Monthly Progressive Test

Class: XI

Subject: PCMB

Academic Excellence Programme TECHNO ACE

Test Booklet No.: MPT010 **Test Date: 10022025**

Time: 120 mins **Full Marks: 200**

Important Instructions :

1. The Test is of 120 mins duration and the Test Booklet contains 100 multiple choice questions of single correct option only. There are four sections with four subjects. You have to attempt all 100 questions (Candidates are advised to read all 100 questions). Questions 1 to 25 contain Physics, Questions 26 to 50 contain Chemistry, Questions 51 to 75 contain Mathematics, Questions 76 to 100 contain Biology.
2. Each question carries 2 marks. For each correct response, the candidate will get 2 marks. There is no negative mark for wrong response. The maximum mark is 200.
3. Use Blue / Black Ball point Pen only for writing particulars marking responses on Answer Sheet.
4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate must handover the Answer Sheet to the invigilator before leaving the Room / Hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is Off Line MPT1010022025.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your UID No. anywhere else except in the specified space. Use of white fluid for correction is NOT permissible on the Answer Sheet. **Do not scrible or write on or beyond discrete bars of OMR sheet at both sides**.
8. Each candidate must show on-demand his/her Registration document to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of Electronic Calculator/Cellphone is prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
13. There is no scope for altering response mark in Answer Sheet.

Space For Rough Works

Physics

1. At normal temperature and pressure the speed of sound in air 332 m/sec. The speed of sound will be in hydrogen.

Ⓐ 1228 m/sec Ⓑ 332 m/sec Ⓒ 996 m/sec Ⓓ 1328 m/sec

2. At what temperature will the speed of sound in hydrogen be the same as in oxygen at 100°C. Densities of oxygen and hydrogen are in the ratio 16 : 1

Ⓐ –250°C Ⓑ 249.7°C Ⓒ 250°C Ⓓ –249.7°C

3. Two sound waves are represented by $y_1 = a_1 \cos(\omega t - kx)$, $y_2 = a_2 \sin(\omega t - kx + \pi/3)$. Then the phase difference between them is,

Ⓐ $\pi/3$ Ⓑ $\pi/2$ Ⓒ $5\pi/6$ Ⓓ $\pi/6$

4. The ratio of the densities of oxygen and nitrogen is 16 : 14. At what temperature, the speed of sound in oxygen will be equal to its speed in nitrogen at 14°C

Ⓐ 16°C Ⓑ 12.2°C Ⓒ 55°C Ⓓ None of the above

5. The length of an organ pipe open at both end is 0.5 meter. Calculate the fundamental frequence of the pipe, if the velocity of sound in air 350 m/sec. If one end of the pipe is closed, then the fundamental frequency will be

Ⓐ 350, 700 Ⓑ 700, 350 Ⓒ 175, 350 Ⓓ 350, 175

6. 5 g of ice at 0°C is dropped in a beaker containing 20 g of water at 40°C, then

Ⓐ All the ice will not melt into water

Ⓑ All the ice will melt and the resulting temperature of water will be 0°C

Ⓒ At the ice will melt and the resulting temperature of water will be 25°C

Ⓓ All the ice will melt and the resulting temperature of water will be 16°C

7. Relation between the ratio of specific heats (γ) of gas and degree of freedom 'f' will be

Ⓐ $\gamma = f + 2$ Ⓑ $\frac{1}{\gamma} = \frac{1}{f} + \frac{1}{2}$ Ⓒ $f = 2/(\gamma - 1)$ Ⓓ $f = 2(\gamma - 1)$

8. The molar specific heats of an ideal gas at constant pressure and volume are denoted by C_p and C_v, respectively. If $\gamma = \frac{C_p}{C_v}$ and R is the universal gas constant, then C_v is equal to

Ⓐ $\frac{1+\gamma}{1-\gamma}$ Ⓑ $\frac{R}{(\gamma-1)}$ Ⓒ $\frac{(\gamma-1)}{R}$ Ⓓ γR

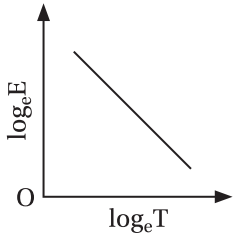
9. 1 mole of a gas with $\gamma = 7/5$ is mixed with 1 mole of a gas with $\gamma = 5/3$, then the value of γ for the resulting mixture is

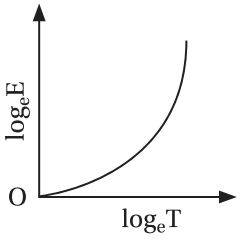
Ⓐ 7/5 Ⓑ 2/5 Ⓒ 24/16 Ⓓ 12/7

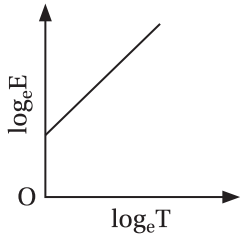
10. Which of the following formula is wrong

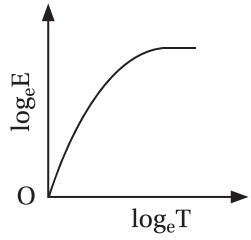
Ⓐ $C_v = \frac{R}{\gamma - 1}$ Ⓑ $C_p = \frac{\gamma R}{\gamma - 1}$ Ⓒ $C_p / C_v = \gamma$ Ⓓ $C_p - C_v = 2R$

11. The emissive power of a body at temperature T(k) is E. Then the graph between $\log_e E$ and $\log_e T$ is of the form

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

■ Assertion Reason based Questions (12–14):

Directions: Read the following questions and choose any one of the following four responses.

A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion.

B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion.

C: Assertion is correct but Reason is wrong.

D: Assertion is wrong but Reason is correct.

12. **Assertion(A) :** Blue star is at high temperature than red star.

Reason(R) : Wien's displacement law states that $T \propto \frac{1}{\lambda_m}$.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

13. **Assertion(A) :** The radiation from sun's surface varies as the fourth power of its absolute temperature.

Reason(R) : The sun is not a black body.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

14. **Assertion(A) :** Greater the coefficient of thermal conductivity of a material, smaller is the thermal resistance of a rod of that material.

Reason(R) : Thermal resistance is the ratio of temperature difference between the ends of the conductor and the rate of flow of heat.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

15. The resistance is $R = \frac{V}{I}$ where V = 100 ± 5 volts and I = 10 ± 0.2 amperes. What is the total error in R?

Ⓐ 5% Ⓑ 7% Ⓒ 5.5% Ⓓ 3%

16. The dimensional formula for angular momentum is

Ⓐ ML^2T^{-2} Ⓑ ML^2T^{-1} Ⓒ MLT^{-1} Ⓓ $M^0L^2T^{-2}$

17. What is the projection of $3\hat{i}+4\hat{k}$ on the y-axis?

Ⓐ 3 Ⓑ 4 Ⓒ 5 Ⓓ zero

18. If a body travels half its total path in the last second of its fall from rest. The time and height of its fall, will respectively be – ($g = 9.8\ m/s^2$)

Ⓐ 0.59 s, 57 m Ⓑ 3.41 s, 57 m Ⓒ 5.9 s, 5.7 m Ⓓ 5.9 s, 34.1 m

19. The displacement of particle is zero at t = 0 and at t = t is x. It starts moving in the x direction with velocity, which varies as $v = k\sqrt{x}$, where k is constant. The velocity

Ⓐ varies with time Ⓑ independent to time

Ⓒ inversely proportional to time Ⓓ nothing can be said

20. The acceleration of a particle is given by a = 3t and at t = 0, v = 0, x = 0. The velocity and displacement at t = 2 sec will be

Ⓐ 6 m/s, 4 m Ⓑ 4 m/s, 6 m Ⓒ 3 m/s, 2 m Ⓓ 2 m/s, 3 m

21. A motor boat covers the distance between two spots on the river in t_1 = 8 hr and t_2 = 12 hr downstream and upstream respectively. The time required for the boat to cover this distance in still water will be

Ⓐ 6.9 hr Ⓑ 9.6 hr Ⓒ 69 sec Ⓓ 96 sec

22. At an instant t, the co-ordinates of a particle are $x = at^2$, $y = bt^2$ and z = 0, then its velocity at the instant t will be

Ⓐ $t\sqrt{a^2+b^2}$ Ⓑ $2t\sqrt{a^2+b^2}$ Ⓒ $\sqrt{a^2+b^2}$ Ⓓ $2t^2\sqrt{a^2+b^2}$

23. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as $a_c = k^2rt^2$, where k is a constant. The power delivered to the particle by the forces acting on it will be

Ⓐ mk^2t^2r Ⓑ $mk^2r^2t^2$ Ⓒ $m^2k^2t^2r^2$ Ⓓ mk^2r^2t

24. Work done in taking a body of mass m to a height nR above surface of earth will be (R = radius of earth)

Ⓐ mgnR Ⓑ $mgR\left(\frac{n}{n+1}\right)$ Ⓒ $mgR\frac{(n+1)}{n}$ Ⓓ $\frac{mgR}{n(n+1)}$

25. The objects A and B of equal mass are suspended from two springs of spring constants K_A and K_B if the objects oscillate vertically in such a manner that their maximum kinetic energies are equal, then the ratio of their amplitudes is

Ⓐ $\frac{K_B}{K_A}$ Ⓑ $\sqrt{\frac{K_B}{K_A}}$ Ⓒ $\frac{K_A}{K_B}$ Ⓓ $\sqrt{\frac{K_A}{K_B}}$

Chemistry

26. An oxide of sulphur contains 50% S, what will be its empirical formula?

(Atomic weight : S = 32, 0 =16)

Ⓐ SO Ⓑ SO_2 Ⓒ SO_3 Ⓓ S_2O_3

27. 1.7 g NH_3 reacts with 4g O_2 according to the reaction: $4NH_3 + 50_2 \rightarrow 4NO + 6H_2O$; Atomic weight : N = 14, H =1, O = 16.

Correct statements are : (I) NH_3 is limiting reagent (II) O_2 is limiting reagent (III) 3g NO is formed

Ⓐ I, II, III Ⓑ I, II Ⓒ II, III Ⓓ I, III

28. A solution is formed by adding 0.3g urea (molar mass = 60) in 500 ml water and final volume is made 1250 ml. What is the final concentration of the solution?

Ⓐ 0.004M Ⓑ 0.008M Ⓒ 0.002M Ⓓ 0.016M

29. 10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be:

Ⓐ 1 mole Ⓑ 2 moles Ⓒ 3 moles Ⓓ 4 moles

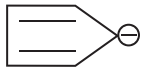
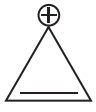
30. The number of radial modes of 3*s* and 2*p* orbitals are respectively:

Ⓐ 2, 0 Ⓑ 0, 2 Ⓒ 1, 2 Ⓓ 2, 11

31. Orbital angular momentum for an electron revolving in a orbit is given by $\sqrt{l(l+1)}\cdot\frac{h}{2\pi}$. This momentum for an s-electron will be given by:

Ⓐ $+\frac{1}{2}\cdot\frac{h}{2\pi}$ Ⓑ Zero Ⓒ $\frac{h}{2\pi}$ Ⓓ $\sqrt{2}\frac{h}{2\pi}$

32. Which of the following (s) is/are aromatic?

Ⓐ  Ⓑ  Ⓒ  Ⓓ Both Ⓐ and Ⓑ

33. Find the oxidation number of carbon is carbon suboxide [C_3O_2]:

Ⓐ +2, +4, –4 Ⓑ –2, +2, 0 Ⓒ +2, 0, + 2 Ⓓ +4, +2, –2

34. Oxygen has a oxidation state of +2 in:

Ⓐ H_2O_2 Ⓑ H_2O Ⓒ OF_2 Ⓓ SO_2

35. Orbital which is represented by ψ_{420} is

Ⓐ $5f$ Ⓑ $4d_{z^2}$ Ⓒ $4s$ Ⓓ $5P_f$

36. Molality of aqueous solution having mole fraction of solvent as 0.95 is approximately.

Ⓐ 2 Ⓑ 3 Ⓒ 4 Ⓓ 5

37. What is the oxidation number of 'S' in Caro's acid?

Ⓐ +4 Ⓑ +6 Ⓒ –6 Ⓓ +2

38. Toluene is orthopara direction compound due to:

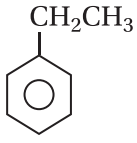
Ⓐ Inductive effect Ⓑ Electromeric effect

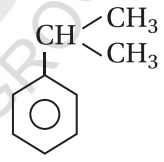
Ⓒ Resonance Ⓓ Hyperconjugation

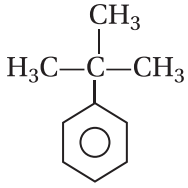
39. Reagent required to convert Benzene to Phenol in one step is:

Ⓐ Baeyer's Reagent Ⓑ Tollen's Reagent Ⓒ Fenton's Reagent Ⓓ Chromyl Chloride

40. Which of the following compounds is expected to give the highest ratio of ortho-para isomer (relatively more ortho) when reacted with $Cl_2/FeCl_3$?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ The would all give the meta isomer

41. The energy required to break 76 gm gaseous fluorine into free gaseous atom is 180 kcal at 25°C. The bond energy of F—F bond will be :

Ⓐ 180 kcal Ⓑ 90 kcal Ⓒ 45 kcal Ⓓ 104 kcal

42. 10 mol of an ideal gas confined to a volume of 10 L is released into atmosphere at 300 K where the pressure is 1 bar. The work done by the gas is : (R = 0.083 bar k^{-1} $mole^{-1}$)

Ⓐ 249 L bar Ⓑ 259 L bar Ⓒ 239 L bar Ⓓ 220 L bar

43. The molar solubility (in mol L^{-1}) of a sparingly soluble salt MX_4 is S. The corresponding solubility product is given by k_{sp} by the relation :

Ⓐ $S=\left(\frac{k_{sp}}{128}\right)^{\frac{1}{4}}$ Ⓑ $S=\left(128\cdot k_{sp}\right)^{\frac{1}{4}}$ Ⓒ $S=\left(256\cdot k_{sp}\right)^{\frac{1}{5}}$ Ⓓ $S'=\left(\frac{k_{sp}}{256}\right)^{\frac{1}{5}}$

Comprehension based questions (Q44–Q45)

Pure water is neutral in nature, $[H^+] = [OH^-]$, when this condition is disturbed by changing the concentration of H^+ or OH^-, the neutral solution changes to acidic $\{[H^+] > [OH^-]\}$ or $\{[H^+] < [OH^-]\}$. This change occurs during salt hydrolysis. pH of salt solution can be calculated using the relation :

(i) For salt of weak acid and strong base

$$pH = \frac{1}{2}[pk_w + pk_a + \log c]$$

(ii) For salt of weak base and strong acid

$$pH = \frac{1}{2}[pk_w - pk_b - \log c]$$

(iii) For salt of weak base and weak acid :

$$pH = \frac{1}{2}[pk_w + pk_a - pk_b]$$

The pH of buffer can be calculated using the following formula :

$$pH = pk_a + \log_{10}\left[\frac{Salt}{Acid}\right]$$

$$pOH = pk_b + \log_{10}\left[\frac{Salt}{Base}\right]$$

Answer the following question s when :

$pk_a = 4.7447$; $pk_b = 4.7447$; $pk_w = 14$

44. When 50 ml of 0.1 M NH_4OH is added to 50 ml of 0.05 M HCl solution, the pH is nearly :

Ⓐ 1.60 Ⓑ 12.40 Ⓒ 4.75 Ⓓ 9.25

45. Solution of 0.1(N) NH_4OH and 0.1(N) NH_4Cl has pH 9.25. pk_b of NH_4OH is

Ⓐ 9.25 Ⓑ 4.75 Ⓒ 3.75 Ⓓ 8.25

46. Calculate the pH of each of the following solutions; when 100 ml of 0.1(M) CH_3COOH mixed with 50 ml of 0.1(M) NaOH.

Ⓐ 2.75 Ⓑ 3.75 Ⓒ 4.75 Ⓓ 7.25

Assertion-Reason Based Questions (Q41–Q44)

Read the two statements carefully and select the correct option given below.

A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion

B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion

C: Assertion is correct but Reason is wrong

D: Assertion is wrong but Reason is correct

47. **Assertion (A):** Resonance can occur when all the atoms involved lie in the same plane and early in the same plane.

Reason (R): $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ and $CH_3-\underset{\underset{CH_3}{|}}{C}=CH_2$ are resonating structure.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

48. **Assertion (A):** Ice floats on water

Reason (R): Due to H-bonding ice has open cage like structure and occupies large volume as compared to water.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

49. **Assertion (A):** NO_3^- and CO_3^{2-} are isoelectronic species.

Reason (R): Central atom in both NO_3^- and CO_3^{2-} are sp^2 hybridised

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

50. Which of the following is/are polar in nature?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ Both Ⓑ and Ⓒ

Mathematics

51. How many triangles can be drawn by using the vertices of icosagon but not using the sides of it?

Ⓐ 2400 Ⓑ 1200 Ⓒ 600 Ⓓ none of these

52. Let $\lim_{x\to 0}\frac{[x]^2}{x^2}=l$ and $\lim_{x\to 0}\frac{[x^2]}{x^2}=m$, (where [.] ⟶ GIF), then

Ⓐ l exists but m does not exist Ⓑ m exists but l does not

Ⓒ both l and m exist Ⓓ neither l nor m exists

53. An organization awarded 48 medals in event 'A', 25 in event B and 18 in event 'C'. If these medals went to total 60 men and only 5 men got all three medals in A, B, C. Then how many got medals exactly two of three events?

Ⓐ 15 Ⓑ 9 Ⓒ 10 Ⓓ 21

54. The line $\sin\theta(x+2y-1)+\cos\theta(3x-y+2)=0$ is equally inclined with the coordinate axes for two values of θ say θ_1 and θ_2. Then the value of $\tan(\theta_1+\theta_2)$ equals $(0\le\theta\le\pi)$

Ⓐ $\frac{10}{11}$ Ⓑ $\frac{5}{6}$ Ⓒ $\frac{3}{7}$ Ⓓ $\frac{2}{9}$

55. Let $S=\left\{z\in c:\ |z-1|=1 \text{ and } \left(\sqrt{2}-1\right)\left(z+\bar{z}\right)-i\left(z-\bar{z}\right)=2\sqrt{2}\right\}$ let $z_1, z_2, \in s$ be such that $|z_1|=\max_{z\in s}|z|$ and $|z_2|=\min_{z\in s}|z|$ then $\left|\sqrt{2}\,z_1-z_2\right|^2$ equals

Ⓐ 1 Ⓑ 4 Ⓒ 3 Ⓓ 2

56. The transformed equation, when the axes are rotated through an angle 60° is $x^2+y^2=2$, then the original equation is

Ⓐ $x^2-y^2=2$ Ⓑ $x^2+y^2=2$ Ⓒ $x^2+y^2=1$ Ⓓ $x^2-y^2=1$

57. Let P be a point on the parabola $y^2=4ax$, where $a>0$. The normal to the parabola at P meets the x–axis at a point Q . The area of the triangle PFQ, where F is the focus of the parabola, is 120. If the slope m of the normal and a are positive integers then the pair (a, m) is

Ⓐ (2, 3) Ⓑ (1, 3) Ⓒ (2, 4) Ⓓ (3, 4)

58. Find the product of all roots of $x^2-5|x|+6=0$

Ⓐ 36 Ⓑ 6 Ⓒ –4 Ⓓ –9

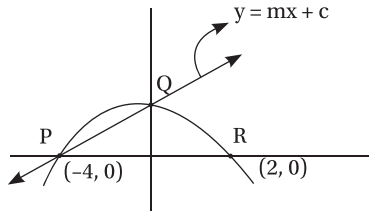
59. Three successive terms of a GP with c. r > 1 are length of the sides of a triangle.
Calculate : 3[r] + [–r] where c . r = r

Ⓐ 0 Ⓑ 1 Ⓒ –1 Ⓓ 2

60. Complex numbers sin x + i cos 2x and cos x – i sin 2x are conjugate to each other, then

Ⓐ $x = n\pi,\ n \in I$ Ⓑ $x = 0$ Ⓒ $x = \frac{n\pi}{2}, n \in I$ Ⓓ none of these

61. Find the equation of the quadratic curve



Ⓐ $y = -x^2 + 6x - 8$ Ⓑ $y = -x^2 - 2x + 8$ Ⓒ $y = x^2 - 6x + 8$ Ⓓ $y = x^2 + 2x - 8$

62. In the above question, find the value of m.

Ⓐ 0 Ⓑ 1 Ⓒ 2 Ⓓ 3

63. Find the reminder : $\left\{\frac{3^{100}}{5}\right\}$ (where $\{\ \} \longrightarrow$ F. P. F)

Ⓐ 0 Ⓑ 1 Ⓒ 2 Ⓓ none of these

64. Let, $f : R \to R$, $g : R \to R$, $h : R \to R$ be three continuous functions such that $g(f(x)) = x$ and $h(g(g(x)) = x$ and $f(x) = x^3 + 5x + 3$ and $k \mid h(1)$ where k is the largest prime. Find k. ($a \mid b \Rightarrow$ a divides b)

Ⓐ 43 Ⓑ 29 Ⓒ 71 Ⓓ 37

65. 2n boys are randomly divided into two group each containing n boys. Find the probability that two particular boys A and B are in different groups.

Ⓐ $\frac{3n}{4n-1}$ Ⓑ $\frac{n-1}{2n-1}$ Ⓒ $\frac{n}{2n-1}$ Ⓓ none of these

66. Suppose that a given sequence $\{x_n\}$ satisfies the equation $x_1 > 0$, $x_{n+1} = \sqrt{5}\, x_n + 2\sqrt{1 + x_n^2}$, $n \in N$. Then among x_1, x_2, ... x_{100} there are atleast k irrational numbers, then find maximum value of k.

Ⓐ 31 Ⓑ 32 Ⓒ 33 Ⓓ 34

67. Find all possible values of a for which the expression $\frac{ax^2 - 7x + 5}{5x^2 - 7x + a}$ may be capable for all values, x being any real quantity.

Ⓐ [–12, 2) Ⓑ (–12, 2) Ⓒ (–12, 2) U {5} Ⓓ [–12, 2] U {5}

68. Let c_1 and c_2 be two circles with c_2 lying inside c1. A circle clying inside c_1 touches c_1 internally & c_2 externally. Then the locus of the centre c.

Ⓐ Circle Ⓑ ellipse Ⓒ hyperbola Ⓓ parabola

69. Let $k \in R$ which of the following statements is/are correct for the roots of the quadratic equation $x^2 + 2(k + 1)x + (9k - 5) = 0$.

Ⓐ If $k \le 1$ then the roots are real and positive

Ⓑ If $2 \le k = 4$, then the roots are complex

Ⓒ If $4 < k < 6$ then the roots are real and opposite in sign

Ⓓ If $6 \le k$ then the roots are real and negative

70. If the 5th, 6th and 7th term of the binomial expansion of $(1 + x^2)^{n+4}$ are in AP. Then the greatest binomial coefficient in the expansion of $(1 + x^2)^{n+4}$ is

Ⓐ 10 Ⓑ 35 Ⓒ 25 Ⓓ 14

Assertion-Reason type Questions (71 – 72):

Direction : A statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

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 and 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.

71. **Assertion (A):** The sum of all the roots of the equation $(x^2 - 9x + 11)^2 + (x^2 - 9x + 20)^2 = 0$, is 20

Reason (R): Sum of the roots of $ax^2 + bx + c = 0$, is $-\frac{b}{a}$

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

72. **Assertion (A):** There are two parallel straight lines. The first lines contains 4 points and the second line contains 3 points. Then the number. Triangles can be formed is 30.

Reason (R): Number of ways to choose r points out of n distinct points is ${}^{n}C_{r} = \frac{n!}{r!(n-r)!}$

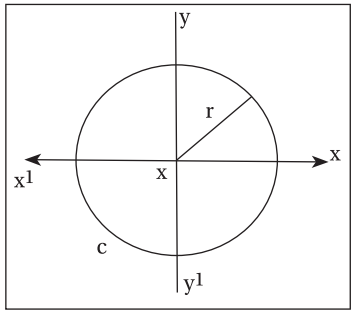
Ⓐ A Ⓑ B Ⓒ C Ⓓ D

Case study based Questions (47-48):

For a positive real number r, the set of complex numbers with modulus r corresponds in the complex plane to C (o ; r), our notation for the circle c with center o and radius r.

The complex numbers z with $|z| < r$ corresponds to the interior points of circle c and $|z| = r$ corresponds to the points on the circle.

$|z| > r$ corresponds to the points in the exterior of the circle c.



Based on the above information answer the following questions.

73. Let $Z_k = \pm\frac{1}{2} \mp \frac{\sqrt{3}}{2}i$ $k = 1, 2$. Then the point(s) lie on the circle $|z| = 1$ is (are)

Ⓐ z_1 Ⓑ z_2 Ⓒ both Ⓓ none of these

74. The amplitude of the point $z_1 = \frac{1}{2} - \frac{\sqrt{3}}{2}i$ is

Ⓐ $\frac{\pi}{3}$ Ⓑ $\frac{\pi}{6}$ Ⓒ $\frac{\pi}{4}$ Ⓓ none of these

75. The angle between the complex numbers $z_1 = \frac{1}{2} - \frac{\sqrt{3}}{2}i$, $z_2 = -\frac{1}{2} + \frac{\sqrt{3}}{2}i$

Ⓐ $\frac{\pi}{2}$ Ⓑ $\frac{2\pi}{3}$ Ⓒ $\frac{-\pi}{6}$ Ⓓ none of these

Biology

76. Pleuro Pneumonia Like Organisms are

Ⓐ Actinomycetes Ⓑ Cyanobacteria Ⓒ Mycoplasma Ⓓ None

77. Which of the following gymnosperm has coralloid roots associated with N_2–fixing cyanobacteria?

Ⓐ *Pinus* Ⓑ *Cycas* Ⓒ *Cedrus* Ⓓ *Gingko*

78. Malphigian tubules are
Ⓐ excretory organ of insect
Ⓑ excretory organ of frog
Ⓒ respiratory organ of insect
Ⓓ endocrine gland of insect

79. In racemose inflorescence, flowers are arranged in
Ⓐ centrifugal order Ⓑ centripetal order Ⓒ acropetal order Ⓓ basipetal order

80. Protoxylem is the first formed xylem. If the protoxylem lies next to phloem, what kind of arrangement would you call it?
Ⓐ Exarch Ⓑ Endarch Ⓒ Mesarch Ⓓ Centrarch

81. Which of the following is present in the skin of frogs?
Ⓐ Mucous gland Ⓑ Poison gland Ⓒ Chromatophores Ⓓ All of these

82. Match Column I with Column II and choose the right option given below:

Column I		Column II	
(a)	RER	1.	Intracellular and extracellular digestion
(b)	SER	2.	Lipid synthesis
(c)	Golgi complex	3.	Protein synthesis and secretion
(d)	Lysosomes	4.	Moves materials out of the cells

Codes
Ⓐ (a)–3.; (b)–2.; (c)–4.; (d)–1.
Ⓑ (a)–2.; (b)–3.; (c)–4.; (d)–1.
Ⓒ (a)–1.; (b)–3.; (c)–2.; (d)–4.
Ⓓ (a)–4.; (b)–2.; (c)–3.; (d)–1.

83. The variety of amino acids are formed on the basis of
Ⓐ position of hydroxyl group
Ⓑ position of carboxyl group
Ⓒ position of hydrogen
Ⓓ type of R group

84. When Karyokinesis is not followed by cytokinesis, it results in the formation of
Ⓐ uninucleate cells Ⓑ multinucleate cells Ⓒ undifferentiated cells Ⓓ diploid cells

85. Light Harvesting complexes (LHCs) are
Ⓐ present within PS–I and PS–II
Ⓑ composed of only chlorophyll–A
Ⓒ made up of hundreds of pigment molecules bound to proteins
Ⓓ both Ⓐ and Ⓒ

86. In which of the following, reduction of NAD does not occur?
Ⓐ Isocitric acid $\rightarrow$ α-ketoglutaric acid
Ⓑ Malic acid $\rightarrow$ Oxaloacetic acid
Ⓒ Pyruvic acid $\rightarrow$ Acetyl CoA
Ⓓ Succinic acid $\rightarrow$ Fumaric acid

87. Application of gibberellin can induce the following—
Ⓐ Leaf fall
Ⓑ Delayed senescence
Ⓒ Elongation of shoot system
Ⓓ Diverse root system

88. Almost the same pO_2 in human is found in
Ⓐ Alveoli and tissues
Ⓑ Oxygenated blood and deoxygenated blood
Ⓒ Alveoli and oxygenated blood
Ⓓ Tissues and deoxygenated blood

89. Atherosclerosis is caused by deposition of
   Ⓐ Calcium
   Ⓑ Fat and cholesterol
   Ⓒ Fibrous tissue
   Ⓓ All

90. Prothrombin → Thrombin. Name the enzyme that catalyses this reaction
   Ⓐ Peptidast
   Ⓑ Thromboplastin
   Ⓒ Thrombocytopenia
   Ⓓ Thrombin is an enzyme which catalyses this reaction

91. Cross arms of myosin monomer consist of
   Ⓐ Outward projection of G-actin filament
   Ⓑ Outward projection of head region of meromyosin
   Ⓒ Outward projection of tail region of meromyosin
   Ⓓ Both Ⓑ and Ⓒ

92. Myelinated nerve fibres are found in X and Y nerves.
   Fill in the blanks X and Y with correct options
   Ⓐ X – cranial; Y – sympathetic
   Ⓑ X – spinal; Y – cranial
   Ⓒ X – spinal; Y – parasympathetic
   Ⓓ X – sympathetic; Y – parasympathetic

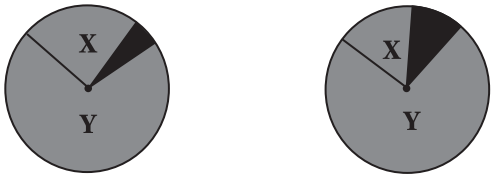
93. Gastric Inhibitory Peptide (GIP)
   Ⓐ Inhibits gastric secretion and motility
   Ⓑ Inhibits gastric secretion but not motility
   Ⓒ Activates gastric secretion and motility
   Ⓓ Activates gastric motility

■ **Assertion – Reason Based Questions: (94-97):**

A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion.
B: Assertion and Reason both are correct but Reason is not the correct explanation of Assertion.
C: Assertion is correct but Reason is wrong.
D: Assertion is wrong but Reason is correct.

94. **Assertion:** Bundle of His is a part of autoexcitable tissue.
   Reason: This region comprises of cardiac tissue that can generate impulse on its own at a frequency less than SA node.

95. The pie charts given below shows the amount of different gases present in the inhaled and exhaled air. Read the chart carefully and answer according to the appropriateness of the Assertion and Reason given below:



   Assertion: 97% of gas X is carried by RBCs in blood as oxyhaemoglobin.

   Reason: X gets bound to Hb in the lungs and gets dissociated at the tissue level.

96. **Assertion:** Photorespiration is a waste process.

   Reason: During photorespiration, neither ATP nor NADPH is formed.

97. **Assertion:** Mitosis restores the nucleocytoplasmic ratio.

   Reason: It is significant in the life of an organism, especially in the growth of multicellular organisms.

■ **Case Based Questions (98-100):**

Read the following passage and answer the given questions:

When there is a change in the blood volume, ionic concentration or there is an excessive loss of fluid, osmoreceptors are activated and they trigger the release of vasopressin or ADH from neurohypophysis. ADH stimulates reabsorption of water from the distal parts of the tubules and thereby preventing water loss and diuresis. In case of sufficient body fluid, osmoreceptors are switched off, hence ADH release is suppressed.

98. The functioning of the kidneys is efficiently monitored and regulated by the hormonal feedback mechanism involving _____

Ⓐ Hypothalamus Ⓑ JGA Ⓒ Heart Ⓓ All of these

99. Angiotensin II increases the glomerular blood pressure and GFR as it is a/an

Ⓐ Osmoregulator Ⓑ Vasoconstrictor Ⓒ Vasodilator Ⓓ None of these

100. What is the net glomerular filtration rate in an average adult?

Ⓐ 75 ml/min Ⓑ 50 ml/min Ⓒ 125 ml/min Ⓓ 100 ml/min