



Monthly Progressive Test

Class: XI

Subject: PCMB



Test Booklet No.: MPT-05

Test Date:

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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 MPT05 12122025.
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 scibble 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. The total energy of a particle executing SHM of amplitude A is 100 J. At a distance of $0.707 A$ from the mean position, its kinetic energy is
 (A) 25 J (B) 50 J (C) 100 J (D) 12.5 J
2. A body performs SHM with an amplitude A at a distance $A/\sqrt{2}$ from the mean position, the correct relation between KE and PE is
 (A) $KE = \frac{PE}{2}$ (B) $KE = \sqrt{2}PE$ (C) $KE = PE$ (D) $KE = \frac{PE}{\sqrt{2}}$
3. The displacement of a particle in SHM varies according to the relation $x = 4(\sin \pi t + \cos \pi t)$. The amplitude of the particle is
 (A) -4 (B) 4 (C) $4\sqrt{2}$ (D) 8
4. The length of the simple pendulum, which ticks seconds is
 (A) 2 m (B) 1.5 m (C) 1 m (D) 3 m
5. The velocity v (in cm/s) of a particle is given in terms of time t (in s) by the equation $v = at + \frac{b}{t+c}$. The dimensions of a , b and c are

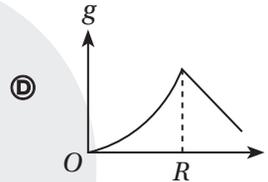
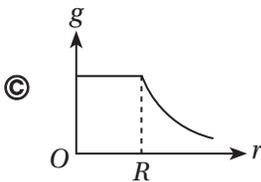
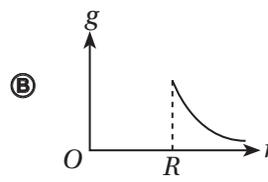
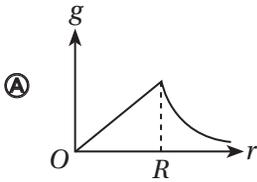
a	b	c
(A) L^2	T	LT^2
(B) LT^2	LT	L
(C) LT^{-2}	L	T
(D) L	LT	T^2
6. The pitch of the screw gauge is 0.5 mm. Its circular scale contains 50 divisions. The least count of the screw gauge is
 (A) 0.001 mm (B) 0.01 mm (C) 0.02 mm (D) 0.025 mm
7. Match columns I and II

Column I	Column II
(a) Acceleration due to gravity	(p) $\sqrt{2gR_e}$
(b) Escape speed	(q) $\frac{GM_e M}{r}$
(c) Total energy of a satellite	(r) $\frac{GM_e}{R^2}$
(d) Gravitational Potential Energy	(s) $\frac{GM_e M}{2(R+h)}$

(A) a-s, b-q, c-p, d-r (B) a-r, b-p, c-s, d-q (C) a-s, b-q, c-s, d-p (D) a-q, b-s, c-p, d-r
8. If the excess pressure inside a soap bubble of radius r_1 in air is equal to the excess pressure inside air bubble of radius r_2 inside the soap solution, then $r_1 : r_2$ is
 (A) 2 : 1 (B) 1 : 2 (C) 1 : 4 (D) $\sqrt{2} : 1$

9. The ratio of radii of gyration of a circular disc and a circular ring of the same radii and mass about a tangential axis perpendicular to plane of disc or ring is
 (A) 1 : 2 (B) $\sqrt{5}:\sqrt{6}$ (C) $2:\sqrt{3}$ (D) $\sqrt{3}:1$
10. The maximum load a wire can withstand without breaking, when its length is reduced to half of its original length, will
 (A) be doubled (B) be half (C) be four times (D) remains same
11. For a satellite moving in an orbit around the earth, the ratio of kinetic energy to magnitude of potential energy is
 (A) $\frac{1}{\sqrt{2}}$ (B) 2 (C) $\sqrt{3}$ (D) $\frac{1}{2}$

12. Which of the following graph represents the variations of acceleration due to gravity (g) with distance r from the centre of earth?



13. Match the Column I and Column II

Column I

- (a) Floating bodies
 (b) Hydrostatic paradox
 (c) Energy conservation
 (d) Speed of efflux

Column II

- (p) Torricelli's law
 (q) Bernoulli's principle
 (r) Archimedes' principle
 (s) Pascal's law

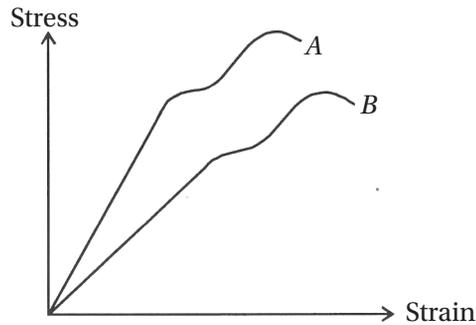
- (A) a-s, b-q, c-r, d-p (B) a-r, b-s, c-q, d-p (C) a-q, b-q, c-s, d-r (D) a-s, b-r, c-q, d-p
14. A rectangular film of liquid is extended from $(4 \text{ cm} \times 2 \text{ cm})$ to $(5 \text{ cm} \times 4 \text{ cm})$. If the work done is $3 \times 10^{-4} \text{ J}$, the value of the surface tension of the liquid is
 (A) 0.250 N m^{-1} (B) 0.125 N m^{-1} (C) 0.2 N m^{-1} (D) 8.0 N m^{-1}
15. The bulk modulus of a spherical object is 'B'. If it is subjected to uniform pressure 'p', the fractional decrease in radius is
 (A) $\frac{B}{3p}$ (B) $\frac{3p}{B}$ (C) $\frac{p}{3B}$ (D) $\frac{p}{B}$
16. **Assertion :** The error in the measurement of radius of a sphere is 0.3%. The permissible error in its surface area is 0.6%.

Reason : The permissible error is calculated by the formula $\frac{\Delta A}{A} = 4 \frac{\Delta r}{r}$.

- (A) Assertion is true, Reason is true, Reason is a correct explanation of Assertion.
 (B) Assertion is true, Reason is true, Reason is not a correct explanation of Assertion.
 (C) Assertion is true, Reason is false.
 (D) Assertion is false, Reason is true.

17. These questions consists of two statements, each printed as Assertion (A) and Reason (R).

Assertion (A) : The stress~strain graphs for two materials A and B are shown in figure. Young's modulus of A is greater than that of B.



Reason (R) : The Young's modulus for small strain is, $Y = \frac{\text{stress}}{\text{strain}}$ = slope of linear portion of stress~strain graph.

- (A) (A) is correct, (R) is correct; (R) is a correct explanation for (A)
 (B) (A) is correct, (R) is correct; (R) is not a correct explanation for (A)
 (C) (A) is correct, (R) is incorrect
 (D) (A) is incorrect, (R) is correct
18. **Assertion :** When percentage errors in measurement of mass and velocity are 1% and 2% respectively, the maximum percentage error in kinetic energy (KE) is 5%.

Reason : $KE = \frac{1}{2}mv^2$, $\frac{\Delta KE}{KE} = \frac{\Delta m}{m} + \frac{2 \Delta v}{v}$

- (A) Assertion is true, Reason is true, Reason is a correct explanation of Assertion.
 (B) Assertion is true, Reason is true, Reason is not a correct explanation of Assertion.
 (C) Assertion is true, Reason is false
 (D) Assertion is false, Reason is true
19. **Assertion (A) :** If polar ice melts, days will be longer.
- Reason (R) :** Moment of inertia decreases and thus angular velocity increases.
- (A) Both Assertion and Reason are correct and Reason is a correct explanation of Assertion
 (B) Both Assertion and Reason are correct and Reason is not a correct explanation of Assertion
 (C) Assertion is correct, Reason is incorrect
 (D) Assertion is incorrect, Reason is correct

Case Based Question—I

A simple pendulum of length l and mass of the bob is m executing SHM with time period T .

20. If mass of the pendulum be doubled then time period will be
- (A) T (B) $\frac{T}{2}$ (C) $2T$ (D) $\sqrt{2}T$
21. If the pendulum move upward with acceleration g then time period will be
- (A) T (B) $\frac{T}{\sqrt{2}}$ (C) $\sqrt{2}T$ (D) $2T$

22. If amplitude of SHM be doubled then time period will be

- (A) $2T$ (B) $\frac{T}{2}$ (C) $\sqrt{2}T$ (D) T

Case Based Question—II

In a thermodynamic process $V = \frac{K}{T^2}$. If temperature increases by 100°C for 2 mole of diatomic gas—

23. Work done by the gas

- (A) $100R$ (B) $200R$ (C) $300R$ (D) $400R$

24. Molar heat capacity for this process

- (A) $2R$ (B) $3R$ (C) $\frac{R}{3}$ (D) $\frac{R}{2}$

25. Molar heat capacity of gas depends on

- (A) material of the gas (B) change in temperature
(C) degrees of freedom (D) thermodynamic process

Chemistry

26. An oxide of sulphur contains 50% S. What will be its empirical formula? [Atomic weight: S = 32, O = 16]

- (A) SO (B) SO₂ (C) SO₃ (D) S₂O₃

27. 1.7 g NH₃ reacts with 4g O₂ according to the reaction: $4\text{NH}_3 + 5\text{O}_2 \longrightarrow 4\text{NO} + 6\text{H}_2\text{O}$;

Atomic weight: N = 14, H = 1, O = 16.

Correct statements are

(I) NH₃ is limiting reagent (II) O₂ is limiting reagent (III) 3g NO is formed

- (A) I, II, III (B) I, II (C) II, III (D) I, III

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

- (A) 0.004 M (B) 0.008 M (C) 0.002 M (D) 0.016 M

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:

- (A) 1 mole (B) 2 moles (C) 3 moles (D) 4 moles

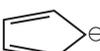
30. The number of radial nodes of 3S and 2P orbitals are respectively:

- (A) 2, 0 (B) 0, 2 (C) 1, 2 (D) 2, 11

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

- (A) $+\frac{1}{2} \cdot \frac{h}{2\pi}$ (B) zero (C) $\frac{h}{2\pi}$ (D) $\sqrt{2} \frac{h}{2\pi}$

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

- (A)  (B)  (C)  (D) Both (A) and (B)

33. Find the oxidation number of carbon in carbon suboxide [C₃O₂]:

[5]

- (A) +2, +4, -4 (B) -2, +2, 0 (C) +2, 0, +2 (D) +4, +2, -2
34. Oxygen has a oxidation state of +2 in:
 (A) H₂O₂ (B) H₂O (C) OF₂ (D) SO₂
35. Orbital which is represented by ψ_{420} is:
 (A) 5f (B) 4d² (C) 4s (D) 5P_f
36. Molality of an aqueous solution having mole fraction of solvent as 0.95 is approximately
 (A) 2 (B) 3 (C) 4 (D) 5
37. Toluene is orthopara directing compound due to:
 (A) Inductive effect (B) Elctromer effect (C) Resonance (D) Hyperconjugation
38. The energy required to break 76 gm gaseous fluorine into free gaseous atom is 180 K Cal at 25°C. The bond energy of F-F bond will be:
 (A) 180 K Cal (B) 90 K Cal (C) 45 K Cal (D) 104 K Cal
39. 10 mol of an ideal gas confined to a volume of 10L is released into atmosphere at 300K where the pressure is 1 bar. The work done by the gas is: (R = 0.083 bar K⁻¹mole⁻¹):
 (A) 249 L bar (B) 259 L bar (C) 239 L bar (D) 220 L bar
40. The molar solubility (in mol L⁻¹) of a sparingly soluble salt MX₄ is S. The corresponding solubility product is given by K_{sp}. S is given in terms of K_{sp} by the relation:
 (A) $S = \left(\frac{K_{sp}}{128}\right)^{\frac{1}{4}}$ (B) $S = (128.K_{sp})^{\frac{1}{4}}$ (C) $S = (256K_{sp})^{\frac{1}{5}}$ (D) $S = \left(\frac{K_{sp}}{256}\right)^{\frac{1}{5}}$

CASE STUDY BASED QUESTION - I (Q.41 - Q. 43):

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 basic {[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:

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

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

Answer the following questions when: pK_a = 4.7447 ; PK_b = 4.7447; PK_w = 14.

41. When 50 ml of 0.1 M NH₄OH is added to 50 ml of 0.05 M HCl solution, the pH is nearly:
 (A) 1.60 (B) 12.40 (C) 4.75 (D) 9.25
42. Solution of 0.1(N) NH₄OH and 0.1(N) NH₄Cl has pH 9.25. pK_b of NH₄OH is
 (A) 9.25 (B) 4.75 (C) 3.75 (D) 8.25

43. 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 .
- (A) 0.75 (B) 3.75 (C) 4.75 (D) 7.25

CASE STUDY BASED QUESTION- II (Q.44 – Q. 46):

Electrons in the outer shell face repulsion and the order of the extent of repulsion is lone pair-lone pair > lone pair-bond pair > bond pair-bond pair. Due to this repulsion, some changes occur in the molecules or ions. The impact of this repulsion hampers bond length, bond angle, shape of the molecule, etc. Now, the lone pairs in the molecules or ions having sp^3d , sp^3d^2 , sp^3d^3 hybridization are always placed at equatorial position not in axial positions. This is due to minimise the said repulsion.

44. The correct order of carbon – carbon bond length is
- (A) $\text{C}_2\text{H}_6 > \text{C}_2\text{H}_4 > \text{C}_2\text{H}_2$ (B) $\text{C}_2\text{H}_6 > \text{C}_2\text{H}_2 > \text{C}_2\text{H}_4$ (C) $\text{C}_2\text{H}_2 > \text{C}_2\text{H}_4 > \text{C}_2\text{H}_6$ (D) $\text{C}_2\text{H}_2 > \text{C}_2\text{H}_6 > \text{C}_2\text{H}_4$
45. What is the shape of ClF_3 molecule:
- (A) Tetrahedral (B) Trigonal bipyramidal (C) T-shaped (D) P.b.p.
46. Correct Bond length of CH_4 , NH_3 and H_2O (decreasing order) is as follows:
- (A) $\text{H}_2\text{O} > \text{NH}_3 > \text{CH}_4$ (B) $\text{CH}_4 > \text{NH}_3 > \text{H}_2\text{O}$ (C) $\text{CH}_4 < \text{NH}_3 < \text{H}_2\text{O}$ (D) $\text{NH}_3 > \text{CH}_4 > \text{H}_2\text{O}$

ASSERTION AND REASON QUESTIONS (Q47 – 50):

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.

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

Reason (R): $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ and $\text{CH}_3-\text{C}=\text{CH}_2$ are resonating structure.

|
 CH_3

- (A) a (B) b (C) c (D) 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) a (B) b (C) c (D) d

49. **Assertion (A):** NaI shows more water solubility than NaCl at constant temperature.

Reason (R): Higher the radius of anion, extent of hydration is higher.

- (A) a (B) b (C) c (D) d

50. **Assertion (A):** NO_3^\ominus and $\text{CO}_3^{2\ominus}$ are isoelectronic species

Reason (R): Central atom in both NO_3^\ominus and $\text{CO}_3^{2\ominus}$ are sp^2 hybridised.

- (A) a (B) b (C) c (D) d

Mathematics

51. The vertex of the parabola

$$x^2 + y^2 - 2xy - 4x - 4y + 4 = 0 \text{ at}$$

- (A) (1, 1) (B) (-1, -1) (C) $\left(\frac{1}{2}, \frac{1}{2}\right)$ (D) None of these

52. $\lim_{x \rightarrow 1} (1 + \sin \pi x)^{\cot \pi x}$

- (A) e^2 (B) $\frac{1}{e}$ (C) e (D) None of these

53. Let the ellipse $3x^2 + py^2 = 4$ passes through the center of the circle $x^2 + y^2 - 2x - 4y - 11 = 0$. Let f_1 and f_2 be the focal distances of a point on the ellipse and r be the radius of the circle. Then the value of $6f_1f_2 - r$ is equal to

- (A) 72 (B) 74 (C) 70 (D) 80

54. A line passing through the point $P(\sqrt{5}, \sqrt{5})$ intersects the ellipse $\frac{x^2}{36} + \frac{y^2}{25} = 1$ at A and B such that (PA). (PB) is maximum. Then $5(PA^2 + PB^2)$ is equal to

- (A) 290 (B) 377 (C) 338 (D) 218

55. What is the value of $\frac{d}{dx} \left(\frac{a^x}{e^x} \right)$?

- (A) $\frac{a^x(\ln a - a^x)}{e^x}$ (B) $\frac{a^x(\ln a - e^x)}{e^x}$ (C) $\frac{a^x(\ln a - 1)}{e^x}$ (D) $\frac{a^x(\ln a - 1)}{(e^x)(e^x)}$

CASE STUDY BASED QUESTION- I (Q.56- Q. 58):

The corner points of a square plot are (1, 2), (2, 3), (3, 1) (0, -4). Plot is located in an industrial area to build a well-known company showroom.



On basis of this information given in passage answer following questions.

56. Find the distance between (1, 2) and (3, 1).

- (A) $\sqrt{5}$ (B) $2\sqrt{5}$ (C) $\sqrt{10}$ (D) 2

57. Find the slope of (2, 3) and (0, -4).

- (A) $\frac{5}{2}$ (B) $\frac{-5}{2}$ (C) $\frac{-7}{2}$ (D) $\frac{7}{2}$

58. Determine $\tan B$ for the triangle with vertices $A(-2, 1)$, $B(2, 3)$ and $C(-2, -4)$.

(A) $\frac{4}{5}$

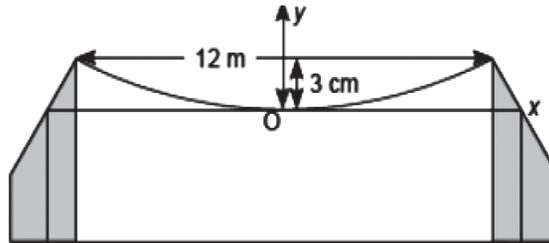
(B) $\frac{2}{3}$

(C) $\frac{-3}{4}$

(D) 1

CASE STUDY BASED QUESTION- II (Q.59 - Q. 61):

A beam is supported at its ends by supports which are 12 m apart. Since the load is concentrated at its centre, there is a deflection of 3 cm at the centre and the deflected beam is in the shape of parabola. Now consider the centre of beam is at origin as shown in figure.



On basis of the above information answer the following questions.

59. Write the equation of parabola.

(A) $x^2 = 1200 y$

(B) $x^2 = 300 y$

(C) $y^2 = 1200 x$

(D) $x^2 = 600 y$

60. Find the focus of parabola.

(A) (300, 0)

(B) (600, 0)

(C) (0, 600)

(D) (0, 300)

61. How far from the centre is the deflection 1 cm?

(A) $2\sqrt{6}$ m

(B) $2\sqrt{3}$ m

(C) 2 m

(D) $2\sqrt{3}$ cm

ASSERTION-REASON BASED QUESTIONS (Q.62 - Q.65):

DIRECTIONS: In each of the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:

- Both A and R are true and R is the correct explanation of A.
- Both A and R are true but R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

62. **Assertion (A):** $\lim_{x \rightarrow 1} \frac{ax^2 + bx + c}{cx^2 + bx + a}$ is equal to 1, where $a + b + c \neq 0$.

Reason (R): $\lim_{x \rightarrow -2} a \frac{\frac{1}{x} + \frac{1}{2}}{x + 2}$ is equal to $\frac{1}{4}$.

(A) a

(B) b

(C) c

(D) d

63. **Assertion (A):** The derivative of $h(x) = \frac{x + \cos x}{\tan x}$ is $\frac{(1 - \sin x)\tan x - (x + \cos x)\sec^2 x}{(\tan x)^2}$.

Reason (R): $\left(\frac{u}{v}\right)' = \frac{u'v - uv'}{(v)^2}$.

(A) a

(B) b

(C) c

(D) d

64. **Assertion (A):** The sum of focal distances of a point on the ellipse $9x^2 + 4y^2 - 18x - 24y + 9 = 0$ is 4.

Reason (R): The equation $9x^2 + 4y^2 - 18x - 24y + 9 = 0$ can be expressed as $9(x-1)^2 + 4(y-3)^2 = 36$.

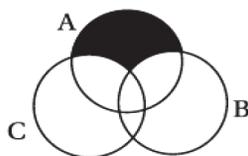
- (A) a (B) b (C) c (D) d

65. **Assertion (A):** The sum of first n terms of the series $0.6 + 0.66 + 0.666 + \dots$ is $\frac{2}{3} \left[n - \frac{1}{9} \left\{ 1 - \left(\frac{1}{10} \right)^n \right\} \right]$.

Reason (R): General term of a GP is $T_n = ar^{n-1}$, where a = first term and r = common ratio.

- (A) a (B) b (C) c (D) d

66. The shaded region in the given figure is



- (A) $A \cap (B \cup C)$ (B) $A \cup (B \cap C)$ (C) $A \cap (B - C)$ (D) $A - (B \cup C)$

67. Range of the function $f(x) = 9 - 7 \sin x$ is

- (A) (2, 16) (B) [2, 16] (C) [-1, 1] (D) (2, 16]

68. $\frac{\tan\left(x - \frac{\pi}{2}\right) \cdot \cos\left(\frac{3\pi}{2} + x\right) - \sin^3\left(\frac{7\pi}{2} - x\right)}{\cos\left(x - \frac{\pi}{2}\right) \cdot \tan\left(\frac{3\pi}{2} + x\right)}$ when simplified reduces to

- (A) $\sin x \cos x$ (B) $-\sin^2 x$ (C) $-\sin x \cos x$ (D) $\sin^2 x$

69. If three lines $x - 3y = p$, $ax + 2y = q$ and $ax + y = r$ form a right angled triangle, then

- (A) $a^2 - 9a + 18 = 0$ (B) $a^2 - 6a - 12 = 0$ (C) $a^2 - 6a + 9 = 0$ (D) $a^2 - 9a + 12 = 0$

70. The radius of the circle $z\bar{z} + (4 - 3i)z + (4 + 3i)\bar{z} + 5 = 0$ is

- (A) $2\sqrt{5}$ (B) $\sqrt{5}$ (C) $3\sqrt{5}$ (D) $4\sqrt{5}$

71. If the quadratic expression $x^2 + 2ax - 3a + 10 > 0 \quad \forall x \in \mathbb{R}$, then

- (A) $a > 5$ (B) $|a| < 5$ (C) $-5 < a < 2$ (D) $2 < a < 3$

72. Sum of integral solutions of inequality $|x - 2| - 3| \leq 0$ is

- (A) 6 (B) -4 (C) 4 (D) -6

73. 5 boys & 3 girls are sitting in a row of 8 seats. Number of ways in which they can be seated so that not all the girls sit side by side, is

- (A) 36000 (B) 9080 (C) 3960 (D) 11600

74. If the term independent of x in the expansion of $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$ is k , then $18k$ is equal to

- (A) 5 (B) 9 (C) 7 (D) 11

75. A variable line L passes through the point (3, 5) and intersects the positive coordinate axes at the points A and B. The minimum area of the triangle OAB, where O is the origin is

- (A) 35 (B) 40 (C) 30 (D) 25

Biology

76. Phototropic and geotropic movements are linked to:
 (A) Gibberellins (B) Auxins (C) Cytokinin (D) Ethylene
77. Leaf fall can be prevented with the help of:
 (A) ABA (B) Auxin (C) Florigen (D) Cytokinin
78. Mowing grass lawns facilitates better maintenance because:
 (A) wounding stimulates regeneration
 (B) removal of apical dominance and stimulation of intercalary meristem
 (C) removal of apical dominance only
 (D) removal of apical dominance and promotion of lateral meristem
79. Gibberellins promote
 (A) seed germination (B) seed dormancy (C) leaf fall (D) root elongation
80. Phytochrome is involved in:
 (A) Photoperiodism (B) Photorespiration (C) Phototropism (D) Photophosphorylation
81. Serum differs from blood in:
 (A) Lacking clotting factors (B) Lacking antibodies
 (C) Lacking globulins (D) Lacking albumins
82. Blood pressure in the pulmonary artery is :
 (A) same as that in aorta (B) more than that in the carotid
 (C) more than that in pulmonary vein (D) less than that in vena cava
83. Blood pressure in the mammalian aorta is maximum during:
 (A) Systole of left ventricle (B) Diastole of right atrium
 (C) Systole of left atrium (D) Diastole of right ventricle
84. Doctors use stethoscope to hear the sounds produced during each cardiac cycle. The second sound is heard when :
 (A) Ventricular walls vibrate due to pushing in of blood from atria
 (B) Semilunar valves close after the blood flows into the vessels from ventricles
 (C) SA node sends signals to AV node
 (D) AV valves open up
85. Impulse of heart beat originates from:
 (A) SA node (B) AV node (C) Vagus nerve (D) Cardiac nerve
86. Respiration in insects is called direct because:
 (A) the cells exchange O_2 and CO_2 directly with the air in the tubes
 (B) the tissues exchange O_2 and CO_2 directly with the coelomic fluid
 (C) the tissues exchange O_2 and CO_2 directly with the air outside through the body surface
 (D) tracheal tubes exchange O_2 and CO_2 directly with the haemocoel, which is then exchanged with the tissues.

87. At higher CO_2 concentration, oxygen dissociation curve of haemoglobin will
 (A) move to left (B) move to right (C) move downwards (D) move upwards
88. Transport of gases in alveoli occurs by:
 (A) Active transport (B) Passive transport (C) Simple diffusion (D) None
89. When 1500 ml of air is present in the lungs, it is called:
 (A) Residual volume (B) Inspiratory reserve volume
 (C) Expiratory reserve volume (D) Vital capacity
90. At high altitudes, the RBCs in human blood will:
 (A) increase in size (B) decrease in size (C) increase in number (D) decrease in number

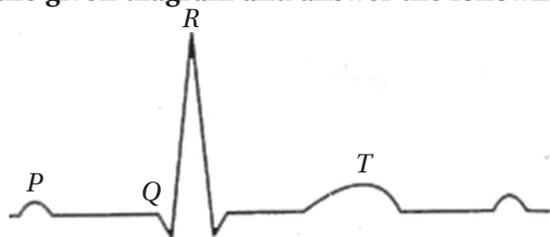
The questions 16 to 19 have two statements—Assertion (A) and Reason (R). Of the two statements, mark the correct answer from the options given below:

- 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.

91. A—The vital capacity is higher in atheletes.
 R—Vital capacity is the amount of air, which one can inhale and exhale with maximum effort.
 (A) a (B) b (C) c (D) d
92. A—Carbon dioxide is carried in the plasma mainly as HCO_3^- ions.
 R—Enzyme carbonic anhydrase of RBC, catalyses the formation of bicarbonate ions that can enter the plasma.
 (A) a (B) b (C) c (D) d
93. A—Ethylene stimulates ripening of fruits like tomatoes, lemons, oranges, etc.
 R—Ethylene stimulates axillary buds to remain dormant during winters.
 (A) a (B) b (C) c (D) d
94. A—Heart of fish contains only deoxygenated blood.
 R—Oxygenated blood does not return back to the heart in fishes.
 (A) a (B) b (C) c (D) d

Case based Questions (20–22)

Study the given diagram and answer the following questions:



The diagram given above is the standard ECG of a normal person.

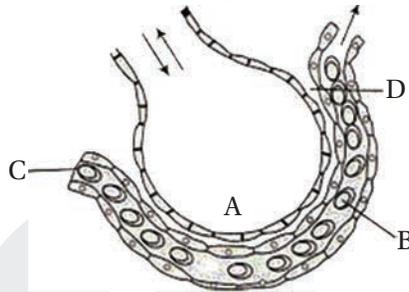
95. The P-wave represents the :
 (A) end of systole (B) contraction of both the atria
 (C) initiation of the ventricular contraction (D) beginning of the systole

96. Which of the following components of ECG is correctly interpreted below:
- Ⓐ Peak P and Peak R together—Systolic and Diastolic blood pressures
 - Ⓑ Peak P—Initiation of left atrial contraction only
 - Ⓒ Complex QRS—One complete pulse
 - Ⓓ Peak T—Initiation of total cardiac contraction
97. In normal ECG, the component that signifies duration of one cardiac cycle is:
- Ⓐ Q-T interval
 - Ⓑ P-R interval
 - Ⓒ S-T interval
 - Ⓓ R-R interval

Case based Question (23-25)

Study the given figure and answer the following questions:

The figure given below shows a small part of human lung where exchange of gases occurs.



98. In which one of the options given below, any one part (marked as A, B, C or D) is correctly identified along with its function?
- Ⓐ Red blood cell—Transport of CO_2 mainly
 - Ⓑ Arterial capillary—Passes oxygen to tissues
 - Ⓒ Alveolar cavity—Main site of exchange of respiratory gases
 - Ⓓ Capillary wall—Exchange of O_2 and CO_2 takes place here
99. A large proportion of air is left unused in the human blood even after its uptake by the body tissues. This O_2 :
- Ⓐ helps in releasing more O_2 to the epithelium tissues
 - Ⓑ acts as a reserve for muscular exercise
 - Ⓒ raises the pCO_2 of blood to 75 mm of Hg
 - Ⓓ is enough to keep oxyhaemoglobin saturation at 96%
100. Name the pulmonary disease in which the alveolar surface area involved in gas exchange is drastically reduced due to damage to the alveolar walls.
- Ⓐ Pneumonia
 - Ⓑ Asthma
 - Ⓒ Emphysema
 - Ⓓ Pleurisy