7 Physiology and Injuries in Sports

Fastrack Revision

- **Physiological Factors Determining Components of Physical Fitness:** Sports physiology is the study of how exercise alters the function and structure of the body. The components of physical fitness like strength, endurance, speed and flexibility can be determined with the help of various physiological factors.
  - **Physiological Factors Determining Strength**
    - Muscle size
    - Muscle composition
    - Age
    - Intensity of the nerve impulse
    - Gender
  - **Physiological Factors Determining Endurance**
    - Aerobic capacity (oxygen uptake, oxygen intake, oxygen transport, energy reserves)
    - Lactic acid tolerance
    - Movement economy
    - Muscle composition
  - **Physiological Factors Determining Speed**
    - Mobility of the nervous system
    - Muscle composition
    - Explosive strength
    - Flexibility
    - Bio-chemical reserves and metabolic power
  - **Physiological Factors Determining Flexibility**
    - Muscle strength
    - Structure of joint
    - Age and gender
    - Stretchability of muscles
    - Internal environment
    - Previous injury
- **Parts of Cardio respiratory system**
  - **Cardiovascular System:** It consists of three parts: the heart, blood vessels and blood. Its major function is to deliver oxygen and nutrients, remove CO_2 and other metabolic waste products, to transport hormones and other molecules, to support thermoregulation and lastly to regulate immune function.
  - **Respiratory System:** The important parts of the respiratory system are the nose, nasal cavity, pharynx, larynx, trachea, bronchi and lungs. Its major functions include, transporting air to the lungs, exchanging gases (O_2 and CO_2) between the air and blood and regulating blood pH.
- **Effects of Exercise on cardiovascular system**
  - **Short-term Effects:** When you do exercise or take part in a strenuous sport, you will notice several changes taking place in your body:
    - Increased heart rate
    - Increased stroke volume
    - Increased cardiac output
    - Increased blood flow
    - Increased blood circulation
    - Blood pressure increase
  - **Long-term Effects:** Exercises are good for the overall well-being of a person. The long-term effects of exercise are as follows:
    - Increases size and strength of heart
    - Blood volume increases
    - Low level of accumulation of lactic acid
    - Resting heart rate decreases
    - Normal blood pressure
    - Increase in stroke volume and cardiac output
    - Increase in capillaries network
- **Effect of Exercise on Respiratory System**
  - **Short-term Effects:**
    - Respiratory rate increases
    - Tidal volume increases
    - Rate of exchange of gas increases
  - **Long-term Effects:**
    - Increased efficiency of respiratory muscles
    - Increased lung volume
    - Increased pulmonary diffusion
    - Increased residual volume
  - **Short-term Effects of Exercises on Muscular System**
    - Increased blood supply
    - Increased muscle temperature
    - Increased muscle flexibility
    - Accumulation of lactic acid
    - Micro-tears in muscle fibres
  - **Long-term Effects of Exercise on Muscular System**
    - Increase in muscle size (muscle hypertrophy)
    - Increase in strength of ligaments and tendons
    - Increase in size and number of mitochondria
    - Increase in myoglobin storage
    - Increase in lactic acid tolerance
- **Physiological Changes due to Ageing:** The major physiological changes due to ageing are as follows:
  - Decrease in muscle size, strength of muscles also decreases.
  - Increase in the accumulation of body fat.
  - The efficiency of lungs diminishes with age. The uptake and exchange of oxygen reduces.
  - The stroke volume, cardiac output and blood flow decrease with increase in age.

- Reaction time and movement time slows down with increasing age.
- The sense of smell, taste, sight, touch and hearing are all diminished overtime.
- Bone density decreases which increases the chances of fractures and dislocations.
- The mass of the kidneys decreases and the chances of urinary infections are increased.

- **Classification of Sports Injuries:** Injury causes damage to any part-external or internal, which affect the health of an individual. Injuries can be classified as:
  - **Soft Tissue Injuries:** It is of two types:
    - **Skin Injuries:** It is an injury over skin like contusion, abrasion, laceration, incision, etc.
      - **Abrasion:** Injury of skin or mucous membrane due to scrapping or rubbing.
      - **Contusion:** Injury to the soft tissue often produced by a blunt force such as kick, fall or blow.
      - **Laceration:** Severe injury of tearing or ripping of the layers of skin and the fatty tissues and muscles below the wound.
      - **Incision:** Injury produced by a sharp edge (knife etc.) and is usually longer than it is deep.
    - **Muscle Injuries:** In this injury, the muscles, tendons and ligaments are affected like sprain, strain etc.
      - **Sprain:** Sudden stretching of ligaments of a joint and is associated with pain and decolouration into tissues.
      - **Strain:** An acute or chronic soft tissue injury which is caused by twisting or pulling of a muscle, tendon or both.
  - **Hard Tissue Injuries:** These injuries involve damage to bones of skeletal system like fracture and dislocation. So, it is of two types:
    - **Dislocation:** It means partial or total separation of a joint. Types of dislocation includes:
      - **Dislocation of Shoulder Joint:** It occurs when a strong force pulls the shoulder outward or extreme rotation of the joint pops the ball of the humerus out of the shoulder socket.
      - **Dislocation of Hip Joint:** It occurs when the head of the thigh bone is forced out of its socket in the hip bone.
      - **Dislocation of Lower Jaw:** It occurs when the lower jaw becomes detached from one or both of the TMJs (temporomandibular joints, which connects the lower jaw to the skull).
    - **Fractures:** It is a crack or full break in a bone or bones. It can be closed or open. Fractures can be stress fracture, greenstick, comminuted, transverse, oblique and impacted.
      - **Stress Fracture:** Also known as hairline fracture, these are tiny cracks in a bone, caused by repetitive force or overuse.
      - **Greenstick:** It is an incomplete fracture which involves bending of bone instead of breaking completely.
      - **Comminuted:** It is a fracture in which the break is in three or more pieces and fragments are present at the fracture site.
      - **Transverse:** Here, the break is in a straight line across the bone.
      - **Oblique:** It is a diagonal break across the bone.
      - **Impacted:** It occurs when the broken ends of the bone are jammed together by the force of the injury.

Practice Exercise

Multiple Choice Questions

Q 1. Which of the following is not a component of physical fitness?
a. Strength b. Balance
c. Speed d. Endurance

Q 2. The amount of oxygen which can be absorbed and consumed by the working muscles from blood is called ..... . *(CBSE SQP 2020-21, CBSE 2023)*
a. oxygen intake
b. oxygen transport
c. oxygen uptake
d. energy reserve

Q 3. Which of these is a physiological factor determining flexibility?
a. Internal environment
b. Age
c. Joint structure
d. All of the above

Q 4. Which of these is not a benefit of exercises related to cardio respiratory fitness?
a. Decreased resting heart rate
b. Increased stroke volume
c. Decreased heart size
d. Increased cardiac output

Q 5. Slow twitch fibres are ..... in colour. *(CBSE SQP 2022-23)*
a. white b. red
c. transparent d. brown

Q 6. The ability to tolerate higher concentration of ..... can help in improving endurance performance. *(CBSE 2023)*
a. lactic acid b. acetic acid
c. hydrochloric acid d. sulphuric acid

Q 7. The amount of blood pumped out by each side of the heart in 1 minute is known as: *(CBSE SQP 2023-24)*
a. blood pressure b. cardiac output
c. blood volume d. oxygen intake

Q 8. The resting cardiac output is approximately:

a. 10 litre/min b. 1 litre/min
c. 5 litre/min d. 15 litre/min

Q 9. Cardiac hypertrophy is:

a. plateauing of heart rate due to maximal exercise intensity.
b. enlargement of heart due to chronic endurance training.
c. lowering of heart rate due to physical training.
d. increase in ventricular volume because of exercise.

Q 10. Which is not a long-term effect of exercise on muscular system?

a. Increase in lactic acid tolerance.
b. Increase in muscle size.
c. Increase in myoglobin storage.
d. Increase in muscle temperature.

Q 11. Which of these is not a soft tissue injury?

a. Abrasion b. Fracture
c. Contusion d. Sprain

Q 12. Overstretching of ligament cause: *(CBSE SQP 2020-21)*

a. strain b. sprain
c. contusion d. bruises

Q 13. Which of these is not a type of fracture?

a. Stress fracture
b. Greenstone fracture
c. Impacted fracture
d. Transverse fracture

Q 14. Match List-I and List-II, selecting the correct option:

List-I	List-II
A. Abrasion	(I) Joint Injury
B. Greenstick Fracture	(ii) Soft Tissue Injury
C. Shoulder Dislocation	(III) Cause of Sports Injury
D. Lack of Fitness	(iv) Bone Injury

(CBSE 2020)

	A	B	C	D		A	B	C	D
a.	(II)	(iv)	(I)	(III)	b.	(III)	(II)	(iv)	(I)
c.	(iv)	(III)	(I)	(II)	d.	(I)	(III)	(II)	(iv)

Q 15. Identify the injury.

a. Contusion b. Laceration
c. Sprain d. Fracture

Q 16. The irregular tear-like wounds caused by some blunt trauma ..... *(CBSE SQP 2023-24)*

a. Laceration b. Contusion
c. Abrasion d. Incision

Q 17. Match the injuries:

1. A. Comminuted fracture

2. B. Incision

3. C. Greenstick fracture

4. D. Abrasion

a. 1-A, 2-C, 3-D, 4-B
b. 1-C, 2-A, 3-D, 4-B
c. 1-C, 2-A, 3-B, 4-D
d. 1-A, 2-C, 3-B, 4-D

Assertion & Reason Type Questions

Directions (Q. Nos. 18-22): *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 18. Assertion (A): Slow twitch muscle fibres produce small levels of force for long periods of time without fatigue.
Reason (R): They are best used for cardiovascular (aerobic) activities.

Q 19. Assertion (A): ATP-CP system provides energy for activities which are of very short duration and are very intensive.
Reason (R): It includes activities like 200 m, 400 m races.

Q 20. Assertion (A): Regular exercise increases residual volume.
Reason(R): Residual volume is the volume of air that remains in the lungs after forceful expiration.

Q 21. **Assertion (A): Sprain is the stretching or tearing of ligaments.**
Reason(R): The most common location for a sprain is in our ankle.

Q 22. **Assertion (A): Greenstick fractures are commonly seen in children.**
Reason(R): The bones of children are very soft and delicate.

Answers

1. (b) Balance
2. (c) oxygen uptake
3. (d) All of the above
4. (c) Decreased heart size
5. (b) red
6. (a) lactic acid
7. (b) cardiac output
8. (c) 5 litre/min
9. (b) enlargement of heart due to chronic endurance training.
10. (d) Increase in muscle temperature.
11. (b) Fracture
12. (b) sprain
13. (b) Greenstone fracture
14. (a) A-(ii), B-(iv), C-(i), D-(iii)
15. (b) Laceration
16. (a) Laceration
17. (b) 1-C, 2-A, 3-D, 4-B
18. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
19. (c) Assertion (A) is true, but Reason (R) is false.
20. (b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
21. (b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
22. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Case Study Based Questions

Case Study 1

Read the following passage and answer the following questions.

Mr. Patel is a renowned cricket coach. When he started his academy, he selected some players and designed a training programme. During training, he noted that a few players were good but were unable to play up to the last moment due to lack of speed, endurance and flexibility.

Q 1. **Age and gender play a very important role in which of these components?**
a. Speed b. Endurance
c. Flexibility d. Strength

Q 2. **Muscle composition plays a important role in which of these components?**
a. Speed b. Endurance
c. Both a. and b. d. Flexibility

Q 3. **Which statement is not true about fast and slow twitch fibres?**
a. Slow twitch fibres are best used for aerobic activities or endurance activities.
b. Slow twitch fibres are also known as Type I fibres and fast twitch fibres are also known as Type II fibres.
c. The percentage of fast and slow twitch fibres can be changed through training.
d. An individual having high percentage of fast twitch fibres than slow twitch fibres will have more speed.

Answers

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

Case Study 2

Read the following passage and answer the following questions.

Mr. Purno, aged 45 years was advised by his doctor to exercise regularly and take care of his dietary habits. This advice was given keeping in view his advancing age and sedentary working profile. Considering his lifestyle answer the following questions.

Q 1. **The most commonly seen change in the cardiovascular system due to regular exercise is:**
a. Increase in BP b. decrease in heart size
c. Both a. and b. d. No change

Q 2. **Mr. Purno's heart beats fewer than 60 times a minute. This condition is known as:**
a. Hypertrophy b. Stroke volume
c. Bradycardia d. Blood volume

Q 3. **With regular exercise, the tidal volume and vital capacity of lungs:**
a. decreases b. increases
c. remains same d. Either b. or c.

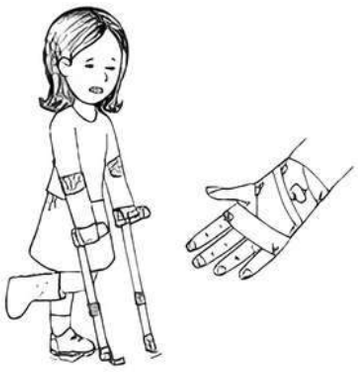
Answers

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

Case Study 3

Read the following passage and answer the following questions.

Tanvi and Ashmita were state level football players of our school. They used to practice hard even during off season. One day while practicing, due to lack of proper warm up, Tanvi had fractured her leg and Ashmita had a sprain in her wrist joint. They were sent to the hospital and first aid was administered.



Q 1. Sprain is an injury to:

a. bone b. skin
c. ligament d. muscle

Q 2. The test to be conducted for detecting fractures is:

a. X-ray b. Blood test
c. ECG d. EEG

Q 3. A bone fracture is an example of injury to:

a. skin b. eyes
c. soft tissue d. hard tissue

Answers

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

Very Short Answer Type Questions

Q 1. Name any two physiological factors which determines strength.

Ans. The physiological factors which determine the strength of an individual are:

(i) Muscle size

(ii) Body weight

Q 2. What is oxygen uptake? *(CBSE 2017)*

Ans. The amount of oxygen which can be absorbed and consumed by the working muscles from the blood is called oxygen uptake.

Q 3. Write down various physiological factors determining speed and flexibility.

Ans. Speed is determined by the following physiological factors:

(i) Mobility of the nervous system

(ii) Explosive strength

Flexibility is determined by:

(i) Muscle strength

(ii) Structure of joint

Q 4. What is 'Stroke volume'? *(CBSE 2016)*

Ans. 'Stroke volume' is the amount of blood ejected per beat from the left ventricle. It is measured in ml/beat.

Q 5. What do you mean by 'Cardiac output'? *(CBSE 2016, 18)*

Ans. 'Cardiac output' is the amount of blood pumped by the heart in one minute. It is measured in litre/minute.

Q 6. Explain the term Hypertrophy of muscles. *(CBSE 2015, 17)*

Ans. Hypertrophy of muscles refers to the increase in muscle size and strength due to regular exercises.

Q 7. Enlist the classification of sports injuries.

Ans. Sports injuries are classified in the following ways:

(i) Soft tissue injuries (For example, abrasion, sprain, etc.).

(ii) Hard tissue injuries (For example, fractures and dislocation of joints).

Q 8. What do you mean by soft tissue injury?

Ans. A soft tissue injury is an injury that causes damage to the skin, ligament or tendon. It includes abrasion, strain, laceration, etc.

Q 9. What kind of sports injury can be termed as 'Abrasion'? *(CBSE 2016)*

Ans. It is the injury of skin in which skin is scrapped or rubbed due to friction with certain equipment or a rough surface.

Q 10. What is contusion? *(CBSE 2017)*

Ans. Contusion is a soft tissue injury which occurs when a direct blow or repeated blows from a blunt object strikes any part of the body, crushing underlying muscle fibres and connective tissues without breaking the skin.

Q 11. What type of sports injury can be termed as 'Laceration' in sports? *(CBSE 2018)*

Or **What is laceration?** *(CBSE SQP 2022 Term-2)*

Ans. Laceration is a soft tissue injury that occurs when the skin is cut open or the flesh is torn or hit by a blunt object or sports equipment.

Q 12. What is incision? *(CBSE 2017)*

Ans. Incision is a soft tissue injury made by sharp cutting instruments such as knives, razors or broken glass. Blood tends to come out freely from incision.

Q 13. Which type of sports injury is known as 'Strain'? *(CBSE 2019)*

Ans. A strain is a soft tissue injury that occurs to a muscle or a tendon generally caused by overuse, force or stretching.

Q 14. What type of fracture is known as 'Greenstick fracture'?

Ans. 'Greenstick fracture' is a fracture in which a bone bends and cracks, instead of breaking completely into separate pieces.

Short Answer Type-I Questions

Q 1. Point out physiological factors for strength. *(CBSE SQP 2023-24)*

Ans. Muscle Size: The size of the muscle is largely responsible to the strength of the muscle. It is an acknowledged actuality that more force can be produced by bigger and larger muscles. In males and females, the similar size of muscle produces the similar force even though males are found to be stronger in comparison to females for the reason that they have larger and bigger muscles.

Muscle Composition: It can be said that the proportion of the fibres determines the strength. Fundamentally each muscle consists of two types of muscle fibres *i.e.*, white fibres (fast twitch fibres) and red fibres (slow twitch fibres). The fast twitch fibres produce more force as they can contract faster. On the other hand, the slow twitch fibres are capable to contract for a longer duration as they do not contract faster. The muscles which can produce more strength have more percentage of fast twitch fibres.

Q 2. Elaborate the physiological factors determining endurance.

Or **Explain any two physiological factors which help in determining endurance.** *(CBSE 2022 Term-2, CBSE 2023)*

Ans. The various physiological factors which determine the endurance of our body are as follows:

(i) Aerobic Capacity: The ability of an organism to maintain adequate supply of O_2 to the working muscles for energy liberation is important for endurance performance. It depends on oxygen intake, oxygen uptake, oxygen transport and energy reserves.

(ii) Lactic Acid Tolerance: The ability to tolerate higher concentration of lactic acid is a significant factor in determining aerobic capacity. As tolerance capacity increases, performance also improves in the endurance activities.

Q 3. How composition of muscle fibres effect speed?

Ans. Composition of muscle fibres effect the speed because two types of muscle fibres, namely fast twitch fibres and slow twitch fibres are present in our body. Muscles with greater percentage of fast twitch fibres contract with more speed in comparison to muscles with slow twitch fibres. Different muscles of the body have different percentage of fast twitch fibres. So, different parts of the body have different speed performances.

Q 4. Write a key point on cardio respiratory factors determining fitness. *(CBSE SQP 2023-24)*

Ans. Cardiovascular System: It consists of three parts: the heart, blood vessels and blood. Its major function is to deliver oxygen and nutrients, remove CO_2 and other metabolic waste products, to transport hormones and other molecules, to support thermoregulation and lastly to regulate immune function.

Respiratory System: The important parts of the respiratory system are the nose, nasal cavity, pharynx, larynx, trachea, bronchi, and lungs. Its major functions include, transporting air to the lungs, exchanging gases (O_2 and CO_2) between the air and blood and regulating blood pH.

Q 5. List any four changes happening in the muscular system due to exercising.

(CBSE SQP 2022 Term-2, CBSE 2023)

Ans. Effects of exercises on muscular system are as follows:

(i) Increased blood supply
(ii) Increased muscle temperature
(iii) Increased muscle flexibility
(iv) Increase in size and number of mitochondria

Q 6. Explain any two types of soft tissue injuries with help of examples. *(CBSE SQP 2022-23)*

Ans. The two types of soft tissue injury are as follows:

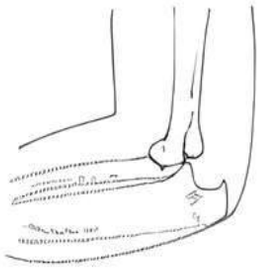
(i) Contusion: Contusion is a soft tissue injury which occurs when a direct blow or repeated blows from a blunt object strikes any part of the body, crushing underlying muscle fibres and connective tissues without breaking the skin.

(ii) Strain: A strain is a soft tissue injury that occurs to a muscle or a tendon generally caused by overuse, force or stretching. Its causes include running, jumping, throwing, etc.

Q 7. Identify the sports injuries and give their names:

(i) 

(ii) 

(iii) 

(iv)

Ans. (i) Compound fracture
(ii) Laceration
(iii) Dislocation of joint
(iv) Comminuted fracture

Q 8. What do you mean by dislocation? Name the different types of dislocations.

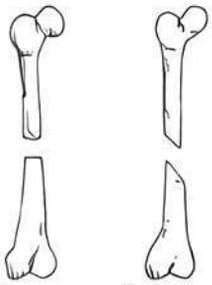
Ans. Dislocation means partial or total separation of a joint. A joint is formed by the meeting of two or more bones of the skeleton.

There are the following types of dislocations:
(i) Dislocation of shoulder joint
(ii) Dislocation of hip joint
(iii) Dislocation of lower jaw

Q 9. Draw diagram of any two types of bone injury.

(CBSE 2022 Term-2)

Ans.



(i) Transverse Fracture (ii) Oblique Fracture

Q 10. Explain any two types of bone injury.

(CBSE 2022 Term-2)

Ans. (i) Greenstick Fracture: A greenstick fracture occurs when a bone bends and cracks, instead of breaking completely into separate pieces.

(ii) Comminuted Fracture: Comminuted fracture is characterised by the breaking of a bone into several small pieces and is the result of high velocity injuries, such as car accidents, falls from a height, etc.

Short Answer Type-II Questions

Q 1. Elaborate any three physiological factors determining flexibility.

Ans. The physiological factors which determine flexibility are:

(i) Structure of Joint: There are several different types of joint in the human body, some of which possess intrinsically greater range of motion than the others. For example, the ball and socket joint has the greatest range of motion of all the joints.

(ii) Previous Injury: Injuries to muscles and connective tissues can lead to thickening of the affected area and reduced range of motion which ultimately leads to reduced flexibility.

(iii) Age and Gender: We know that with the increase in age there will be a decrease in flexibility. Gender also affects flexibility, as female tend to be more flexible than male.

Q 2. Discuss any three short-term effects of exercise on cardiovascular system.

Ans. The short-term effects are as follows:

(i) Increased Heart Rate: When an individual starts exercising, his heart rate increases as per the intensity and duration of the exercise.

(ii) Increased Stroke Volume: The stroke volume or the amount of blood pumped per beat from the left ventricle increases proportionally with intensity of the exercise.

(iii) Increased Cardiac Output: The cardiac output or the volume of blood pumped by the heart in one minute increases from 5 litre/minute to 40 litre/minute, during intense exercise.

Q 3. Discuss in detail short-term effects of exercise on respiratory system.

Ans. Short term effects of exercise in respiratory system are as follows:

(i) Respiratory Rate Increases: Our body requires more oxygen during exercise, and to meet this increased demand, the respiratory rate (breathing rate) increases. The normal respiration rate for an adult at rest is 12 to 20 breaths per minute, but during exercises it increases to 40 breaths per minutes.

(ii) Tidal Volume Increases: The amount of air inhaled and exhaled in one breath is known as tidal volume. Tidal volume increases as a result of exercise to take in more oxygen and remove carbon dioxide from our body.

(iii) Rate of Exchange of Gas Increases: Regular exercise increases the rate of exchange of gas in lungs.

Q 4. Elucidate any six effects of exercise on muscular system. *(CBSE 2023)*

Ans. Effects of exercise on muscular system are as follows:

(i) **Hypertrophy of Muscle:** Scientific and systematic exercise leads to increase in thickness of muscle fibres that results in increase in muscle size also known as muscle hypertrophy.

(ii) **Increases in Strength of Ligaments and Tendons:** Regular exercise helps to strengthen bones, ligaments and tendons.

(iii) **Increase in Size and Number of Mitochondria:** Aerobic exercises leads to increase in size and numbers of mitochondria and which take in more oxygen and produce more ATP and energy.

(iv) **Increase in Myoglobin Storage:** Long-term effect of aerobic exercise is to increase the storage of myoglobin which transports oxygen to mitochondria. Large amount of myoglobin means large amount of oxygen and large amount of energy.

(v) **Increase in Lactic Acid Tolerance:** Regular exercises help to tolerate pain and sourness in muscles due to accumulation of lactic acid.

Q 5. "Regular physical exercise can delay your ageing process". Justify your answer in light of the effect of activities on physiological changes. *(CBSE 2015)*

Ans. Some of the major effects are as follows:

(i) **Changes in Respiratory System:** The efficiency of lungs diminishes with age. There is decreased oxygen uptake and oxygen exchange. The muscles of the ribcage become weak. Hence, the ability to breathe deeply is reduced.

(ii) **Changes in Cardiovascular System:** With the growing age, the strength and efficiency of cardiac muscle is diminished. As a result, stroke volume, cardiac output and blood flow decrease with increase in age.

(iii) **Changes in Urinary System:** With ageing, the mass of kidneys decreases. This leads to reduction in capacity of bladder and an increase in residual urine. The chances or urinary infections are increased and it takes a longer time for kidneys to dispose waste products from the body.

Q 6. Mention briefly about the common sports injuries and their. *(CBSE 2018, 20)*

Or **Create a flowchart to explain classification of sports injuries.** *(CBSE SQP 2022 Term-2)*

Ans. **Common Sports Injuries:**

Sports Injuries

Soft Tissue Injuries	Bone Injuries	Joint Injuries
1. Abrasion	1. Simple fracture	1. Dislocation of lower jaw
2. Contusion	2. Compound fracture	2. Dislocation of shoulder joint
3. Incision	3. Complicated fracture	3. Dislocation of hip joint
4. Strain	4. Greenstick fracture	
5. Sprain	5. Comminuted fracture	
6. Laceration	6. Impacted fracture	

Q 7. Explain any three joint injuries.

Ans. The three joint injuries are as follows:

(i) **Dislocation of Jaw:** It occurs when the chin strikes any other object forcefully. It may also occur if the mouth is opened excessively.

(ii) **Dislocation of Shoulder Joint:** It may occur due to sudden jerk or fall on a hard surface. The end of humerus comes out of the shoulder socket.

(iii) **Dislocation of Hip Joint:** By putting maximum strength spontaneously may cause dislocation of hip joint. The end of femur gets displaced from the socket.

Long Answer Type Questions

Q 1. Describe physiological factors determining components of physical fitness.

Ans. Physiological factors determining components of physical fitness are:

(i) **Strength:** This is the maximum force or tension a muscle or a muscle group can exert against a resistance. The way to increase strength is to try exercises such as lifting weights (under proper supervision).

(ii) **Endurance:** This is the ability of a muscle or a muscle group to perform repeated contractions against a resistance/load or to sustain contraction for an extended period of time with less discomfort and more rapid recovery.

(iii) **Speed:** This is the rapidity with which one can repeat successive movements of the same pattern. It may also be defined as the ability of a person to move quickly through a short distance.

(iv) **Flexibility:** This is the quality of the muscle ligaments and tendons that enables the joints of the body to move easily through a complete range of movements.

Q 2. Discuss physiological factors determining speed.

Ans. The various physiological factors determining speed are as follows:

(i) **Mobility of the Nervous System:** To generate more speed, our muscles contract and relax at maximum possible speed due to which rapid excitation and inhibition occur in the concerned motor centres. This is known as mobility of the nervous system.

(ii) **Flexibility:** Flexibility also determines the speed to a certain extent as it allows our body to move at maximum speed without much internal resistance.

(iii) **ATP and CP Stores:** For maximum speed performance, ATP and CP stores in the muscles should be enough. If ATP and CP store is less, the muscle contractions due to insufficient energy supply become slow after a short time.

(iv) **Muscle Composition:** Muscle with greater percentage of fast twitch fibres contract with more speed in comparison to muscles with lower percentage of fast twitch fibres.

(v) **Explosive Strength:** For every quick and explosive movement, explosive strength is indispensable. It depends on muscle composition, muscle size and muscle coordination.

Q 3. Discuss in detail long-term and short-term effects of exercise on cardio respiratory system.

(CBSE 2022 Term- 2)

Ans. Cardio respiratory system consists of cardiovascular system and respiratory system.

Short-term effects of exercise on Cardiovascular system:

(i) Exercise makes the body work harder and therefore muscles require more oxygen to continue to work effectively. As a result, the heart rate increases.

(ii) As the heart rate increases, blood circulation increases in the body. As a result, the movement or flow of blood increases to tissues or organs.

(iii) During exercise, stroke volume increases as more oxygen is required which is accomplished by delivering blood to muscles.

Long-term effects of exercise on Cardiovascular system:

(i) Continuous aerobic exercises help to increase the strength and the size of heart which helps in better performance.

(ii) Regular exercises prepares muscles to adjust to working with lower levels of oxygen and the circulatory system develops itself to transport oxygen to different parts of the body, thereby resulting in low levels of lactic acid.

(iii) Due to the demands placed on different parts of the body during exercise, the capillary density at muscle sites improves. Increased capillary density allows for greater oxygen being transported to the muscles, improving their ability to perform intense exercise.

Short-term effects of exercise in Respiratory system:

(i) Our body requires more oxygen during exercise, and to meet this increased demand, the respiratory rate (breathing rate) increases.

(ii) Tidal volume increases as a result of exercise to take in more oxygen and remove carbon dioxide from our body.

(iii) Regular exercise increases the rate of exchange of gas in lungs.

Long-term effects of exercise in Respiratory system:

(i) Continuous exercises done for long duration help to increase the capacity and volume of lungs.

(ii) Regular exercise increases residual volume that helps to exchange the gases in normal limits.

(iii) Due to regular exercise efficiency of respiratory muscles increases, inhalation and exhalation become fluent.

Q 4. What do you understand by fracture? How can fractures be classified? Explain.

(CBSE 2019,23, CBSE SQP 2023-24)

Ans. A fracture is a break in a bone as a result of high force impact or stress, or a minimal trauma injury as a result of certain medical conditions that weakens the bones, such as osteoporosis etc.

The different types of fractures are discussed below:

(i) Greenstick Fracture: A greenstick fracture involves bending of bones and cracks, instead of breaking completely into separate pieces. It occurs most often during infancy and childhood when bones are soft and more flexible.

(ii) Comminuted Fracture: A fracture in which the bone is broken into more than two pieces and is the result of high velocity injuries, such as car accidents, falls from a height etc.

(iii) Stress Fractures: These are tiny cracks in a bone, most commonly in bones of lower leg and foot. They are caused by repetitive force or overuse (repeatedly jumping up and down or running long distances).

(iv) Impacted Fracture: A fracture in which the ends of the cracked bones are driven into each other by the force of the injury.

(v) Oblique Fracture: Oblique fractures are slanted fractures that occur when a force is applied at any angle other than right angle to the bone. (Any four)

TiP

Learn and understand the concepts of each type of fracture and make a list of how each one differs from the other one.

Q 5. Explain following sports injuries briefly.

(i) Abrasion

(ii) Transverse fracture

(iii) Sprain

(iv) Laceration

(v) Contusion

Ans. (i) It is the injury of skin in which the skin is scrapped or rubbed due to friction with certain equipment or a rough surface.

(ii) A fracture in which the break is across the bone at a right angle to the long axis of the bone.

(iii) Sprain is a ligament injury which occurs due to overstretching or tearing of ligament. Severe pain, swelling, inflammation and tenderness are common symptoms.

(iv) Laceration is a soft tissue injury that occurs when the skin is cut open or the flesh is torn or hit by a blunt object or sports equipment.

(v) Contusion is a soft tissue injury which occurs when a direct blow or repeated blows from a blunt object strikes any part of the body, crushing underlying muscle fibres and connective tissues without breaking the skin.

Chapter Test

Multiple Choice Questions

Q 1. Match the following:

List-I (Component of Physical Fitness)	List-II (Physiological Factor)
A. Endurance	(i) Muscle size
B. Flexibility	(ii) Movement economy
C. Speed	(iii) Previous injury
D. Strength	(iv) Bio-chemical reserves and metabolic power

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

Q 2. What is the normal respiratory rate for an adult?

a. 10-12 breaths per minute

b. 40-60 breaths per minute

c. 12-20 breaths per minute

d. 30-40 breaths per minute

Q 3. Which of the following is not a short-term effects of exercise on muscular system?

a. Micro-tears in muscle fibres

b. Increased blood supply

c. Increased muscle flexibility

d. Increase in size and number of mitochondria

Q 4. Match the following:

List-I (Types of Fracture)	List-II (Definition)
A. Impacted fracture	(i) A crack in a bone.
B. Stress fracture	(ii) Bone is broken, splinted or crushed into number of pieces.
C. Comminuted fracture	(iii) Bone is broken diagonally.
D. Oblique fracture	(iv) Broken ends of the bones are jammed together.

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

Q 5. ..... bone comes out of socket in hip dislocation.

a. Humerus b. Femur

c. Tibia d. Fibula

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): Sprain is ligament injury.
Reason (R): Strain is a muscle injury.

Q 7. Assertion (A): Oxygen intake is the amount of oxygen which can be absorbed and consumed by the working muscles from the blood.
Reason (R): It depends on the lung size, number of active alveoli, size of chest cavity, etc.

Case Study Based Question

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

The Godavari school attended a CBSE Cluster Basketball Tournament. During the semi-final match Varun, one of the players fell down on the hard surface and was injured on the shoulder.

(i) Which joint injury might have happened to Varun?
a. Dislocation of lower jaw
b. Dislocation of shoulder joint
c. Dislocation of hip joint
d. Dislocation of wrist

(ii) ..... bone comes out from the socket in the above joint injury.
a. Ulna b. Femur
c. Fibula d. Humerus

(iii) Joint injury symptoms include:
a. Pain b. Swelling
c. Bruising d. All of the above

Very Short Answer Type Questions

Q 9. Differentiate between slow twitch fibre and fast twitch fibre.

Q 10. Write briefly about the effect of training on:
(i) blood flow
(ii) blood volume

Short Answer Type-I Questions

Q 11. How composition of muscle fibres determine the speed of an individual?

Q 12. Differentiate between strain and sprain.

Q 13. What do you understand by dislocation? Name different types of dislocations.

Short Answer Type-II Questions

Q 14. Briefly explain the long-term effects of exercise on respiratory system.

Q 15. What do you mean by oxygen intake and oxygen uptake?

Q 16. Elaborate any three physiological factors determining strength.

Long Answer Type Questions

Q 17. Write in detail about bone injuries and joint injuries.

Q 18. Discuss in detail three long-term and three short-term effects of exercise on muscular system.