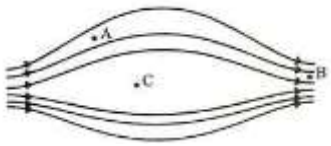
PHYSICS

SECTION A – MULTIPLE CHOICE QUESTIONS

Q.1 Figure shows the magnetic field lines of a magnetic field. There are three points A, B and C in this field. Choose the correct option regarding field strength.



(A) Maximum at A and minimum at B
(B) Maximum at B and minimum at C
(C) Maximum at C and minimum at B
(D) Maximum at A and minimum at C

Q.2 A positively-charged particle (alpha particle) projected towards west is deflected towards north by a magnetic field. The direction of magnetic field is:
(A) towards south (B) towards east
(C) downward (D) upward

Q.3 A plane glass slab is kept over various coloured letters; the letter which appears least raised is
(A) blue (B) green
(C) violet (D) red

Q.4 Two lamps X and Y are connected in series. The lamp X glows brighter than Y. Then:
(A) the resistance of X is greater than the resistance of Y.
(B) the resistance of X is lesser than the resistance of Y.
(C) the resistance of X is equal to the resistance of Y.
(D) there is no relation between the resistances of X and Y.

Q.5 Two electric bulbs whose resistances are in the ratio 1 : 2 are connected in parallel to a constant voltage source. The power dissipated in them have the ratio:
(A) 1 : 2 (B) 1 : 1
(C) 2 : 1 (D) 1 : 4

Q.6 A current of 0.5 A is drawn by a filament of an electric bulb for 10 minutes. Find the number of electrons flowing through the circuit:
(A) 6×10^{18} electrons (B) 18×10^{18} electrons
(C) 6×10^{20} electrons (D) 18×10^{20} electrons

Q.7 If n identical resistors of equal values are firstly connected in series and then connected in parallel, then the value of their resistance ratio R_S/R_P will be:
(A) 1/n (B) $1/n^2$
(C) n^2 (D) n

Q.8 A convex lens of focal length A and a concave lens of focal length B are placed in contact. The focal length of the combination is:
(A) A + B (B) (A − B)
(C) AB/(A + B) (D) AB/(B − A)

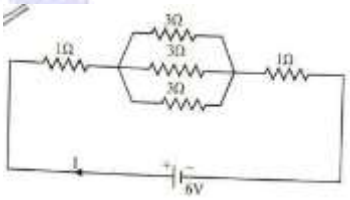
Q.9 A ray of light passes from glass ($\mu = 3/2$) to water ($\mu = 4/3$). The value of critical angle will be:
(A) $\sin^{-1}(1/2)$ (B) $\sin^{-1}(\sqrt{(8/9)})$
(C) $\sin^{-1}(8/9)$ (D) $\sin^{-1}(5/7)$

Q.10 The refractive index of water and glass with respect to air are 4/3 and 3/2 respectively. The refractive index of glass with respect to water will be
(A) 17/6 (B) 1/6
(C) 2 (D) 9/8

SECTION B – INTEGER-BASED QUESTIONS

Q.11 An electric bulb is rated 220 V, 110 W. When it is operated on 110 V, Find the power consumed:

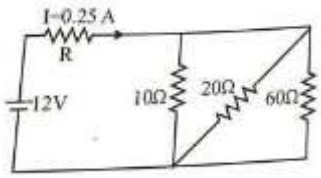
Q.12 In the given circuit, the value of current I will be:



Q.13 Find the power of a concave lens of focal length 2 m.

Q.14 A beam of light travelling in air enters into a liquid. Its speed reduces by 30%. Find the refractive index of liquid with respect to air.

Q.15 What is the value of R in the circuit given below if the current passing through the battery is 0.25 A?



CHEMISTRY

SECTION A – MULTIPLE CHOICE QUESTIONS

Q16. In the following balanced chemical equation:
a MnO_2 + b HCl → c $MnCl_2$ + d H_2O + e Cl_2
Identify the oxidizing agent, reducing agent, and the value of (b + e)/(a + c):
(A) MnO_2, HCl, 2.5 (B) HCl, MnO_2, 2.5
(C) MnO_2, Cl_2, 3.0 (D) $MnCl_2$, HCl, 2.0

Q17. When copper is added to concentrated nitric acid, a reddish-brown gas 'X' is evolved along with a blue solution. In this reaction, nitric acid acts as:
(A) Only an acid
(B) Only a reducing agent
(C) Both an acid and an oxidizing agent
(D) Both a base and a dehydrating agent

Q18. Which of the following reactions represents a disproportionation reaction (where the same element undergoes both oxidation and reduction)?
(A) $2KClO_3 \rightarrow 2KCl + 3O_2$
(B) $Cl_2 + 2NaOH$ (cold, dilute) → $NaCl + NaClO + H_2O$
(C) $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$
(D) $CuO + H_2 \rightarrow Cu + H_2O$

Q19. An aqueous solution of a salt 'P' turns red litmus blue. When 'P' is heated strongly, it loses water of crystallization to

form an anhydrous white powder 'Q', which is used in the manufacture of borax and glass. Identify 'P' and 'Q':
(A) P = $NaHCO_3$, Q = Na_2CO_3
(B) P = $Na_2CO_3 \cdot 10H_2O$, Q = Na_2CO_3
(C) P = $CaSO_4 \cdot 2H_2O$, Q = $CaSO_4 \cdot \frac{1}{2}H_2O$
(D) P = NaCl, Q = NaOH

Q20. Four solutions A, B, C, and D have pH values 2.4, 6.8, 8.5, and 13.2 respectively. Which of the following statements is INCORRECT?
(A) Solution A will liberate CO_2 briskly when treated with Na_2CO_3.
(B) Solution B is slightly acidic and has $[H^+] > 10^{-7}$ M.
(C) Solution C will turn phenolphthalein pink and has $[OH^-] > [H^+]$.
(D) Solution D has a higher concentration of H^+ ions than Solution C.

Q21. During the electrolytic refining of impure copper, a thick block of impure copper is made the anode and a thin strip of pure copper is made the cathode. Which statement regarding the impurities present in the blister copper is true?
(A) More reactive impurities like Zn and Fe remain in the solution as ions.
(B) Less reactive impurities like Ag and Au dissolve into the electrolyte.
(C) All metallic impurities settle down at the bottom of the cathode as anode mud.
(D) Copper ions migrate from the cathode to the anode.

Q22. An element 'M' reacts with cold water to form a basic solution and a gas that catches fire immediately. Another element 'N' does not react with cold or hot water, reacts with steam to form an oxide that is amphoteric in nature. Identify M and N respectively:
(A) Calcium, Iron (B) Potassium, Aluminium
(C) Sodium, Magnesium (D) Magnesium, Zinc

Q23. Which of the following pairs of metals will NOT evolve hydrogen gas when react with dilute nitric acid (HNO_3) under normal conditions?
(A) Mg and Mn (B) Zn and Fe
(C) Mg and Zn (D) Mn and Al

Q24. What is the correct IUPAC name of the following compound?
$CH_3 - CH(C_2H_5) - CH_2 - CH(CH_3) - CH_3$
(A) 2-ethyl-4-methylpentane (B) 2,4-dimethylhexane
(C) 3,5-dimethylhexane (D) 4-ethyl-2-methylpentane

Q25. Consider the following statements regarding allotropes of carbon and catenation:
I. Buckminsterfullerene (C_{60}) contains 20 six-membered rings and 12 five-membered rings.
II. In graphite, each carbon atom is bonded to three other carbon atoms in the same plane, leaving one free valence electron per carbon atom.
III. Silicon exhibits catenation to the same extent as carbon because both belong to Group 14.
Which of the statements given above is/are correct?
(A) I and II only (B) II and III only
(C) I and III only (D) I, II, and III

SECTION B – INTEGER-BASED QUESTIONS

Q26. Determine the correct IUPAC name for the unsaturated hydrocarbon given below:
$CH_3 - C(CH_3)_2 - CH = CH - CH_3$

Q27. Identify the correct IUPAC name of the compound:
$CH \equiv C - CH(CH_3) - CH_2 - CH_3$

Q28. 0.4 g of pure NaOH (Molar mass = 40 g/mol) is dissolved in water to make 100 mL of solution. Assuming complete dissociation, what is the pH of the resulting solution at 298 K?

Q29. Calculate the pH of a solution prepared by dissolving 0.365 g of HCl gas (Molar mass = 36.5 g/mol) in enough water to obtain a total volume of 10 Litres.

Q30. 0.049 g of pure H_2SO_4 (Molar mass = 98 g/mol) is dissolved in water to make 500 mL of aqueous solution. Assuming 100% ionization of both replaceable H^+ ions, find the pH of the solution.

BIOLOGY

SECTION A – MULTIPLE CHOICE QUESTIONS

31. In single-celled organisms like Amoeba, diffusion is sufficient to meet all requirements of food exchange, gas exchange, and waste removal because:
(A) Their entire cell surface is in direct contact with the external environment
(B) They possess a complex circulatory system
(C) They do not respire
(D) They produce food via photosynthesis

32. Statement I: Nervous coordination is extremely fast because it relies on electrical impulse transmission along neurons.
Statement II: Hormonal coordination is slower but provides sustained and widespread responses throughout the body.
Which of the above statements is/are correct?
(A) Only Statement I (B) Only Statement II
(C) Both Statement I and II (D) Neither Statement I nor II

33. Assertion (A): Traits acquired by an organism during its lifetime (like muscle building) are generally not inherited by its offspring.
Reason (R): Such acquired traits do not bring about alterations or changes in the DNA of germ cells.
(A) Both A and R are true, and R is the correct explanation of A.
(B) Both A and R are true, but R is not the correct explanation of A.
(C) A is true, but R is false.
(D) A is false, but R is true.

34. Match asexual reproduction processes with correct descriptions:
List I: 1. Binary fission, 2. Multiple fission, 3. Budding, 4. Spore formation
List II: a. Division into two equal daughter cells, b. Division into many daughter cells simultaneously, c. Outgrowth forming a new individual, d. Production of microscopic reproductive units enclosed in walls
(A) 1-a, 2-b, 3-c, 4-d (B) 1-b, 2-a, 3-c, 4-d
(C) 1-a, 2-c, 3-b, 4-d (D) 1-d, 2-b, 3-a, 4-c

35. High power of regeneration (growing back an entire organism from body parts) is classically observed in:
(A) Amoeba (B) Planaria
(C) Paramecium (D) Yeast

36. Match brain regions with their primary functional roles:
List I: 1. Cerebrum, 2. Cerebellum, 3. Medulla oblongata, 4. Hypothalamus
List II: a. Thinking, memory, and voluntary actions, b. Posture and balance, c. Involuntary heart rate and breathing control, d. Thermoregulation and hunger
(A) 1-a, 2-b, 3-c, 4-d (B) 1-b, 2-a, 3-c, 4-d
(C) 1-a, 2-c, 3-b, 4-d (D) 1-d, 2-b, 3-a, 4-c

37. Assertion (A): Implantation is the embedding of the fertilized embryo in the lining of the uterus.
Reason (R): Implantation marks the beginning of pregnancy and embryonic nourishment.
(A) Both A and R are true, and R is the correct explanation of A.
(B) Both A and R are true, but R is not the correct explanation of A.
(C) A is true, but R is false.
(D) A is false, but R is true.

38. Why is the depletion of the ozone layer particularly prominent and severe over the Antarctic region?
(A) Extremely low winter temperatures facilitate the formation of polar stratospheric clouds that accelerate CFC-induced ozone destruction when sunlight returns in spring
(B) Higher concentration of atmospheric oxygen
(C) Continuous volcanic eruptions unique to Antarctica
(D) Complete absence of nitrogen in polar air

39. Assertion (A): Bowman's capsule in the kidney filters blood under pressure.
Reason (R): Ultrafiltration allows small molecules like glucose, water, and urea to pass into the nephron tubule while retaining blood cells and large proteins.
(A) Both A and R are true, and R is the correct explanation of A.
(B) Both A and R are true, but R is not the correct explanation of A.
(C) A is true, but R is false.
(D) A is false, but R is true.

40. Which plant hormone stimulates stem elongation, internodal growth, and seed germination?
(A) Auxin (B) Gibberellin
(C) Cytokinin (D) Abscisic acid

SECTION B – INTEGER-BASED QUESTIONS

41. What is the diploid chromosome number in human somatic cells? [Integer Answer: _____]

42. How many major stages or phases (Glycolysis, Krebs Cycle, Electron Transport Chain) are typically recognized in the complete aerobic breakdown of glucose? [Integer Answer: _____]

43. How many distinct genotypes are produced in the F2 generation of a monohybrid cross? [Integer Answer: _____]

44. If 500 Joules of energy are available at the producer level, how many Joules of energy will be transferred to the primary consumer (herbivore) according to the 10% law? [Integer Answer: _____]

45. How many functional ureters are normally present in the human excretory system? [Integer Answer: _____]

MATHS

SECTION A – MULTIPLE CHOICE QUESTIONS

46. If $a = 2^3 \times 3$, $b = 2 \times 3 \times 5$, $c = 3^n \times 5$ and LCM(a, b, c) = $2^3 \times 3^2 \times 5$, then n is equal to:
(A) 1 (B) 2
(C) 3 (D) 4

47. The number of polynomials having zeroes as −2 and 5 is:
(A) 1 (B) 2
(C) 3 (D) More than 3

48. Graphically, the pair of equations $6x - 3y + 10 = 0$ and $2x - y + 9 = 0$ represents two lines which are:
(A) Intersecting at exactly one point (B) Intersecting at exactly two points
(C) Coincident (D) Parallel

49. Which of the following equations has 2 as a root?
(A) $x^2 - 4x + 5 = 0$ (B) $x^2 + 3x - 12 = 0$
(C) $2x^2 - 7x + 6 = 0$ (D) $3x^2 - 6x - 2 = 0$

50. In an AP, if a = 3.5, d = 0, n = 101, then a_n will be:
(A) 0 (B) 3.5
(C) 103.5 (D) 104.5

51. It is given that $\Delta ABC \sim \Delta DFE$, $\angle A = 30°$, $\angle C = 50°$, AB = 5 cm, AC = 8 cm and DF = 7.5 cm. Then which of the following is true?
(A) DE = 12 cm, $\angle F = 50°$ (B) DE = 12 cm, $\angle F = 100°$
(C) EF = 12 cm, $\angle D = 100°$ (D) EF = 12 cm, $\angle D = 30°$

52. The distance of the point P(−6, 8) from the origin is:
(A) 8 (B) $2\sqrt{7}$
(C) 10 (D) 6

53. If $4 \tan \theta = 3$, then $(4 \sin \theta - \cos \theta) / (4 \sin \theta + \cos \theta)$ is equal to:
(A) 2/3 (B) 1/3
(C) 1/2 (D) 3/4

54. At one end A of a diameter AB of a circle of radius 5 cm, tangent XAY is drawn to the circle. The length of the chord CD parallel to XY and at a distance 8 cm from A is:
(A) 4 cm (B) 5 cm
(C) 6 cm (D) 8 cm

55. A shuttlecock used for playing badminton has the shape of the combination of:
(A) A cylinder and a sphere (B) A cylinder and a hemisphere
(C) A sphere and a cone (D) Frustum of a cone and a hemisphere

SECTION B – INTEGER-BASED QUESTIONS

56. Find the positive root of $\sqrt{(3x^2 + 6)} = 9$.

57. Find the sum of the first 6 positive multiples of 4.

58. If the points A(6, 1), B(8, 2), C(9, 4), and D(p, 3) are the vertices of a parallelogram taken in order, find the value of p.

59. A ladder 20 m long just reaches the top of a vertical wall. If the ladder makes an angle of 60° with the wall, find the height of the wall (in metres).

60. A die is thrown once. If the probability of getting a prime number is 1/k, and a box contains 90 discs numbered 1 to 90 where the probability of drawing a two-digit number is m/10, find the value of k + m.

MENTAL ABILITY

SECTION A – MULTIPLE CHOICE QUESTIONS

Q61. Find the missing number:
6, 13, 27, 55, 111, ?
(A) 221 (B) 222
(C) 223 (D) 225

Q62. The present ages of a father and his daughter are in the ratio 11 : 4. Eight years ago, the ratio of their ages was 3 : 1. Find the ratio of their ages after 12 years.
(A) 23 : 10 (B) 25 : 12
(C) 21 : 10 (D) 47 : 19

Q63. If '+' and '−' are interchanged, and '×' and '÷' are also interchanged, calculate:
64 − 16 ÷ 4 + 3 × 5
(A) 127.4 (B) 250.6
(C) 132.6 (D) 180.5

Q64. A person walks 16 m east, turns left and walks 12 m, then turns left and walks 6 m. He next turns right and walks 8 m, and finally turns right and walks 4 m. Find his shortest distance from the starting point and the direction.
(A) $10\sqrt{149}$ m, North-East (B) 200 m, North-East
(C) $149\sqrt{2}$ m, South-East (D) 241 m, East

Q65. Identify the odd pair.
(A) (7, 50) (B) (9, 82)
(C) (11, 122) (D) (13, 171)

Q66. Q66. A vertical mirror is placed to the right of the following sequence. Select the correct mirror image.
Original: ↑ ↗ → ↘ ↓

(A) ↓ ↙ ← ↖ ↑ (B) ↓ ↘ ← ↗ ↑
(C) ↑ ↖ ← ↙ ↓ (D) ↓ ↙ → ↖ ↑

Q67. TRUE OR FALSE LOGIC
Statements:
1. Every applicant who clears the eligibility test is shortlisted.
2. Every shortlisted applicant has submitted the required certificate.
3. Neha has not submitted the required certificate.
Conclusions:
I. Neha has not been shortlisted.
II. Neha has not cleared the eligibility test.
III. Every applicant who has not cleared the eligibility test has not submitted the required certificate.
Which conclusion(s) logically follow?
(A) Only I (B) Only II
(C) Both I and II (D) All I, II and III

Q68. The following table represents the number of male and female participants in three competitions.

Competition	Male	Female
P	250	200
Q	300	250
R	350	300

What percentage of the total participants are female?
(A) $27\frac{7}{12}\%$ (B) $45\frac{5}{11}\%$
(C) $40\frac{4}{11}\%$ (D) $49\frac{5}{11}\%$

Q69. The letters of "EXAMINATION" are arranged alphabetically. After removing all vowels, which letter occupies the third position from the left?
(A) M (B) N
(C) T (D) X

Q70. Find the missing number.
Row 1: 4 3 19
Row 2: 5 4 29
Row 3: 6 5 41
Row 4: 7 6 ?
(A) 53 (B) 55
(C) 57 (D) 59

SECTION B – INTEGER-BASED QUESTIONS

Q71. The present age of A is 4 years more than twice the age of B. C is 6 years older than B. If the sum of their present ages is 66 years, find the present age of B.

Q72. Six persons P, Q, R, S, T and U are sitting around a circular table, all facing the centre.
- P sits opposite S.
- Q sits immediately to the left of P.
- R sits immediately to the left of Q.
- T sits immediately to the left of S.

Who is sitting opposite Q?

Q73. A person walks 28 m west, 15 m north, 10 m east, 9 m south and finally 6 m east. Find the shortest distance between his final position and the starting point.

Q74. The total production of a company was 720 units in the first month and 900 units in the fourth month. Calculate the percentage increase in production.

Q75. Production over five days:
Monday – 205 | Tuesday – 260 | Wednesday – 215 | Thursday – 280 | Friday – 240
Find the difference between the total production on Tuesday and Thursday and the total production on Monday, Wednesday and Friday.