Monthly Progressive Test

Class: XI

Subject: PCMB

Academic Excellence Programme TECHNO ACE

Test Booklet No.: MPT07 **Test Date:** 22112024

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

Important Instructions :

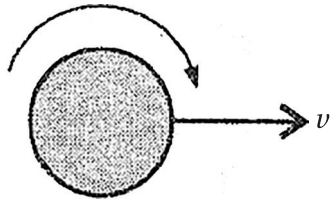
1. The Test is of 120 mins duration and the Test Booklet contains 100 multiple choice questions of single correct option only. There are four sections with four subjects. You have to attempt all 100 questions (Candidates are advised to read all 100 questions). Questions 1 to 25 contain Physics, Questions 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 MPT0722112024.
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.

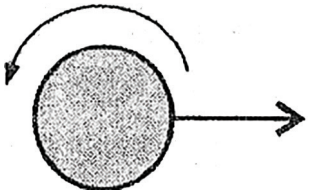
Space For Rough Works

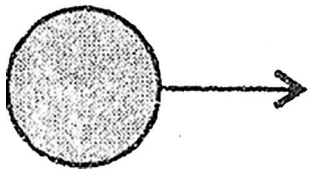
Physics

1. Two pieces of metal when immersed in a liquid have equal upthrust on them; then:
   Ⓐ Both pieces must have equal weights
   Ⓑ Both pieces must have equal densities
   Ⓒ Both pieces must have equal volumes
   Ⓓ Both are floating to the same depth

2. To get the maximum flight, a ball must be thrown as:

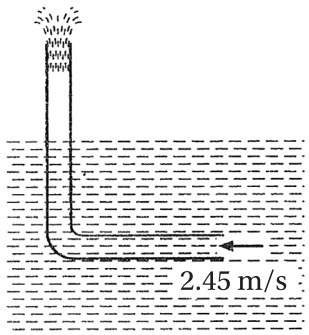
Ⓐ 

Ⓑ 

Ⓒ 

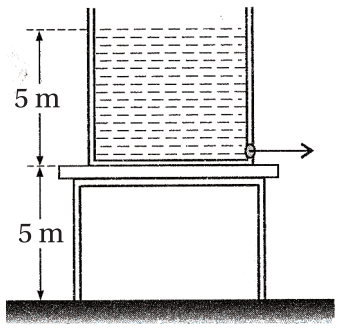
Ⓓ any of Ⓐ, Ⓑ and Ⓒ

3. An L-shaped tube with a small orifice is held in a water stream as shown in figure. The upper end of the tube is 10.6 cm above the surface of water. What will be the height of the jet of water coming from the orifice? (Velocity of water stream is 2.45 m/s):



   Ⓐ Zero
   Ⓑ 20.0 cm
   Ⓒ 10.6 cm
   Ⓓ 40.0 cm

4. An incompressible non-viscous fluid flows steadily through a cylindrical pipe which has radius $2R$ at point A and radius R at point B farther along the flow direction. If the velocity at point A is V, its velocity at point B will be:



   Ⓐ $2V$
   Ⓑ V
   Ⓒ $V/2$
   Ⓓ $4V$

5. A cubical vessel of height of 1m is full of water. The work done in pumping water out of the vessel is

   Ⓐ 49J
   Ⓑ 98J
   Ⓒ 4900J
   Ⓓ 9800J

6. A tank is filled liquid upto height H. A small hole is made at the bottom of tank. Let t_1 be the time taken to empty first half and t_2 the time to rest half, then t_1/t_2 is proportional to:

Ⓐ $\sqrt{2}$ Ⓑ $\sqrt{2}-1$ Ⓒ 4.14 Ⓓ $\frac{1}{\sqrt{2}}$

7. When a body is wholly or partially immersed in a liquid, appears to lose weight. This loss of weight is equal to the weight of:

Ⓐ Water displaced by the body Ⓑ Liquid displaced by the body

Ⓒ Equal volume of water Ⓓ Equal volume of liquid

8. If under stress there is no change in volume for a material wire, it has a Poisson's ratio of value

Ⓐ 0.3 Ⓑ 0.5 Ⓒ 0.7 Ⓓ 0.9

9. A long wire of length L is fixed at one end while the other end is stretched with a force F and the length of the wire becomes $(L + l)$. The elastic potential energy stored in the extended wire is

Ⓐ $\frac{1}{2}YFl$ Ⓑ YFl Ⓒ YFL Ⓓ $\frac{1}{2}Fl$

10. If there is a change in volume under longitudinal stress then volume strain =

Ⓐ $(1-2\sigma)\times$ longitudinal strain Ⓑ $(1+2\sigma)\times$ longitudinal strain

Ⓒ $2\sigma\times$ longitudinal strain Ⓓ $\left(1-\frac{\sigma}{2}\right)\times$ longitudinal strain

11. The energy density stored in a stressed wire is given by

Ⓐ Stress × strain Ⓑ $\frac{1}{2}$stress × strain Ⓒ $\frac{\text{stress}}{\text{strain}}$ Ⓓ 2 stress × strain

12. The developed thermal force in a rod for a temperature rise of θ°C [coefficient of linear expansion = α, A = area of cross-section]

Ⓐ $Y\alpha\theta$ Ⓑ $\frac{1}{2}Y\alpha\theta$ Ⓒ $YA\alpha\theta$ Ⓓ $\frac{1}{2}YA\alpha\theta$

13. Dimensions of compressibility is

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

14. Two wires of same radius and material have their lengths in the ratio 1 : 2. If these are stretched by the forces in the ratio 2 : 1, the strain produced in the two wires will be in the ratio

Ⓐ 1 : 1 Ⓑ 1 : 2 Ⓒ 2 : 1 Ⓓ 1 : 4

15. The SI unit of volume stress is

Ⓐ without units Ⓑ pascal Ⓒ newtons Ⓓ none of the above

Assertion-Reason type Questions (16):

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

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

B. If both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.

C. If Assertion is true but the Reason is false.

D. If Assertion is false but Reason is true.

16. **Assertion:** On top of a mountain air pressure is low

Reason: The column of air above the top of the mountain is shorter

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

17. The direction of reaction to a force is

Ⓐ 30° to normal force

Ⓑ 60° to normal force

Ⓒ 45° to normal force

Ⓓ along the line of action of force but in opposite sense

18. Sound emits from a vibrating source

Ⓐ in all directions Ⓑ only in downward

Ⓒ only in upward direction Ⓓ none of these

19. Speed of sound through steel is nearly 5000 m/s

Ⓐ False Ⓑ May be false Ⓒ True Ⓓ None of these

20. Speed of sound in air is

Ⓐ 640 m/s Ⓑ 332 m/s Ⓒ 200 m/s Ⓓ None of these

■ **Case Based Questions (21–22):**

21. A gaseous mixture enclosed in a vessel of one gm-mole of gas A ($\gamma = 5/3$) with another gas B ($\gamma = 7/5$) at a temperature T. Gases are ideal and they do not react with each other. If γ for mixture of gases be 19/13, the molar specific heat capacity of the mixture is [R = universal gas constant]

Ⓐ $6R/5$ Ⓑ $11R/6$ Ⓒ $13R/6$ Ⓓ $16R/5$

22. The number of moles of gas B, in gm-mole, is

Ⓐ 1.5 Ⓑ 2 Ⓒ 2.5 Ⓓ 3

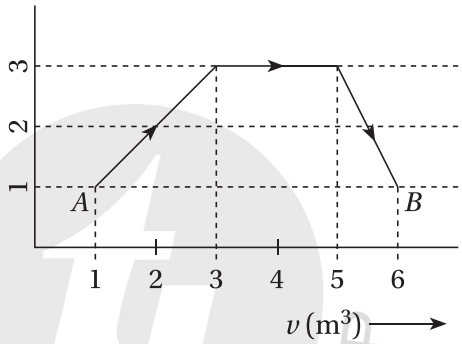
23. The temperature of an ideal gas is increased from 120 K to 480 K. If at 120 K the root mean square velocity of the gas molecules is v, at 480 K it becomes

Ⓐ $4v$ Ⓑ $2v$ Ⓒ $v/2$ Ⓓ $v/4$

24. The kinetic energy of a molecule of CO at STP [k = Boltzmann's constant]

Ⓐ $kT/2$ Ⓑ kT Ⓒ $3kT/2$ Ⓓ $5kT/2$

25. The change in state of a gas from A to B is as shown in Fig. The work done in the process is:



Ⓐ 6×10^5 J Ⓑ 7×10^5 erg Ⓒ 7×10^5 J Ⓓ 12×10^5 J

Chemistry

26. Correct order of Bronsted acidity is

Ⓐ $(CH_3)_3CCOOH > CH_3COOH > (NO_2)_3CCOOH > CF_3COOH$

Ⓑ $(CH_3)_3CCOOH > CH_3COOH > CF_3COOH > (NO_2)_3CCOOH$

Ⓒ $(NO_2)_3CCOOH > CF_3COOH > (CH_3)_3CCOOH > CH_3COOH$

Ⓓ $(NO_2)_3CCOOH > CF_3COOH > CH_3COOH > (CH_3)_3CCOOH$

27. Correct order of dipole moment is

(I) 1, 3, 5 - trichlorobenzene (II) 1, 2 - dichlorobenzene

(III) 1, 4 - dichlorobenzene (IV) 1,3 - dichlorobenzene

Ⓐ I > III > IV > II Ⓑ I > III > II > IV

Ⓒ I = III < II < IV Ⓓ I = III < IV < II

28. Which of the following is the most stable carbanion ?

Ⓐ p - O_2N - C_6H_4 - CH_2- Ⓑ p - H_3C - C_6H_4 - CH_2-

Ⓒ C_6H_5 - CH_2- Ⓓ p - C_2H_5 - C_6H_4 - CH_2-

29. Which of the following molecule does not produce Prussian blue coloured compound at the end of Lassaigne's test ?

Ⓐ $C_6H_5NHC_2H_5$ Ⓑ $C_6H_5 - N = N - C_6H_5$

Ⓒ $CH_3CH_2CH_2NO_2$ Ⓓ $H_2N - CH_2 - COOH$

Assertion Reason Type Question (30–31):

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

30. **Assertion (A):** $CH_3COOCH(CH_3)_2$ and $CH_3COOCH_2CH_2CH_3$ are metamers

Reason (R): In case of metamerism, the number of carbon atoms around the functional group is different

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

31. **Assertion (A):** 3 -methylpentan - 2 - one is an optically active molecule

Reason (R): The third carbon of 3 -methylpentan - 2 - one is a chiral carbon

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

32. Aqueous solution of an organic compound 'A' on electrolysis liberates ethyne and carbon dioxide as products. The compound 'A' is

Ⓐ Potassium ethanoate Ⓑ Potassium succinate

Ⓒ Potassium citrate Ⓓ Potassium maleate

33. In Carius method of halogen estimation, which of the following is used ?

Ⓐ Concentrated $H_2SO_4 + AgNO_3$ Ⓑ Dilute $H_2SO_4 + AgNO_3$

Ⓒ Dilute $HNO_3 + AgNO_3$ Ⓓ Fuming $HNO_3 + AgNO_3$

34. Consider the molecule 2,2,4,4 - tetramethylpentane and select the correct statements

(I) There are two quarternay carbon atoms (II) There is one tertiary carbon atom

(III) There are 6 primary carbon atoms

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

35. Tertiary butyl carbocation is more stable than methyl carbocation. Which factors are responsible to explain this fact ?

(I) Resonance (II) Inductive effect (III) Hyperconjugation

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

Assertion Reason Type Question (36–37):

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

36. **Assertion (A):** $(CH_3)_3CCOC(CH_3)_3$ does not show tautomerism

Reason (R): $(CH_3)_3CCOC(CH_3)_3$ does not contain hydrogen atom

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

37. **Assertion (A):** Boiling point of 2, 2 - dimethylpropane is much higher than n - pentane

Reason (R): 2, 2 dimethylpropane contains contains primary and quarternary carbon atoms while n - pentane contains no branched carbon atoms.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

38. Which is not associated with alkane formation ?

Ⓐ Reaction between ethyl magnesium bromide with water

Ⓑ Heating of butanoic acid with NaOH + CaO

Ⓒ Heating of pentyne with Raney nickel catalyst

Ⓓ Heating of $CH_3CH(Cl)CH_2(I)$ with excess $NaNH_2$

39. CnH_{2n+2} completely reacts with pure oxygen gas to form carbon dioxide and water. The correct option will be

	Mole of oxygen needed	Mole of water produced
Ⓐ	$\left(\frac{2n+1}{2}\right)$	$(n+2)$
Ⓑ	$\left(\frac{3n+2}{2}\right)$	$(n+1)$
Ⓒ	$\left(\frac{3n+1}{2}\right)$	$(n+2)$
Ⓓ	$\left(\frac{3n+1}{2}\right)$	$(n+1)$

40. The steam volatile substances which are immiscible with water are separated by _____ method

Ⓐ Steam distillation method Ⓑ Fractional distillation method

Ⓒ Fractional crystallization method Ⓓ Filtration method

41. 25 ml water is evaporated from 200 ml 0.2 N NaOH solution. What is the final concentration of the solution ?

Ⓐ 0.212 N Ⓑ 0.228 N Ⓒ 0.254 N Ⓓ 0.208 N

42. In which of the following option, all molecules have zero dipole moment value ?

Ⓐ XeF_2, BF_3, NF_3, CO_2 Ⓑ XeF_2, PCl_3, ClF_3, SF_4

Ⓒ SF_6, PF_5, CCl_4, CS_2 Ⓓ SO_2, NO_2, NH_3, CH_4

43. Find out wrong statements

(I) Oxygen - oxygen bond length in H_2O_2 is lower than that in O_2 molecule

(II) In ClF_3 molecule, one lone pair of chlorine is placed at axial position and other is at equatorial position

(III) There are two lonepairs on the central atom of XeF_4

(IV) BF_3 and NH_3 have same shapes

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

44. Correct order of carbon - carbon bond length is

Ⓐ $C_2H_6 > C_2H_4 > C_2H_2$ Ⓑ $C_2H_6 > C_2H_2 > C_2H_4$

Ⓒ $C_2H_2 > C_2H_4 > C_2H_6$ Ⓓ $C_2H_2 > C_2H_6 > C_2H_4$

45. Correct order of thermal stability is

Ⓐ $BaCO_3 > SrCO_3 > CaCO_3 > MgCO_3$ Ⓑ $BaCO_3 > SrCO_3 > MgCO_3 > CaCO_3$

Ⓒ $MgCO_3 > CaCO_3 > SrCO_3 > BaCO_3$ Ⓓ $MgCO_3 > SrCO_3 > CaCO_3 > BaCO_3$

46. Ethanol is more soluble in water than methoxy methane. This is properly explained by

Ⓐ Ethyl group has more + I effect than methyl group

Ⓑ Ethanol can form stronger hydrogen bond with water but methoxy methane cannot

Ⓒ The hydroxyl group (- OH) has stronger - I effect than (- O - CH_3) group

Ⓓ Ethanol is more resonance stabilized than methoxy methane

47. CH_3CONH_2 is weaker Lewis base than $CH_3CH_2NH_2$ because

Ⓐ + I effect of CH_3CO - group is much higher than CH_3CH_2 - group

Ⓑ The lone pair in CH_3CONH_2 takes part in resonance while that in $CH_3CH_2NH_2$ does not

Ⓒ Strong intramolecular hydrogen bond is present in CH_3CONH_2 while that is not possible in case of $CH_3CH_2NH_2$

Ⓓ At a constant temperature, water solubility of CH_3CONH_2 is much higher than $CH_3CH_2NH_2$

48. Which are wrong statements ?

(I) Lone pair takes part both in resonance and tautomerism

(II) $\overset{\ominus}{C}H_2NO_2$ Ion is less stable than $\overset{\oplus}{C}H_2NO_2$ ion

(III) Carbon - carbon bond lengths of ethyne is higher than ethene.

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

49. Which of the following compound has two chiral centres ?

Ⓐ 3 - bromo - 3 - phenyl - 2 - propanol

Ⓑ 1 - bromo - 4 - chloro - 2 - butanol

Ⓒ 2 - (N, N - dimethylanimo) - propanoic acid

Ⓓ 2-amino propanoic acid

50. Excess $H_3CCH(Br)CH_2CH_3$ reacts with alcoholic KOH. The correct product will be

Ⓐ $H_3CCH = CHCH_3$ only Ⓑ $H_3CCH_2CH = CH_2$ only

Ⓒ (A) major, (B) minor Ⓓ (B) major, (A) minor

Mathematics

51. If $2x^2 + \lambda xy + 2y^2 + (\lambda - 4)x + 6y - 5 = 0$ is the equation of a circle, then its radius is

Ⓐ $3\sqrt{2}$ Ⓑ $2\sqrt{3}$ Ⓒ $2\sqrt{2}$ Ⓓ None of these

52. If the straight line $y = mx$ is outside the circle $x^2 + y^2 - 20y + 90 = 0$, then

Ⓐ $m > 3$ Ⓑ $m < 3$ Ⓒ $|m| > 3$ Ⓓ $|m| < 3$

53. The vertex of the parabola $y^2 = 4(x + 1)$ is

Ⓐ $(0, 1)$ Ⓑ $(0, -1)$ Ⓒ $(1, 0)$ Ⓓ $(-1, 0)$

54. The length of latus rectum of the parabola $x^2 - 4x - 2y - 8 = 0$ is

Ⓐ 8 Ⓑ 4 Ⓒ 2 Ⓓ 1

55. The parabola $(y - 2)^2 = (x + 4)$ is symmetric about

Ⓐ $x = 0$ Ⓑ $y = 0$ Ⓒ $y = 2$ Ⓓ $x = -4$

56. The value of $\lim\limits_{x \to 0} \dfrac{\sqrt{1-\cos x^2}}{1-\cos x}$ is

Ⓐ $\dfrac{1}{2}$ Ⓑ 2 Ⓒ $\sqrt{2}$ Ⓓ None of these

57. $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \ldots \text{to} \infty}}}$, then the value of $\dfrac{dy}{dx}$ is equal to

Ⓐ $\sqrt{\dfrac{\sin x}{y+1}}$ Ⓑ $\dfrac{\sin x}{y+1}$ Ⓒ $\dfrac{\cos x}{2y+1}$ Ⓓ $\dfrac{\cos x}{2y-1}$

Assertion Reason based Questions (58–59):

Directions: In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(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.

58. **Assertion(A):** $\lim\limits_{x\to\infty}\dfrac{(x+1)^{10}+(x+2)^{10}+...+(x+100)^{10}}{x^{10}+9^{10}}=100$

Reason(R): If $f(x)$ and $g(x)$ are polynomials of same degree, then

$$\lim_{x\to\infty}\frac{f(x)}{g(x)}=\frac{\text{Coefficient of leading term in } f(x)}{\text{Coefficient of leading term in } g(x)}$$

Ⓐ a Ⓑ b Ⓒ c Ⓓ d

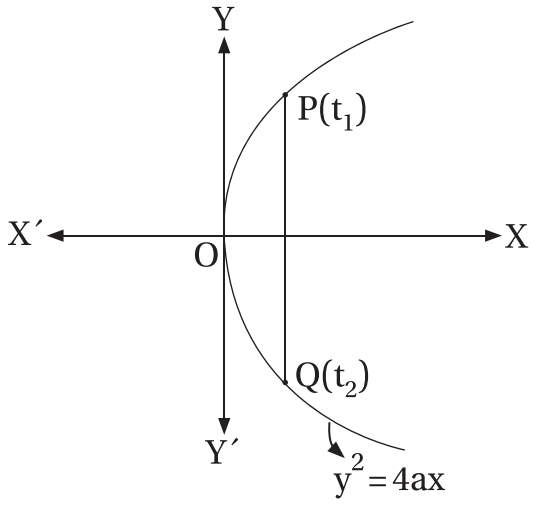
59. **Assertion(A):** $\lim\limits_{x\to\infty}\left(\cos\dfrac{\pi}{x}\right)^{x}=1$

Reason(R): $\lim\limits_{x\to\infty}-\pi.\tan\dfrac{\pi}{x}=0$

Ⓐ a Ⓑ b Ⓒ c Ⓓ d

Case Study Based Questions (60–62):

Mr Loney has drawn a standard right handed parabola, represented by the equation $y^2 = 4ax$. He then drew a chord with endpoints at $P(t_1)$ and $Q(t_2)$. From this, he discovered some remarkable results. Based on this answer the following questions.



60. Slope of PQ = ?

Ⓐ $\frac{2}{t_1 - t_2}$ Ⓑ $\frac{2}{t_1 + t_2}$ Ⓒ $\frac{2t_1t_2}{t_1 - t_2}$ Ⓓ $\frac{2t_1t_2}{t_1 + t_2}$

61. Equation of PQ is

Ⓐ $2x - (t_1 + t_2)y + 2a\,t_1t_2 = 0$ Ⓑ $2x + (t_1 + t_2)y + 2at_1t_2 = 0$

Ⓒ $2x + (t_1 + t_2)y - 2a\,t_1t_2 = 0$ Ⓓ none of these

62. If PQ passes through the point $(c, 0)$, then

Ⓐ $t_1t_2 = -\frac{c}{a}$ Ⓑ $t_1t_2 = \frac{c}{a}$ Ⓒ $t_1t_2 = \frac{-a}{c}$ Ⓓ $t_1t_2 = \frac{a}{c}$

63. If two circles $(x - 1)^2 + (y - 3)^2 = r^2$ and $x^2 + y^2 - 8x + 2y + 8 = 0$ intersect in two distinct points, then

Ⓐ $2 < r < 8$ Ⓑ $r < 2$ Ⓒ $r = 2$ Ⓓ $r > 2$

64. The vertex of a parabola is the point (a, b) and latus-rectum is of length ℓ. If the axis of the parabola is along the positive direction of y-axis, then its equation is

Ⓐ $(x+a)^2 = \frac{\ell}{2}(2y - 2b)$ Ⓑ $(x-a)^2 = \frac{\ell}{2}(2y - 2b)$

Ⓒ $(x+a)^2 = \frac{\ell}{4}(2y - 2b)$ Ⓓ $(x-a)^2 = \frac{\ell}{8}(2y - 2b)$

65. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, then $\frac{dy}{dx} = ?$

Ⓐ $\frac{1}{(1+x)^2}$ Ⓑ $\frac{-1}{(1+x)^2}$ Ⓒ $\frac{x}{1+x}$ Ⓓ $\frac{-x}{1+x}$

66. If ${}^{m+n}P_2 = 90$ and ${}^{m-n}P_2 = 30$, then

Ⓐ $m = 8, n = 2$ Ⓑ $m = 8, n = 3$

Ⓒ $m = 6, n = 2$ Ⓓ $m = 6, n = 3$

67. The middle term in the expansion of $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^{10}$ is

Ⓐ ${}^{10}C_5 x^{5/2}$ Ⓑ ${}^{10}C_5 x^{-5/2}$

Ⓒ ${}^{10}C_5$ Ⓓ $-{}^{10}C_5$

68. The set of admissible values of x such that $\frac{2x+3}{2x-9}<0$ is

Ⓐ $\left(-\infty,-\frac{3}{2}\right)\cup\left(\frac{9}{2},\infty\right)$ Ⓑ $(-\infty,0)\cup\left(\frac{9}{2},\infty\right)$

Ⓒ $\left(-\frac{3}{2},0\right)$ Ⓓ $\left(-\frac{3}{2},\frac{9}{2}\right)$

69. If $\frac{x}{\cos\theta}=\frac{y}{\cos\left(\theta+\frac{2\pi}{3}\right)}=\frac{z}{\cos\left(\theta-\frac{2\pi}{3}\right)}$, then $x+y+z$ is equal to

Ⓐ –1 Ⓑ 1 Ⓒ 0 Ⓓ None of these

70. Let $n(U)=700$, $n(A)=200$, $n(B)=300$ and $n(A\cap B)=100$. Then, $n(A^c\cap B^c)=$

Ⓐ 400 Ⓑ 600 Ⓒ 300 Ⓓ 200

71. For $0<x<\pi/2$, $\frac{d}{dx}\sqrt{\frac{1-\sin 2x}{1+\sin 2x}}$ is equal to

Ⓐ $\sec^2 x$ Ⓑ $-\sec^2\left(\frac{\pi}{4}-x\right)$ Ⓒ $\sec^2\left(\frac{\pi}{4}+x\right)$ Ⓓ $\sec^2\left(\frac{\pi}{4}-x\right)$

72. Let $3f(x)-2f\left(\frac{1}{x}\right)=x$, then $f'(2)$ is equal to

Ⓐ $\frac{2}{7}$ Ⓑ $\frac{1}{2}$ Ⓒ 2 Ⓓ $\frac{7}{2}$

73. $\lim\limits_{x\to\infty}\left(\frac{x^3}{3x^2-4}-\frac{x^2}{3x+2}\right)$ is equal to

Ⓐ Does not exist Ⓑ $\frac{1}{3}$ Ⓒ 0 Ⓓ $\frac{2}{9}$

74. A double ordinate of the parabola $y^2=8px$ is of length $16p$. The angle subtended by it at the vertex of the parabola is

Ⓐ $\frac{\pi}{4}$ Ⓑ $\frac{\pi}{2}$ Ⓒ $\frac{\pi}{3}$ Ⓓ none of these

75. The centre of a circle passing through the points (0, 0), (1, 0) and touching the circle $x^2+y^2=9$ is

Ⓐ $\left(\frac{3}{2},\frac{1}{2}\right)$ Ⓑ $\left(\frac{1}{3},\frac{3}{2}\right)$ Ⓒ $\left(\frac{1}{2},\sqrt{2}\right)$ Ⓓ $\left(\frac{1}{3},-\sqrt{2}\right)$

76. Tidal volume is

Ⓐ Volume of air inspired or expired

Ⓑ Additional volume of air a person can inspire by forcible inspiration

Ⓒ Additional volume of air a person can expire by forcible expiration

Ⓓ Remaining volume of air in the lungs, even after a forcible expiration

77. Haemoglobin has maximum affinity with

Ⓐ CO_2 Ⓑ CO Ⓒ O_2 Ⓓ NH_3

78. Which of the following sequences is truly a systemic circulation pathway?

Ⓐ Right ventricle ⟶ Pulmonary arteries ⟶ Tissues ⟶ Pulmonary veins ⟶ Left atrium

Ⓑ Right atrium ⟶ Left ventricle ⟶ Aorta ⟶ Tissues ⟶ Veins ⟶ Left atrium

Ⓒ Left atrium ⟶ Left ventricle ⟶ Pulmonary arteries ⟶ Tissues ⟶ Right atrium

Ⓓ Left atrium ⟶ Left ventricle ⟶ Aorta ⟶ Arteries ⟶ Tissues ⟶ Veins ⟶ Right atrium

79. Atrial natriuretic hormone is produced by

Ⓐ Kidney Ⓑ Heart

Ⓒ Duodenum Ⓓ Thyroid gland

80. SA node is located in

Ⓐ Lower wall of right atrium Ⓑ Upper wall of right atrium

Ⓒ Upper wall of left atrium Ⓓ Lower wall of left atrium

81. Which of the following parts is not a part of axial skeleton?

Ⓐ Pelvic girdle Ⓑ Ribs

Ⓒ Sternum Ⓓ Vertebral column

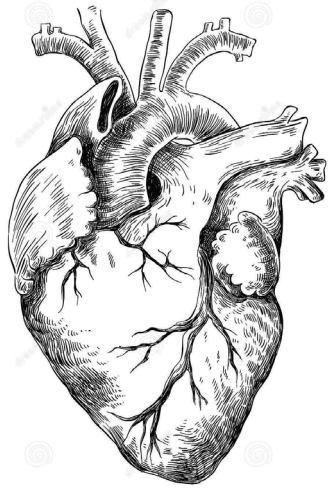
82. An autoimmune neuromuscular disorder leading to fluctuating muscle weakness and fatiguability is

Ⓐ Tetany Ⓑ Muscular dystrophy

Ⓒ Osteoporosis Ⓓ Myesthania gravis

Case Based Questions (83–86):

Observe the diagram given below and answer the following questions :



83. Bicuspid valve is present between

Ⓐ Right atrium and Right ventricle
Ⓑ Left atrium and Left ventricle
Ⓒ Right atrium and Left ventricle
Ⓓ Left atrium and Right ventricle

84. The left atrium receives oxygenated blood from the lungs through _____ pairs of pulmonary veins.

Ⓐ One Ⓑ Two Ⓒ Three Ⓓ Four

85. Which chamber has the thickest muscular wall?

Ⓐ Right atrium Ⓑ Right ventricle Ⓒ Left atrium Ⓓ Left ventricle

86. The AV node is found at the _____ .

Ⓐ lower left corner of right atrium
Ⓑ upper right corner of right ventricle
Ⓒ upper right corner of left atrium
Ⓓ lower left corner of left ventricle

Assertion-Reason type Questions (87–90):

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

A. Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.
B. Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
C. Assertion is true but Reason is false.
D. Assertion is false but Reason is true.

87. **Assertion:** The first branches of the trachea are called bronchi.

Reason: The trachea and bronchi are encircled by C-shaped rings of cartilage.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

88. **Assertion:** Haemoglobin combines with oxygen in a reversible manner to form oxyhaemoglobin.

Reason: When the oxygenated blood reaches the tissues, oxyhaemoglobin breaks quickly and sets the oxygen free to enter the tissues.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

89. **Assertion:** Gluteus maximus is largest muscle in the human body.

Reason: It is found in the hips.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

90. **Assertion:** The part of the myofibril between two successive Z-lines is called sarcomere.

Reason: Sarcomere is the functional unit of muscle contraction.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

91. Cnidoblasts help in –

Ⓐ Movement Ⓑ Paralysing the prey

Ⓒ Reproduction Ⓓ Sensitivity

92. Why are pneumatic bones found in birds?

Ⓐ To give strength to the body

Ⓑ To help the birds lay eggs

Ⓒ To maintain constant body temperature

Ⓓ To make the body light

93. Insectivorous plants, such as Pitcher plant and Venus fly trap, have

Ⓐ Modified leaf Ⓑ Modified stem Ⓒ Modified root Ⓓ All

94. Mitochondria are not found in

Ⓐ Liver cells Ⓑ Yeast Ⓒ Mature RBCs Ⓓ Immature RBCs

95. Light between which wavelengths is most effective for photosynthesis?

Ⓐ 300 nm and 500 nm Ⓑ 400 nm and 700 nm

Ⓒ 600 nm and 700 nm Ⓓ 350 nm and 680 nm

96. For how long does the contraction of muscles continue in the sliding filament theory?

Ⓐ Till Ca^{+2} is present in the sarcoplasm

Ⓑ Till ATP binds to myosin head

Ⓒ Till ADP binds to myosin head

Ⓓ Till polymerisation of myosin head continues

97. Muscle contains a red coloured oxygen containing pigment called _____.

Ⓐ Rhodopsin Ⓑ Myoglobin Ⓒ Haemocyanin Ⓓ Haemoglobin

98. Match the following columns :

	Column I (ECG Wave)		Column II (Features)
A.	P-wave	1.	Depolarisation of ventricles
B.	QRS complex	2.	Repolarisation of ventricles
C.	T-wave	3.	Depolarisation of interventricular septum
D.	Q-wave	4.	Depolarisation of atria

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

Assertion-Reason type Questions (99–100):

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

A. Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.

C. Assertion is true but Reason is false.

D. Assertion is false but Reason is true.

99. **Assertion:** Expiration is a passive process

Reason: It occurs when the intrapulmonary pressure is higher than the atmospheric pressure.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

100. **Assertion:** pO_2 is the highest in the alveoli.

Reason: Partial pressure of a gas is the pressure contributed by an individual gas in a mixture.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

Space For Rough Works

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