SECTION : PHYSICS

This section contains **15 Multiple Choice Questions**. Each question has four choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.

1. Which of the following is a fundamental physical quantity?
(1) Speed
(2) Force
(3) Mass
(4) Density

2. A body moves 12 m towards the east, then 5 m towards the west. The ratio of distance travelled to the magnitude of displacement is:
(1) 17 : 7
(2) 7 : 17
(3) 12 : 5
(4) 5 : 12

3. The momentum of a body changes from 10 kg·m/s to 30 kg·m/s in 4 s. The net force acting on it is:
(1) 2 N
(2) 5 N
(3) 10 N
(4) 20 N

4. Two bodies of mass 10 kg and 20 kg are 1 m apart. The gravitational force between them is:
(1) 6.67×10^{-11} N
(2) 1.33×10^{-8} N
(3) 1.33×10^{-9} N
(4) 6.67×10^{-9} N

5. An object is placed 30 cm in front of a concave mirror of focal length 15 cm. The image formed is:
(1) At 30 cm in front of the mirror, real, inverted, same size
(2) At 60 cm in front of the mirror, real, inverted, magnified
(3) At 10 cm in front of the mirror, real, inverted, diminished
(4) At 30 cm behind the mirror, virtual, erect, same size

6. Three resistors of 2 Ω, 3 Ω and 6 Ω are connected in parallel. The equivalent resistance is:
(1) 1 Ω
(2) 11 Ω
(3) 2 Ω
(4) 0.5 Ω

7. A concave mirror forms a real image twice the size of the object when the object is 15 cm from the mirror. The focal length of the mirror is:
(1) −10 cm
(2) −20 cm
(3) −30 cm
(4) −45 cm

8. A 12 V battery is connected to a 4 Ω resistor in series with a parallel combination of 6 Ω and 3 Ω resistors. The current through the 3 Ω resistor is:
(1) 2 A
(2) 1.33 A
(3) 0.67 A

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(4) 4 A

9. Which statement about the magnetic field inside a long current-carrying solenoid is correct?
(1) It is zero
(2) It is non-uniform and strongest near the ends
(3) It is uniform and parallel to the axis of the solenoid
(4) It is circular around each turn throughout the interior

10. A car travels the first half of a journey at 30 km/h and the second half at 60 km/h. Its average speed is:
(1) 40 km/h
(2) 45 km/h
(3) 50 km/h
(4) 35 km/h

11. The same force acts separately on bodies of mass 2 kg and 4 kg. The ratio of their accelerations ($a_1 : a_2$) is:
(1) 1 : 2
(2) 2 : 1
(3) 1 : 1
(4) 4 : 1

12. A person has a mass of 60 kg on Earth. On the Moon, where g is one-sixth of Earth's value, his mass and weight are:
(1) 10 kg and 98 N
(2) 60 kg and 98 N
(3) 60 kg and 588 N
(4) 10 kg and 588 N

13. A convex mirror has a radius of curvature of 40 cm. An object is placed 30 cm in front of it. The image distance is:
(1) +12 cm
(2) −12 cm
(3) +60 cm
(4) +20 cm

14. A current of 2 A flows through a 10 Ω resistor for 5 minutes. The heat produced is:
(1) 200 J
(2) 6000 J
(3) 12000 J
(4) 60000 J

15. A 2 kg ball is dropped from a height of 20 m. The speed with which it hits the ground is:
(1) 10 m/s
(2) 20 m/s
(3) 40 m/s
(4) 200 m/s

SECTION : CHEMISTRY

This section contains **15 Multiple Choice Questions**. Each question has four choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.

16. In the reaction $CuO + H_2 \rightarrow Cu + H_2O$, which statement is correct?
(1) CuO is the reducing agent
(2) H_2 is oxidised and acts as the reducing agent
(3) H_2 is reduced because it gains oxygen
(4) Copper is oxidised because its oxidation state increases

17. Carbon forms two oxides. 12 g of carbon combines with 16 g of oxygen in the first and 32 g of oxygen in the second. These data illustrate:
(1) Law of conservation of mass
(2) Law of definite proportions

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(3) Law of multiple proportions
(4) Gay-Lussac's law

18. **Assertion (1):** Dry HCl gas does not change the colour of dry blue litmus paper.
Reason (R): Acids release H^+ ions only in the presence of water.
(1) Both A and R are true, and R explains A
(2) Both are true, but R does not explain A
(3) A is true, R is false
(4) A is false, R is true

19. Solution X has pH 3 and solution Y has pH 6. How many times greater is the H^+ concentration in X than in Y?
(1) 3
(2) 30
(3) 100
(4) 1000

20. Which of the following statements are correct?
I. Baking soda releases CO_2 on heating, which makes cakes spongy.
II. Washing soda is obtained by heating baking soda, followed by recrystallisation.
III. Bleaching powder is made by passing chlorine over dry slaked lime.
IV. Plaster of Paris is $CaSO_4 \cdot 2H_2O$.
(1) I, II, III only
(2) II, III, IV only
(3) I and IV only
(4) All four

21. Metal M liberates H_2 from dilute HCl and displaces copper from $CuSO_4$ solution, but it cannot displace zinc from $ZnSO_4$ solution. M is most likely:
(1) Mg
(2) Fe
(3) Cu
(4) Ca

22. Which pairing of ore and the correct first step of metallurgy is right?
(1) ZnS: calcination; $ZnCO_3$: roasting
(2) ZnS: roasting; $ZnCO_3$: calcination
(3) ZnS: calcination; $ZnCO_3$: calcination
(4) ZnS: roasting; $ZnCO_3$: roasting

23. The total number of covalent bonds (shared electron pairs) in one molecule of propane (C_3H_8) is:
(1) 8
(2) 9
(3) 10
(4) 11

24. Compound X reacts with sodium metal to give H_2 but does not react with $NaHCO_3$. Compound Y reacts with both. X and Y are respectively:
(1) Ethanoic acid, ethanol
(2) Ethanol, ethanoic acid
(3) Ethanol, ethanal
(4) Ethanal, ethanoic acid

25. Assertion (A): Detergents work effectively in hard water, whereas soaps do not.
Reason (R): Calcium and magnesium salts of detergent molecules are soluble in water.
(1) Both true, R explains A
(2) Both true, R does not explain A
(3) A is true, R is false
(4) A is false, R is true

26. Which pair correctly shows the element with the *higher* first ionisation enthalpy?
(1) B > Be and O > N
(2) Be > B and N > O
(3) Be > B and O > N
(4) B > Be and N > O

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27. The correct order of ionic radii for the isoelectronic species O^{2-}, F^-, Na^+ and Mg^{2+} is:
(1) $O^{2-} < F^- < Na^+ < Mg^{2+}$
(2) $Mg^{2+} < Na^+ < F^- < O^{2-}$
(3) $Na^+ < Mg^{2+} < O^{2-} < F^-$
(4) $F^- < O^{2-} < Mg^{2+} < Na^+$

28. Which sample contains the greatest number of atoms? (H = 1, C = 12, O = 16)
(1) 0.5 mol CH_4
(2) 11.2 L N_2 at STP
(3) 18 g H_2O
(4) 4 g H_2

29. A compound contains 40% C, 6.7% H and 53.3% O by mass, and its molar mass is 180 g/mol. Its molecular formula is:
(1) CH_2O
(2) $C_3H_6O_3$
(3) $C_5H_{10}O_5$
(4) $C_6H_{12}O_6$

30. Aqueous $CuSO_4$ is electrolysed using copper electrodes. Which observation is correct?
(1) The blue colour fades because Cu^{2+} is depleted
(2) O_2 is evolved at the anode
(3) The anode loses mass, the cathode gains the same mass, and the blue colour stays unchanged
(4) The cathode loses mass and the anode gains mass

SECTION : BIOLOGY

This section contains **20 Multiple Choice Questions**. Each question has four choices (1), (2), (3) and (4) out of which **ONLY ONE** is correct.

31. Assertion (A): Transpiration creates a suction pull that helps in the upward movement of water and dissolved minerals from roots to leaves in tall plants.

Reason (R): Water molecules form a continuous column in xylem vessels due to their mutual attraction (cohesion).

Choose the correct option

(1) : Both (A) and (R) are true, and (R) is the correct explanation of (A).

(2) : Both (A) and (R) are true, but (R) is NOT the correct explanation of (A).

(3) : (A) is true, but (R) is false.

(4) : (A) is false, but (R) is true.

32. Which of the following blood vessels carries de-oxygenated blood away from the heart to the lung?

(1) Vena cava

(2) Pulmonary artery

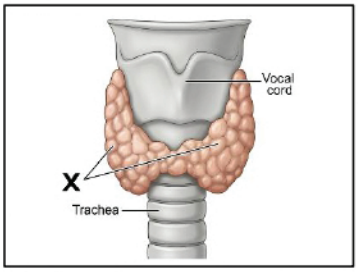
(3) Aorta

(4) Pulmonary vein

33. Which of the following disease is caused due to over secretion of the structure marked as X?

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(1)Gigantism
(2) Diabetes mellitus
(3) Diabetes insipidus
(4) Grave's disease

34. ABA is antagonistic to
(1) GA
(2) cytokinin
(3) ethylene
(4) auxin

35. The number of phenotypes in ABO blood groups is
(1) 1
(2) 4
(3) 6
(4) 8

36. The pigment molecules responsible for photosynthesis are located in the
(1) cytoplasm of the cell.
(2) matrix of the mitochondria.
(3) thylakoid membrane of the chloroplast.
(4) All of the above

37. An experimental plant is subjected to unilateral light source. If the tip of the coleoptile is covered with an opaque cap, what will be the physiological response?

(1) The coleoptile bends towards the light source.

(2) The coleoptile bends away from the light source.

(3) The coleoptile will grow straight upwards without any curvature.

(4) Auxin accumulation on the illuminated side inhibits cell longation.

38. Which of the following sets of vertebrate hormones are all produced in the anterior pituitary gland?
(1) Somatostatin, Vasopressin, Insulin
(2) Prolactin, Growth hormone, Enkephalins
(3) Oxytocin, Prolactin, Adrenocorticotropin
(4) Estrogen, Progesterone, Testosterone

39. Regarding ABO blood group, if one parent is homozygous and other is heterozygous, what are the chances that their child will have 'O' blood group?
(1) 25%
(2) 50%
(3) 75%
(4) Zero

40. Menstruation is triggered by a sudden decline in the amount of hormone secreted by corpus luteum. Identify the hormone.
(1) Luteinizing hormone
(2) Follicle stimulating hormone
(3) Progesterone
(4) Estrogen

41. In the human female reproductive system, fertilization of the ovum by a sperm normally takes place in which specific structure?

(1) Ovary

(2) Fallopian tube

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(3) Uterus

(4) Cervix

42. Which of the following hormones is produced in women only during pregnancy? (1) Relaxin
(2) Estrogen
(3) Oxytocin
(4) Progesterone

43. Which of the following contraceptive methods provides effective prevention against unwanted pregnancy as well as protection from Sexually Transmitted Diseases (STDs)?

(1) Oral contraceptive pills

(2) IUCD

(3) Condoms

(4) Surgical tubectomy

44. During hemodialysis treatment for a patient with kidney failure, why is fluid in the dialysis machine kept at an isotonic concentration relative to blood, except lacking nitrogenous wastes?

(1) To actively pump glucose out of the bloo(4)

(2) To prevent loss of essential salts and water from moving out .

(3) To increase blood pressure inside the dialysis tubing.

(4) To destroy red blood cells completely.

45. During recovery, a nerve fibre becomes
(1) positively charged outside and negatively charged inside.
(2) positively charged on both-outside and inside.
(3) negatively charged outside and positively charged inside.
(4) negatively charged on both-outside and inside

46. Match the plant hormones in Column I with their primary functions in Column II:

Column I	Column II
1. Auxin	(1) Promotes cell division and delays leaf aging.
2. Gibberellin	(2) Promotes cell elongation, phototropism, and apical dominance.
3. Cytokinin	(3) Stimulates stem elongation, seed germination, and flowering.

(1) 1-A, 2-B, 3-C

(2) 1-B, 2-C, 3-A

(3) 1-C, 2-A, 3-B

(4) 1-B, 2-A, 3-C

47. Which of the following ions are required for nerve conduction ?
(1) Ca++, Na+ and K+
(2) Ca++ and Mg++

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(3) Mg++ and K+
(4) Na+ and K+

48. During heavy physical exercise, human muscle cells experience a temporary shortage of oxygen. Which metabolic pathway takes over, and what byproduct causes muscle cramps?

(1) Aerobic respiration producing ethanol

(2) Anaerobic respiration producing lactic acid

(3) Photosynthesis producing glucose

(4) Fermentation producing carbon dioxide and water

49. Why is the human male considered responsible for determining the sex of the child biologically?

(1) Males produce gametes containing only X chromosomes.

(2) Females produce gametes containing both X and Y chromosomes.

(3) Males produce two types of sperms: 50% carrying an X chromosome and 50% carrying a Y chromosome.

(4) The Y chromosome is dominant over the X chromosome in every generation.

50. An experimental setup uses potassium hydroxide KOH inside a bell jar enclosing a destarched potted plant. After a few hours in sunlight, an iodine test on a leaf shows no starch formation. What does this prove?

(1) Chlorophyll is essential for photosynthesis.

(2) Carbon dioxide is necessary for photosynthesis.

(3) Sunlight cannot penetrate glass bell jars.

(4) Oxygen is released during respiration.

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