pace race means, running the whole distance of a race at a constant speed". Which are the races included in pace races? *(CBSE 2015)*

Ans. Longer races such as 800 m and above are included in pace races.

Q 15. What do you mean by locomotor ability?

Ans. Locomotor ability is the ability to maintain maximum speed for maximum distance or time. It is imperative in sports events such as 100 m, 200 m races, hockey, football, etc.

Q 16. What is speed endurance in terms of speed?

Ans. Speed endurance is the ability to perform movements with high speed under conditions of fatigue.

Q 17. Define flexibility.

Ans. Flexibility is the ability to perform a joint action through a range of movements.

Q 18. Name the methods used for developing flexibility.

Ans. Methods for developing flexibility are:

(i) Dynamic method
(ii) Static-stretching method
(iii) Ballistic method
(iv) Proprioceptive Neuromuscular Facilitation (PNF) technique.

Q 19. What is coordinative ability? *(CBSE 2018)*

Ans. It is the ability to perform smooth and accurate movements involving different parts of the body efficiently.

Q 20. What is balance ability?

Ans. It is the ability to maintain balance during the complete body movements and to regain balance quickly after the balance-disturbing movements.

Short Answer Type-I Questions ↘

Q 1. What are the components needed in talent identification?

Ans. The key components to identify talent are as follows:

(i) Physical characteristics such as size, height, weight, body structure etc.
(ii) Physiological skills such as speed, strength, flexibility, endurance, agility and fitness.
(iii) Cognitive skills such as game understanding, desire to learn, maturation level, perception etc.
(iv) Technical skills such as dribbling, passing, control and shooting, along with defensive skills.

Q 2. What do you mean by maximum strength and strength endurance?

Ans. **Maximum strength** is the highest external resistance an athlete can hold or lift for one rep at one point in time. It is used in weightlifting, shot-put, javelin throw, etc.

Strength endurance is the ability to work against resistance under conditions of fatigue. It is used in long distance races, road cycling, swimming, etc.

Q 3. What do you mean by basic endurance?

Ans. Basic endurance is the ability to perform movements in which large number of body muscles are involved and the movements are performed at a slow pace for a long duration such as jogging and swimming for more than 30 minutes.

Q 4. What do you mean by short-term and middle-term endurance?

Ans. **Short-term** endurance is needed to resist fatigue in sports activities lasting from about 45 seconds to 2 minutes. For example, 800 m.

Middle-term endurance is needed for sports activities lasting from 2 to 11 minutes. For example, 1500 m race.

Q 5. Differentiate between locomotor ability and acceleration ability.

Ans. The difference between locomotor ability and acceleration ability are as follows:

S. No.	Basis of Difference	Locomotor Ability	Acceleration Ability
(i)	Definition	It is the ability to maintain maximum speed for maximum time or distance.	It is the ability to achieve maximum speed from a stationary position or a low speed phase in a very less amount of time
(ii)	Example	100 m, 200 m, 400 m races etc.	Hockey, Football, etc.

Q 6. What do you mean by active flexibility and passive flexibility?

Ans. **Active flexibility** is the ability to perform movements to maximum range without external help.

Passive flexibility is the ability to perform movements in maximum range with external help. For example, stretching with the help of a partner.

Short Answer Type-II Questions

Q 1. Dynamic strength is divided into three parts. Write in brief about each. *(CBSE 2015)*

Ans. Various types of dynamic strength are:

(i) Maximum Strength: It is the highest external resistance (most weight) an athlete can hold or lift for one rep at one point in time. It is needed by weightlifters and shot put throwers.

(ii) Explosive Strength: It is the ability of an individual to overcome resistance by means of high speed. It is a combination of both strength and speed. It is needed by javelin throwers, athletes and pole vaulters.

(iii) Strength Endurance: It is the ability of an individual to continue overcoming resistance even after the condition of fatigue. It is the combination of strength and endurance. It is needed in long distance races and cycling events.

Q 2. Explain what is strength and write the methods for improving strength. *(CBSE 2016, 23)*

Ans. Strength is the ability of a muscle or a group of muscles to exert a force against a resistance or to overcome resistance.

Methods for improving strength are:

(i) Isometric Exercises: These are the exercises in which the movement is not visible and length of muscles remain the same.

(ii) Isotonic Exercises: These are the exercises in which movements are visible and length of muscles changes.

(iii) Isokinetic Exercises: These are performed on specialised machines.

Q 3. Differentiate between isometric and isotonic exercises. *(CBSE 2016)*

Ans. An isometric contraction occurs when there is tension on a muscle without any movement. The length of the muscles remains constant.

Isotonic exercises involve controlled contraction and extension of muscles and mobilisation of the joints around those muscles.

A comparison between their characteristics is given below:

S.No.	Isometric Exercises	Isotonic Exercises
(i)	Less or no equipment required.	Sometimes equipment is required to perform them.
(ii)	It develops static strength.	It develops dynamic strength.
(iii)	It needs less time.	Muscles which are used in this exercise gain most strength.

Q 4. Explain isokinetic exercise with suitable example. *(CBSE SQP 2023-24)*

Ans. **Isokinetic Exercise:** This method was introduced by J.J. Perrine in 1968 and involves a particular type of muscle contraction called isokinetic contraction, generally used in sporting events like rowing and swimming. These exercises are performed on specially designed instruments. In isokinetic contraction, the muscles apply maximal force throughout the range of motion around the joint. The use of isokinetic contraction is minimal. Hence, the contribution of isokinetic contraction in developing strength is yet to be scientifically proved.

Examples: Treadmill, Butterfly stroke in swimming, etc.

Q 5. What is endurance? Explain its types. *(CBSE 2017)*

Ans. Endurance is the ability to sustain a physical activity over a long period of time resisting fatigue.

Types of Endurance:

There are four types of endurance:

(i) Speed Endurance: It is the ability to resist fatigue in sports activities lasting up to 45 seconds. The best example of this is the 400 m sprint.

(ii) Short-term Endurance: It is needed to resist fatigue in sports activities lasting from about 45 seconds to2 minutes. The best example of this is the 800 m race.

(iii) Middle-term Endurance: It is needed for sports activities which last from 2 to 11 minutes. The best example of this is the 1500 m race.

(iv) **Long-term Endurance:** It is needed for sports activities which last for more than 11 minutes. The best example of this is 5,000 m, 10,000 m race.

Q 6. Explain interval training method. *(CBSE 2017)*

Ans. Interval training method is a training of heart through endurance training. It is based on 'effort and recovery' principle *i.e.*, it involves a series of high intensity workouts interspersed with recovery (rest) periods. Recovery period can be adjusted according to the efficiency of the athlete. 'Walk-back sprinting' is an example of interval training for runners, in which one sprints a short distance (100-800 m), then walks back to the starting point (recovery period) to repeat the sprint a certain number of times.

Q 7. What is fartlek training? Write in brief. *(CBSE 2017)*

Ans. Fartlek training methods were developed by Gosta Holmer in 1930s for improving endurance. Fartlek, a Swedish term which means 'speed play', is a combination of continuous and interval training. Its running involves periods of fast running intermixed with periods of slow running. Unlike traditional interval training that involves specific time or measured segments, Fartleks are more unstructured. This type of training stresses on both the aerobic and anaerobic systems.

An example of this training is given below:

(i) Jogging or easy running for 5 to 10 minutes.
(ii) Hard speed for 1.5 to 2.5 km.
(iii) Rapid walking for 5 minutes.
(iv) Easy running interspersed with sprints of about 50-60 m.
(v) Full speed uphill for 175-200 m.
(vi) Fast pace for 1 minute.
(vii) The above mentioned routine is repeated until the total time prescribed on the training schedule is elapsed.

Q 8. List down any four advantages of fartlek training method. *(CBSE SQP 2022-23)*

Ans. Advantages of fartlek training are:

(i) It is good for increasing strength and cardiorespiratory endurance.
(ii) Several athletes can take part in the training programme at a time.
(iii) It does not require any equipment and can be organised easily.
(iv) It is not rigid but flexible in nature.
(v) It improves the efficiency of the heart and lungs.
(vi) It provides experience of nature. (Any four)

Q 9. Define speed. Explain the methods of speed development. *(CBSE 2015-16)*

Or **How do acceleration runs and pace races develop speed?**

Ans. Speed: It is the ability of an individual to cover maximum distance in minimum possible time.

Developing Methods

(i) **Acceleration Run:** Acceleration runs are usually adopted to develop speed, specially in attaining maximum speed from a stationary position. Before acceleration runs, proper warm up must be done. After every acceleration run, there should be a proper interval so that the athlete may start the next run without any fatigue. Generally, the athlete should take rest of 4 to 5 minutes in between the runs.

(ii) **Pace Races:** Pace races mean running the whole distance of a race at a constant speed. In pace races, an athlete runs the race with uniform speed, generally 800 m and above. Very young children can maintain their maximum speed for 15 to 20 m, whereas a well-trained athlete can maintain maximum speed for 40 m. Repetitions can be fixed according to the standard of the athletes.

Q 10. What are various factors of speed?

Or **Explain the types of speed.**

Or **Write in brief about any three physiological factors determining speed.** *(CBSE 2016)*

Ans. The various factors of speed are:

(i) **Reaction Speed:** It is the ability to respond to a given stimulus as quickly as possible. In sports, reaction ability is not only significant to react quickly to a signal, but it should also be accurate according to situation.

(ii) **Movement Speed:** It is the ability to do a single movement in the minimum time. It is of high relevance in sports like jumping, throwing, kicking, boxing, etc.

(iii) **Acceleration Speed:** It is the ability to increase speed from minimum to maximum. This form of speed, to a great extent, depends upon explosive strength, frequency of movement and technique. It is important in swimming, hockey, football, gymnastic, etc.

(iv) **Locomotor Ability:** It can be defined as the ability to maintain maximum speed of locomotion over a period of time as far as possible. It is very important in races, speed skating, swimming, hockey, football, etc.

(v) **Speed Endurance:** It is the ability to perform sports movements with high speed under conditions of fatigue. It is a combination of speed and endurance abilities. It depends upon anaerobic capacity, psychic factors and level of skill.

Q 11. Define flexibility and its types. *(CBSE 2020)*

Ans. Flexibility is the maximum limit or the range of movement of joints. It depends on the fitness and conditioning of the muscles, joints, ligaments and tendons.

There are two types of flexibility:

(i) **Active Flexibility:** It is the ability of an individual to perform joint movement with a greater range without any external help.

(ii) Passive Flexibility: It is the ability to perform joint movement with a greater range with an external help of partner. It helps in the development of active flexibility.

Long Answer Type Questions

Q 1. Write in detail about strength improving methods—isometric, isotonic and isokinetic. *(CBSE 2019)*

Ans. (i) Isometric Exercises: It is also known as static strength training and involve muscular actions in which the length of the muscle does not change and there is no visible movement at the joint. Work is not done in isometric exercises and body temperature may increase while performing them.

Advantages of Isometric exercises

(a) Needs less time.

(b) Can be performed anywhere as no equipment is required.

(ii) Isotonic Exercises: Isotonic exercise is a form of exercise which involves controlled contraction and extension of muscles and mobilisation of the joints around those muscles. Length of the muscles can be increased by isotonic exercise and work is done in them.

Advantages of Isometric Exercises

(a) Strengthens the muscle throughout the range of motion.

(b) Can be done with or without technical equipment.

(iii) Isokinetic Exercises: Isokinetic exercises are performed on specially designed machines to maintain a constant speed of movement according to the individual's capacity. These exercises were developed by Perrine in 1968. These exercises allow muscles to gain strength consistently.

Advantages of Isokinetic Exercises

(a) They develop a high level of endurance as well as explosive strength.

(b) Reduced likelihood of injury.

Q 2. Differentiate between isometric, isotonic and isokinetic exercises.

Ans. The difference between isometric, isotonic and isokinetic exercises are as follows:

S.No.	Isometric Exercises	Isotonic Exercises	Isokinetic Exercises
(i)	Isometric exercises involve static muscle contraction against a stationary resistance.	Isotonic exercises involve dynamic movement but don't require a constant movement speed.	Isokinetic exercises involve movement but maintains a constant speed.
(ii)	Iso-'SAME', metric- 'LENGTH'. This is a type of muscle contraction in which muscle remains at same length.	Iso-'SAME', tonic-'TENSION'. This is a type of muscle contraction in which muscle changes the length either by shortening or by lengthening.	Iso-'SAME', kinetic 'SPEED'. This is a type of muscle contraction in which the muscle moves with some speed.
(iii)	These are used only in a few games like gymnastics, weight-lifting, wrestling, etc.	These are most popular and effective type of strength training used in almost all games/sports.	These generally involve muscle contraction against an electronic resistance and are specific to a particular sport.
(iv)	They develop maximum strength.	It develops explosive strength.	It develops explosive strength as well as strength endurance.
(v)	Can rehabilitate immobilised joint.	Does not contribute to rehabilitation.	Cannot rehabilitate immobilised joint.
(vi)	Amount of strength developed does not last long.	Strength developed through this method remains for longer period.	Amount of strength developed is excellent.
(vii)	Poor	Develops excellent coordination.	Develops good coordination.
(viii)	Does not contribute to development of endurance and speed.	Contributes to development of strength, endurance and speed.	Better development of speed as compared to isotonic.
(ix)	Examples: (a) Pushing against a wall (b) Flexed arm hang, etc.	Examples: (a) Push ups, pull ups (b) Rope climbing, bench press, over head, press, etc.	Examples: (a) Treadmill (b) Butterfly stroke in swimming, etc.

Q 3. What is movement speed? Explain the methods to develop speed. *(CBSE 2015)*

Ans. Movement speed is the ability to perform a movement in minimum time. It depends upon technique, explosive strength, flexibility and coordinative abilities. It plays a vital role in boxing, wrestling, gymnastics, swimming, etc.

Following methods are used to develop speed:

(i) Acceleration Runs: Acceleration runs are usually practised to develop speed especially in attaining maximum speed from stationary position. Accelerated runs are repeated over and over again with sufficient intervals between runs. The number of acceleration runs can be

fixed according to the age and experience and capacity of the athlete.

(ii) **Pace Runs or Races:** Pace run means running the whole distance of a race at a constant speed. Generally, 800m and above races are included in pace runs. In longer races, an athlete must conserve his energy by reducing his speed. For example, if there is a runner of 800 m race and his best time is 1 minute 40 seconds. So, he/she should run the first 400 m in 49 seconds and the next 400 m in 51 seconds.

Q 4. Define flexibility. Explain its types and any two methods develop flexibility. *(CBSE SQP 2023-24)*

Ans. Flexibility is the maximum limit or the range of movement of joints. It depends on the fitness and conditioning of the muscles, joints, ligaments and tendons.

There are two types of flexibility:

(i) **Active Flexibility:** It is the ability of an individual to perform joint movement with a greater range without any external help.

(ii) **Passive Flexibility:** It is the ability to perform joint movement with a greater range with an external help of partner. It helps in the development of active flexibility.

Flexibility can be improved with the help of following methods:

(i) **Static Stretching Method:** It includes holding a stretch position with just the strength of the muscles.

(ii) **Ballistic Method:** It involves some form of rapid movement of a limb to force it beyond its normal range of motion.

(iii) **Proprioceptive Neuromuscular Facilitation Technique:** It involves slow stretching of the muscles through a full range of motion to achieve maximum muscle relaxation. (Any two)

Q 5. Write a detailed note on Micro, Meso and Macro training cycle.

Ans. **Macro Training Cycle:** A macrocycle is an annual plan that works towards peaking for the goal competition of the year. There are three phases in the macrocycle: preparation, competitive and transition. Preparation phase prepare athletes for things like general conditioning, fitness, agility and speed. This phase could be 3 mesocycles, with one mesocycle focusing on conditioning, the next on strength and power, and the next on agility and speed. Competition phase is during their season, so it could be one long mesocycle focusing on maintaining fitness levels and working on strategies, skills and techniques. After the season is over, the athlete will take some time off and then transition back into the start of the next macrocycle, which will bring them back to the preparation phase. The transition phase may consist of one or two mesocycles, which involve recovery, basic strength, endurance and maintenance.

Meso Training Cycle: A mesocycle represents a phase of training with duration of between 2 – 6 weeks (or microcycles) that is designed to accomplish a particular goal. A mesocycle can also be defined as a number of continuous weeks where the training programme emphasise the same type of physical adaptations, *e.g.* muscle mass and anaerobic capacity. During the preparatory phase, a mesocycle commonly consists of 4 – 6 micro-cycles, while during the competitive phase it will usually consist of 2 – 4 microcycles depending on the competition's calendar. The goal in mind is to make sure the body peaks for the high priority competitions by improving each cycle along the way.

Micro Training Cycle: A micro cycle is the shortest training cycle, typically lasting a week with the goal of facilitating a focused block of training. A batch of microcycles makes up a mesocycle. Each microcycle will have its own short term goal and each microcycle within a mesocycle works towards the goal of the mesocycle. Adjustment of intensity and training volume is crucial at this stage to achieve the expected results without a hitch.

Q 6. What do you understand by coordinative ability? Discuss about different types of coordinative abilities. *(CBSE 2019)*

Ans. Coordinative abilities are the abilities which enable an individual to perform smooth and accurate movements including different parts of the body.

The different types of coordinative abilities are:

(i) **Orientation Ability:** It is the ability to determine the position of the body and its parts in time and space in relation to gravity and moving objects like ball, opponent etc.

(ii) **Differentiation Ability:** It is the ability to achieve a high degree of perfection and economy of individual body part movements.

(iii) **Reaction Ability:** It is the ability to react quickly and efficiently to a well-known or unexpected signal.

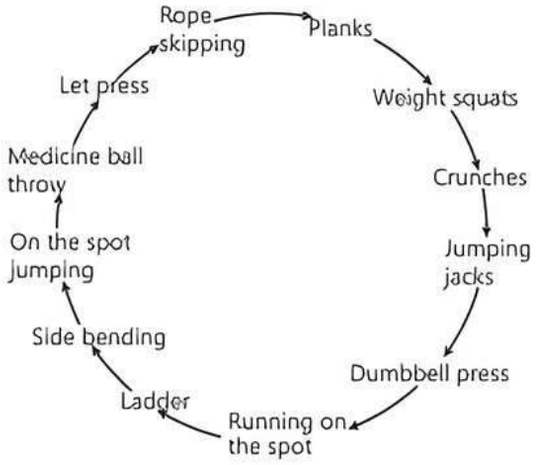
(iv) **Balance Ability:** It is the ability to maintain balance while the body is in motion and to regain balance quickly after balance disturbing movements.

(v) **Coupling Ability:** It is the ability to coordinate body parts movements with one another and in relation to a definite goal-oriented whole body movement.

Q 7. What is circuit training? Draws a diagram of circuit training with 12 stations and explain its importance in sports. *(CBSE 2020)*

Ans. Circuit training is a training method to improve mobility, strength and stamina. It comprises of 6-10 strength exercises, in which each exercise is performed for a specified number of repetitions or

for a set time before moving on to the next exercise.
A typical circuit training diagram of 12 stations is given below:



Importance of Circuit Training

(i) It can be performed indoors or outdoors.
(ii) A wide range of exercises to select from which maintains the athletes enthusiasm.
(iii) The coach can easily supervise the training.
(iv) It is an ideal balance between strength and conditioning, thus helpful in injury prevention
(v) It is a great way to do a whole body workout in a short period of time. (Any four)

TiP

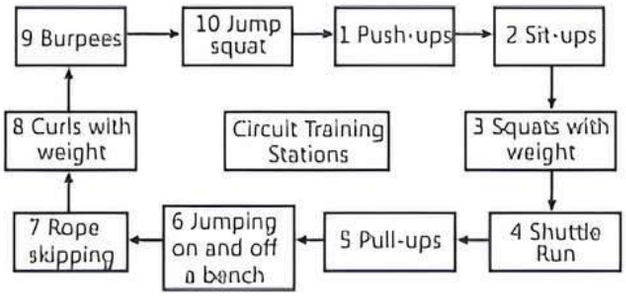
Practice drawing circuit diagrams with 10/12 stations. Incorrect exercises will deduct your marks.

COMMON ERROR

Many students commit errors in explaining the importance of circuit along in sports.

Q 8. What is circuit training? Draw a diagram of 10 stations the improve general fitness. How can load be increased in circuit training?

Ans. Circuit training is a training method to improve mobility strength and stamina. It comprises of 6 to 10 strength exercises, in which each exercise is performed for a specified number of repetitions or for a set time before moving on the next exercise.
A typical circuit training diagram of 10 stations in given below:



COMMON ERROR

Many students are not able to draw the diagram of circuit training along with correct stations.

Following points are important to increase load in circuit training:

(i) Number of repetitions can be increased per exercise.
(ii) Frequency can be increased.
(iii) Additional load can be increased.
(iv) Interval between exercises can be reduced.

Chapter Test

Multiple Choice Questions

Q 1. While exercising on a multi gym, the type of muscular contraction that occurs is:

a. Isotonic b. Isometric
c. Isokinetic d. Eccentric

Q 2. Match the following:

List-I (Type of Endurance)	List-II (Examples)
A. Short-term Endurance	(i) Marathon
B. Speed Endurance	(ii) 400 m Sprint race
C. Medium-term Endurance	(iii) 800 m race
D. Long-term Endurance	(iv) 1500 m race

	A	B	C	D
a.	(iii)	(ii)	(iv)	(i)
b.	(iii)	(iv)	(ii)	(i)
c.	(iv)	(iii)	(i)	(ii)
d.	(i)	(ii)	(iii)	(iv)

Q 3. Match the following:

List-I	List-II
A. PNF Stretching	(i) Kicking action in a circular.
B. Dynamic Stretching	(ii) Bringing your leg up high and then holding it there with your hand.
C. Static Active Stretching	(iii) Muscles are stretched without moving the limbs.

D.	Static Passive Stretching	(iv)	Involves both stretching and contraction of specific muscle group.

	A	B	C	D
a.	(iv)	(iii)	(ii)	(i)
b.	(iv)	(i)	(iii)	(ii)
c.	(i)	(ii)	(iii)	(iv)
d.	(iii)	(iv)	(ii)	(i)

Q 4. Which ability determines and changes the position and movements of the body in different types of situations?

a. Balance Ability b. Orientation Ability
c. Rhythm Ability d. Adaptation Ability

Q 5. In the sport shown below, which type of strength is used?

a. Explosive strength b. Static strength
c. Maximum strength d. Both b. and c.

Assertion and Reason Type Questions

Directions (Q. Nos. 6-7): *There are two statements marked as Assertion (A) and Reason (R). Read the statements and choose the appropriate option from the options given below:*

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
c. Assertion (A) is true, but Reason (R) is false.
d. Assertion (A) is false, but Reason (R) is true.

Q 6. Assertion (A): Acceleration run is used to develop speed while attaining maximum speed from a static position.
Reason (R): In must be done after proper warm up.

Q 7. Assertion (A): Coordinative abilities are those abilities of an individual which enable the individual to perform a variety of skills properly as well as efficiently.
Reason (R): Coordinative abilities mainly depends on the central nervous system.

Case Study Based Question

Q 8. Read the following passage and answer the following questions.

Flexibility is the ability to execute a movement with greater amplitude or range. A person possessing a good degree of flexibility can perform daily tasks with greater ease and efficiently. Flexibility is helpful in preventing injuries, improving posture, reducing back pain, improving balance while making movements, etc.

(i) The ability to perform a movement with greater amplitude without an external help is called:

a. passive flexibility b. active flexibility
c. static flexibility d. dynamic flexibility

(ii) Stretching with the help of a prop is an example of:

a. passive flexibility
b. Ballistic flexibility
c. locomotor flexibility)
d. active flexibility

(iii) Flexibility is helpful in:

a. reducing backpain
b. improving posture
c. Both a. and b.
d. reducing anxiety

Very Short Answer Type Questions

Q 9. Define talent identification.
Q 10. What are isometric exercises?

Short Answer Type-I Questions

Q 11. List any two advantages of Interval Training method.
Q 12. Differentiate between acceleration runs and pace runs.
Q 13. Write a short note on Meso training cycle.

Short Answer Type-II Questions

Q 14. Explain any three methods to improve flexibility.
Q 15. What is endurance? How endurance can be developed through Fartlek method?
Q 16. Discuss any three types of coordinative abilities.

Long Answer Type Questions

Q 17. Discuss the types of endurance according to the nature and duration of activity.
Q 18. What are the types of strength? Explain isotonic method to improve strength.