Monthly Progressive Test

Class: XI

Subject: PCMB

Academic **E**xcellence **P**rogramme
TECHNO ACE

Test Booklet No.: **MPT05**

Test Date: | 2 | 2 | 0 | 8 | 2 | 0 | 2 | 4 |

Time: 180 mins

Full Marks: 200

Important Instructions :

1. The Test is of 180 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 MPT0522082024.

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.

Physics

1. A 40 kg slab rests on a frictionless floor. A 10 kg block rests on top of the slab (figure). The static coefficient of friction between the block and the slab is 0.60 while the kinetic coefficient is 0.40. The 10 kg block is acted upon by a horizontal force of 100 N. If $g = 9.8$ m/s² the resulting acceleration of the slab will be:

100 N ← 10 kg Block
40 kg Slab
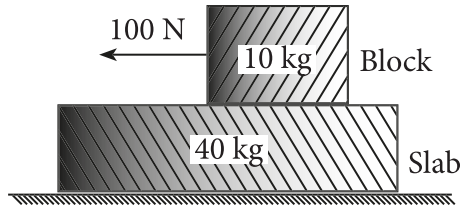
Ⓐ 0.98 m/s²   Ⓑ 1.47 m/s²   Ⓒ 1.52 m/s²   Ⓓ 6.1 m/s²

2. A block takes twice as much time to slide down a 45° rough inclined plane as it takes to slide down a similar smooth plane. The coefficient of friction is:

Ⓐ $\dfrac{3}{4}$ Ⓑ $\dfrac{\sqrt{3}}{2}$ Ⓒ $\dfrac{1}{4}$ Ⓓ $\dfrac{1}{3}$

3. A particle moves from a point $(-2\hat{i} + 5\hat{j})$ to $(4\hat{j} + 3\hat{k})$ when a force of $(4\hat{i} + 3\hat{j})$ is applied. How much work has been done by the force?

Ⓐ 8 J   Ⓑ 11 J   Ⓒ 5 J   Ⓓ 2 J

4. A block of mass 2 kg is free to move along the x-axis. It is at rest and from $t = 0$ s onwards it is subjected to a time-dependent force $F(t)$ in the x-direction. The kinetic energy of the block after 4.5 s is

$F(t)$ (Newton)

4 N

0   3 s   4.5 s t (s)
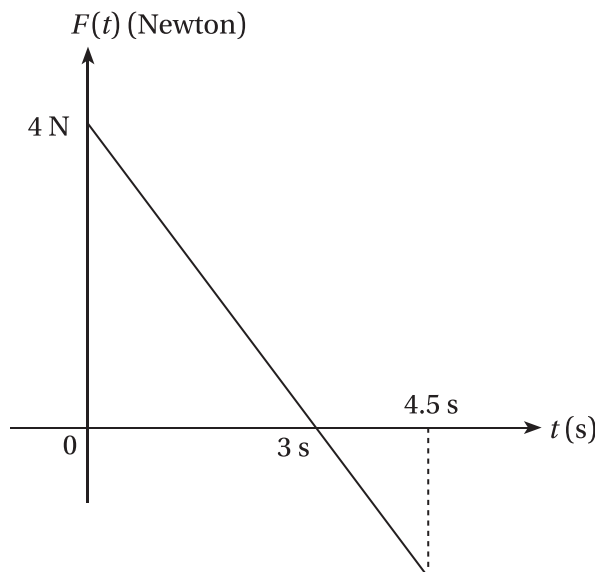
Ⓐ 4.5 J   Ⓑ 7.50 J   Ⓒ 5.06 J   Ⓓ 14.06 J

5. A body of mass m_1 collides elastically with another body of mass m_2 at rest. If the velocity of m_1 after collision becomes $\frac{2}{3}$ times its initial velocity, the ratio of their masses is

Ⓐ $1:5$ Ⓑ $5:1$ Ⓒ $5:2$ Ⓓ $2:5$

6. Four particles A, B, C and D with masses $m_A = m$, $m_B = 2m$, $m_C = 3m$ and $m_D = 4m$ are at the corners of a square. They have accelerations of equal magnitude with directions as shown. The acceleration of the centre of mass of the particles (in ms^{-2}) is
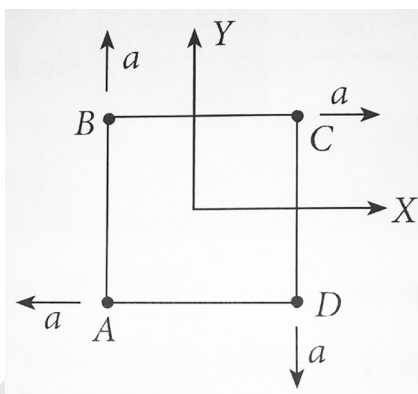
Ⓐ $\frac{a}{5}(\hat{i} - \hat{j})$ Ⓑ $a(\hat{i} + \hat{j})$ Ⓒ Zero   Ⓓ $\frac{a}{5}(\hat{i} + \hat{j})$

7. The potential energy $U = \dfrac{a}{r^2} - \dfrac{b}{r}$. Then find out maximum force (if $a = 2$, $b = 4$)

Ⓐ $-\dfrac{16}{27}$ N   Ⓑ $-\dfrac{32}{27}$ N   Ⓒ $\dfrac{32}{27}$ N   Ⓓ $\dfrac{16}{27}$ N

Assertion Reason based Questions (8–9):

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

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.

8. Assertion : Lighter and heavier bodies moving with same momenta and experiencing same retarding force have equal stopping times.

Reason : For a given force and momentum, stopping time is independent of mass.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

9. **Assertion :** An object of mass m is initially at rest. A constant force *F* acts on it . Then the velocity gained by the object, in a fixed displacement, is inversely proportional to $\sqrt{m}$.

   Reason : For a given force and displacement, velocity is always inversely proportional to mass.

   (A) A　　　　(B) B　　　　(C) C　　　　(D) D

10. A smooth block is released at rest on a 45° incline and then slides a distance d. The time taken to slide is *n* times as much to slide on rough incline than on a smooth incline. The coefficient of friction is

   (A) $1+\left(\dfrac{1}{n^2}\right)$　　　(B) $\sqrt{\left\{1+\left(\dfrac{1}{n^2}\right)\right\}}$　　　(C) $1-\left(\dfrac{1}{n^2}\right)$　　　(D) $1-\left(\dfrac{1}{n}\right)$

11. A block of mass 10 kg is moving under a constant force 40 N against opposing kinetic friction of 20 N. Then acceleration of block is

   (A) 2 m/s²　　　(B) 1 m/s²　　　(C) 3 m/s²　　　(D) 4 m/s²

12. A player caught a cricket ball of mass 150 g moving at a rate of 20 m/s. If the catching process is completed in 0.1 s, the force of the blow exerted by the ball on the hand of the player is equal to

   (A) 30 N　　　(B) 300 N　　　(C) 150 N　　　(D) 3 N

13. A body moves a distance of 10 m along a straight line under the action of a force of 5 newton. If the work done is 25 joule, the angle which the force makes with the direction of motion body is

   (A) 0°　　　(B) 30°　　　(C) 60°　　　(D) 90°

14. If a force *F* is applied on a body which moves with *V* in the direction of the force, then the power will be

   (A) FV^2　　　(B) FV　　　(C) F/V^2　　　(D) F/V

15. A ball impinges directly on a similar ball at rest. The first ball is brought to rest by the impact. If half of the kinetic energy is lost by impact, the value of coefficient of restitution is

   (A) $\dfrac{1}{2\sqrt{2}}$　　　(B) $\dfrac{1}{\sqrt{3}}$　　　(C) $\dfrac{1}{\sqrt{2}}$　　　(D) $\dfrac{\sqrt{3}}{2}$

Assertion and Reason (16 – 17):

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

These consist of two statements. Assertion(A) and Reason (R). Answer these questions selecting the appropriate option given below.

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:** Elevation angle (θ) of the projectile at its highest point as seen from the point of projection is $\tan\theta = (1/2)$.

    Reason: The projectile is fired at an angle of of 45° with the horizontal.

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

17. **Assertion:** It is given that a particle has speed $7\sqrt{2}$ unit after 10s from start.

    Reason: The particle has initial velocity $(3i + 4j)$ unit and acceleration $(0.1i + 0.3j)$ unit after 10 s from start.

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

18. A projectile is given initial velocity of $(\bar{i} + 2\bar{j})$ m/s, g = 10 m/s². The equation of its trajectory

    Ⓐ $y = 2x - 5x^2$ Ⓑ $4y = 2x - 5x^2$ Ⓒ $4y = 2x - 5x^2$ Ⓓ $y = x - 5x^2$

19. A plane is traveling eastward at a speed of 500 km h⁻¹. But a 90 km h⁻¹ wind is blowing southward. What is the speed of the plane relative to the ground ?
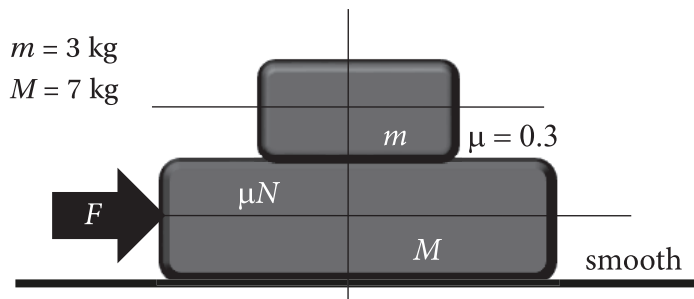
    Ⓐ 508 km h⁻¹   Ⓑ 200 km h⁻¹

    Ⓒ 400 km h⁻¹   Ⓓ 150 km h⁻¹

20. Two stones are dropped down simultaneously from different heights. At the time of starting, the distance between the stones is 30 cm. After 2 second, what will be the distance between the two stones?

    Ⓐ 10 cm   Ⓑ 5 cm   Ⓒ 20 cm   Ⓓ 30 cm

Case Study Based Questions (21–24):

A typical problem on two blocks

$m = 3$ kg
$M = 7$ kg
m
$\mu = 0.3$
μN
F
M
smooth

A block mass m = 3 kg rests on another block of mass M = 7 kg. The coefficient of friction between two blocks is 0.3 [g = 10 ms^{-2}] and the bigger block rests on a smooth floor.

21. If a horizontal push force of F = 9 N is given on lower block the accelerations a_1 (of M) and a_2 (of m) are given by [a_1 and a_2 are measured with respect fixed horizontal floor]

Ⓐ $a_1 = 0$ ms^{-2}, $a_2 = 0.9$ ms^{-2}
Ⓑ $a_1 = 0.9$ ms^{-2}, $a_2 = 0.9$ ms^{-2}
Ⓒ $a_1 = 0.9$ ms^{-2}, $a_2 = 0$ ms^{-2}
Ⓓ $a_1 = 0$ ms^{-2}, $a_2 = 0$ ms^{-2}

22. In above if F = 23 N then

Ⓐ $a_1 = 2$ ms^{-2}, $a_2 = 2$ ms^{-2}
Ⓑ $a_1 = 1$ ms^{-2}, $a_2 = 0.5$ ms^{-2}
Ⓒ $a_1 = 2$ ms^{-2}, $a_2 = 1$ ms^{-2}
Ⓓ $a_1 = 2$ ms^{-2}, $a_2 = 0$ ms^{-2}

23. In above if F = 30 N then

Ⓐ $a_1 = 3$ ms^{-2}, $a_2 = 1$ ms^{-2}
Ⓑ $a_1 = 0$ ms^{-2}, $a_2 = 3$ ms^{-2}
Ⓒ $a_1 = 3$ ms^{-2}, $a_2 = 3$ ms^{-2}
Ⓓ $a_1 = 3$ ms^{-2}, $a_2 = 0$ ms^{-2}

24. In above if F = 44 N then

Ⓐ $a_1 = 5$ ms^{-2}, $a_2 = -7$ ms^{-2}
Ⓑ $a_1 = 5$ ms^{-2}, $a_2 = 2$ ms^{-2}
Ⓒ $a_1 = -5$ ms^{-2}, $a_2 = -2$ ms^{-2}
Ⓓ $a_1 = 5$ ms^{-2}, $a_2 = -2$ ms^{-2}

25. A force $F = 20 + 10y$ acts on a particle in y-direction where F is in Newton and y-in metre. Work done by this force to move the particle from $y = 0$ to 1 m is

Ⓐ 20 J
Ⓑ 30 J

Ⓒ 5 J
Ⓓ 25 J

Chemistry

26. X = Change in bond order value when O_2 forms O_2^{2-} ion

Y = Change in bond order value when H_2 forms H_2^- ion

The correct value of $[2(X + Y)]$ is

Ⓐ 2   Ⓑ 3   Ⓒ 4   Ⓓ 5

27. The increasing order of viscosity of the following compounds is given by Hexane < Water < Glycerol. Which of the following is the correct reason ?

Ⓐ Hexane has strong intermolecular forces

Ⓑ Water has strongest intermolecular forces

Ⓒ Glycerol has strong intermolecular forces

Ⓓ Hexane has the highest molecular mass among these three compounds

28. The negative deviation from ideal behaviour stands for the

Ⓐ value of PV decreases with decrease in pressure

Ⓑ value of PV decreases with increase in pressure

Ⓒ value of PV increases with increase in pressure

Ⓓ value of PV remains constant with increase in pressure

29. Correct order of thermal stability is

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

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

30. Find out the correct statement

Ⓐ CH_2Cl_2 is non-polar but CH_3Cl is a polar molecule

Ⓑ $SnCl_4$ is more covalent than $SnCl_2$

Ⓒ Dipole moment of CO_2 is more than SO_2

Ⓓ LiCl is less water soluble than NaCl at a constant temperature

Question number 31 to 32 are *ASSERTION-REASON TYPE QUESTIONS*. Select the correct option

OPTION A : Assertion and reason both are correct and reason is the correct explanation of assertion

OPTION B : Assertion and reason both are correct and reason is not the correct explanation of assertion

OPTION C : Assertion is correct but reason is wrong

OPTION D : Assertion is wrong but reason is correct

31. **Assertion :** H_2S can release H^+ ion more easily than H_2O

Reason : Due to larger size of sulphur, extent of overlap between sulphur and hydrogen is lower than that between oxygen and hydrogen in water

32. **Assertion :** Under similar conditions of temperature and pressure, O_2 diffuses 1.4 times faster than SO_2

Reason : Density of SO_2 is 1.4 times higher than that of O_2

33. Valance bond theory (VBT) is not associated with

Ⓐ Antibonding electrons

Ⓑ Overlap of orbitals

Ⓒ Energy of orbitals

Ⓓ Nucleus and outer shell electron attraction

34. In an ionic compound A^+X^-, degree of covalent character is higher when

Ⓐ Both A^+ and X^- are large 　　　　Ⓑ Both A^+ and X^- are small

Ⓒ Both A^+ and X^- have similar size 　　Ⓓ Cation A^+ is small and anion X^- is large

35. What is the correct nearest representation of universal gas constant (R) ?

Ⓐ $R = \dfrac{\dfrac{Force}{(Length)^3} \times (Length)^2}{Temperature}$ 　　　　Ⓑ $R = \dfrac{\dfrac{Force}{(Length)^2} \times (Length)^3}{Temperature}$

Ⓒ $R = \dfrac{\dfrac{Force}{(Length)^2} \times (Length)^4}{Temperature}$ 　　　　Ⓓ $R = \dfrac{\dfrac{Force}{(Length)^4} \times (Length)^2}{Temperature}$

36. When temperature of a solution is increased then surface tension decreases. Which of the following points are truly matching with this statement

(I) on increasing temperature, randomness of the system increases

(II) on increasing temperature, the liquid starts vapourising

(III) on increasing temperature, intermolecular force of attraction decreases

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

37. According to kinetic theory of gases

Ⓐ the collisions between the gas molecule are completely elastic

Ⓑ weak force of attraction is there between the gas molecules

Ⓒ the collision between gas molecules and inner walls is completely inelastic

Ⓓ after the collision , velocity of the molecules increases

38. X = Number of lone pair on sulphur in SF_4

Y = Number of lone pair on xenon in XeF_4

Z = Total number of lone pairs in CO_2

What is the value of $[X + 2Y + Z]$?

Ⓐ 7   Ⓑ 8   Ⓒ 9   Ⓓ 6

39. Which of the following is not associated with hydrogen bonding ?

Ⓐ NH_3 is highly soluble in water but CH_4 is insoluble

Ⓑ KHF_2 exists but $KHCl_2$ does not

Ⓒ H_3BO_3 is solid and a very weak Bronsted acid

Ⓓ HI is stronger Bronsted acid than HCl

40. Correct order of bond angle is

Ⓐ $CO_2 > BF_3 > NH_3 > H_2O$ Ⓑ $CO_2 > NH_3 > BF_3 > H_2O$

Ⓒ $CO_2 > BF_3 > H_2O > NH_3$ Ⓓ $CO_2 > H_2O > NH_3 > BF_3$

41. Energy of which is equal to – 54.4 eV ?

Ⓐ 2nd Bohr orbit of Li^{2+} (Z = 3)   Ⓑ 2nd Bohr orbit of Be^{3+} (Z = 4)

Ⓒ 3rd Bohr orbit of Li^{2+} (Z = 3)   Ⓓ 4th Bohr orbit of Be^{3+} (Z = 4)

42. The magnetic moment of M^{x+} (atomic number = 25) is $\sqrt{15}$ BM. The number of unpaired electrons and the value of 'x' respectively are

Ⓐ 4, 3   Ⓑ 3, 4   Ⓒ 3, 2   Ⓓ 5, 2

43. If Avogadro number is 6.02×10^{23}, then how many electrons are present in 0.05 gm hydrogen molecules ?

Ⓐ 301×10^{21} Ⓑ 301×10^{20} Ⓒ 301×10^{19} Ⓓ 301×10^{22}

44. Consider the given equation $Na_2CO_3 + 2HCl \longrightarrow 2NaCl + CO_2 + H_2O$

Correct products are when 0.53 gm Na_2CO_3 is reacting completely

[atomic weight : Na = 23, C = 12, O = 16, Avogadro number = 6.02×10^{23}]

Ⓐ 0.56 L CO_2 at STP and 6.02×10^{21} water molecules

Ⓑ 0.224 L CO_2 at STP and 3.01×10^{21} water molecules

Ⓒ 0.112 L CO_2 at STP and 3.01×10^{21} water molecules

Ⓓ 0.112 L CO_2 at STP and 6.02×10^{21} water molecules

Question number 45 is ASSERTION-REASON TYPE QUESTIONS. Select the correct option

OPTION A : Assertion and reason both are correct and reason is the correct explanation of assertion

OPTION B : Assertion and reason both are correct and reason is not the correct explanation of assertion

OPTION C : Assertion is correct but reason is wrong

OPTION D : Assertion is wrong but reason is correct

45. **Assertion :** NaI shows more water solubility than NaCl at constant temperature

    Reason : Higher the radius of anion, extent of hydration is higher

46. 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

47. A bubble of volume V_1 is at the bottom of a pond at 15°C and 1.5 atm pressure. When it comes to the surface, it is observed that the pressure is 1 atm and temperature is 25°C and the volume is V_2. What is the correct relationship between V_1 and V_2 ?

    Ⓐ $V_2 \rangle 2.V_1$ Ⓑ $V_2 \approx (1.5).V_1$ Ⓒ $V_2 \langle (0.5).V_1$ Ⓓ $V_2 \rangle 3.V_1$

Question number 48 to 50 are *CASE BASED QUESTIONS*. Read the passage carefully and select the correct option

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.

48. The correct order of carbon - carbon bond length is

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

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

49. Correct order of ∠HMH bond angle is

    Ⓐ $H_2Te > H_2Se > H_2S > H_2O$ Ⓑ $H_2Te > H_2S > H_2O > H_2Se$

    Ⓒ $H_2O > H_2S > H_2Se > H_2Te$ Ⓓ $H_2O > H_2Se > H_2S > H_2Te$

50. 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 lone pairs 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

Mathematics

51. If the coefficient of x^6 in $\left(x^3 + \dfrac{k}{x}\right)^6$ is 160, then k is equal to

Ⓐ 3   Ⓑ 4   Ⓒ 2   Ⓓ None of these

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

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

53. The sum of the first 10 terms of a certain G.P. is equal to 244 times the sum of the first 5 terms. Then the common ratio is

Ⓐ 4   Ⓑ 7   Ⓒ 2   Ⓓ 3

54. If a, b, c, d are positive real numbers such that $a + b + c + d = 2$, then $M = (a + b)(c + d)$ satisfies the relation

Ⓐ $0 < M \leq 1$ Ⓑ $1 \leq M \leq 2$ Ⓒ $2 \leq M \leq 3$ Ⓓ None of these

55. If A and G be the A.M. and G.M. respectively between two numbers, then the numbers are

Ⓐ $A \pm \sqrt{G^2 - A^2}$ Ⓑ $A \pm \sqrt{A^2 - G^2}$ Ⓒ $A \pm \sqrt{A^2 + G^2}$ Ⓓ $G \pm \sqrt{A^2 - G^2}$

56. A line passing through $(2, 2)$ is perpendicular to the line $3x + y = 3$. Its y intercept is

Ⓐ $\dfrac{1}{3}$ Ⓑ $\dfrac{2}{3}$ Ⓒ 1   Ⓓ $\dfrac{4}{3}$

57. The line $(p + 2q)x + (p - 3q)y = p - q$ for different values of p and q passes through the point

Ⓐ $\left(\dfrac{3}{2}, \dfrac{5}{2}\right)$ Ⓑ $\left(\dfrac{2}{3}, \dfrac{2}{5}\right)$ Ⓒ $\left(\dfrac{3}{5}, \dfrac{3}{5}\right)$ Ⓓ $\left(\dfrac{2}{5}, \dfrac{3}{5}\right)$

Assertion Reason based Questions (58–59):

Directions: In this question, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choice.

(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:** If $(1+ax)^n = 1+8x+24x^2+...$, then the values of a and n are 2 and 4 respectively.

   Reason: $(1+x)^n = 1+nx+\dfrac{n(n-1)}{2!}x^2 + ...$ for all $n \in Z^+$.

   Ⓐ a   Ⓑ b   Ⓒ c   Ⓓ d

59. **Assertion:** If the third term of a G.P. is 4, then the product of its first five terms is 4^5.

   Reason: Product of first five terms of a G.P. is given as $a\,(ar)\,(ar^2)\,(ar^3)\,(ar^4)$.

   Ⓐ a   Ⓑ b   Ⓒ c   Ⓓ d

Case Study based Questions (60–62):

Three girls Rani, Mansi, Sneha are talking to each other while maintaining a social distance due to covid-19. They are standing on vertices of a triangle, whose coordinates are given.

Rani (2, –2)

Mansi (1, 1)   Sneha (–1, 0)
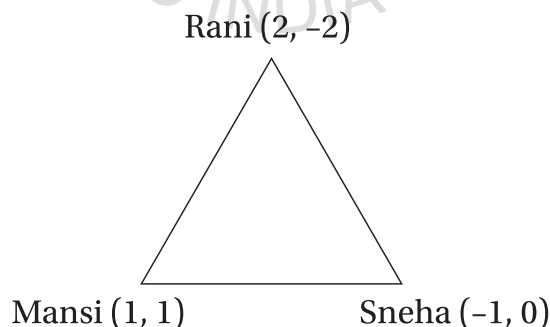
Based on the above information answer the following questions.

60. Slope of equation of line formed by Rani and Sneha is

   Ⓐ $\dfrac{2}{3}$ Ⓑ $\dfrac{-3}{2}$ Ⓒ $\dfrac{-2}{3}$ Ⓓ $\dfrac{1}{3}$

61. The equation of median through Rani is

   Ⓐ $5x+4y=2$ Ⓑ $5x-4y=2$ Ⓒ $4x-5y=1$ Ⓓ None of these

62. The equation of line passing through Rani and parallel to line formed by Mansi and Sneha is

Ⓐ $x - 2y = 4$ Ⓑ $x + 2y = 6$ Ⓒ $x - 2y = 6$ Ⓓ $2x + y = 4$

63. Which of the following values of n are possible, if the middle term of $(x + 3y)^n$ is the fifth term.

Ⓐ 6, 7 or 8   Ⓑ 7, 8 or 10   Ⓒ 7, 8 or 9   Ⓓ 8, 9 or 10

64. Which term of G.P. 25, 125, 625, ... is 390625?

Ⓐ 5   Ⓑ 6   Ⓒ 7   Ⓓ 8

65. Find the distance between $2x + y + 4 = 0$ and $2x + y + 8 = 0$.

Ⓐ $\dfrac{4}{\sqrt{5}}$ units   Ⓑ $\dfrac{3}{\sqrt{5}}$ units   Ⓒ $\dfrac{9}{\sqrt{5}}$ units   Ⓓ $\dfrac{3}{\sqrt{2}}$ units

66. If $\tan x = \dfrac{b}{a}$, then the value of $a \cos 2x + b \sin 2x$ is

Ⓐ a Ⓑ $a - b$ Ⓒ $a + b$ Ⓓ b

67. The range of $f(x) = \dfrac{x}{1 + x^2}$ is

Ⓐ $\left[-\dfrac{1}{2}, \dfrac{1}{2}\right]$ Ⓑ $\left(-\dfrac{1}{2}, \dfrac{1}{2}\right)$ Ⓒ $\left[-\dfrac{1}{2}, 0\right) \cup \left(0, \dfrac{1}{2}\right]$ Ⓓ $[-1, 1]$

68. Let $x = \sin 1°$, then the value of the expression

$$\frac{1}{\cos 0° . \cos 1°} + \frac{1}{\cos 1° . \cos 2°} + \frac{1}{\cos 2° . \cos 3°} + ... + \frac{1}{\cos 44° . \cos 45°} \text{ is equal to}$$

Ⓐ x Ⓑ $\dfrac{1}{x}$ Ⓒ $\dfrac{\sqrt{2}}{x}$ Ⓓ $\dfrac{x}{\sqrt{2}}$

69. 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

70. Value of $\dfrac{\sin 13° \cos 47° + \cos 13° \sin 47°}{\cos 72° \cos 12° + \sin 72° \sin 12°}$

Ⓐ 1   Ⓑ 0   Ⓒ $\dfrac{1}{\sqrt{3}}$ Ⓓ $\sqrt{3}$

71. The 5$^{\text{th}}$ term from the end in the expansion of $\left(3x - \dfrac{1}{x^2}\right)^{10}$ is

Ⓐ $\dfrac{17010}{x^{10}}$ Ⓑ $\dfrac{17010}{x^8}$ Ⓒ $\dfrac{210}{x^8}$ Ⓓ None of these

72. If A is the single AM between two numbers and S is the sum of the n AM's inserted between them, then $\dfrac{S}{A}$ depends on

Ⓐ n 　　　Ⓑ n, a 　　　Ⓒ n, b 　　　Ⓓ n, a, b

73. $9^{1/3} \times 9^{1/9} \times 9^{1/27} \times \ldots\ldots$ to $\infty =$

Ⓐ 9 　　　Ⓑ 3 　　　Ⓒ 81 　　　Ⓓ $\sqrt[3]{81}$

74. The angle between the lines $2x + 3 = 0$ and $3y = 5$ is

Ⓐ $0°$ 　　　Ⓑ $30°$ 　　　Ⓒ $60°$ 　　　Ⓓ $90°$

75. If $\dfrac{x}{c} + \dfrac{y}{d} = 1$ be any line through the intersection of lines $\dfrac{x}{a} + \dfrac{y}{b} = 1$ and $\dfrac{x}{b} + \dfrac{y}{a} = 1$, then

Ⓐ $\dfrac{1}{a} + \dfrac{1}{d} = \dfrac{1}{b} + \dfrac{1}{c}$

Ⓑ $\dfrac{1}{b} + \dfrac{1}{d} = \dfrac{1}{c} + \dfrac{1}{a}$

Ⓒ $\dfrac{1}{c} + \dfrac{1}{d} = \dfrac{1}{a} + \dfrac{1}{b}$

Ⓓ None of these

Biology

76. Fluid mosaic model of cell membrane proposes that

Ⓐ A lipid bilayer with embedded proteins only

Ⓑ A lipid bilayer with proteins on the outer surface only

Ⓒ A lipid bilayer coated with proteins on both the surfaces

Ⓓ A lipid bilayer with proteins of two types, embedded (intrinsic) and superficial (extrinsic)

77. Mitochondria are not found in

Ⓐ Liver cells 　　　Ⓑ Yeast 　　　Ⓒ Mature RBCs 　　　Ⓓ Immature RBCs

78. In plant cells the number of golgi bodies increases during

Ⓐ Respiration 　　　Ⓑ Cell division 　　　Ⓒ Translocation 　　　Ⓓ Food synthesis

79. The simplest amino acid is—

Ⓐ Tyrosine 　　　Ⓑ Lysine 　　　Ⓒ Glycine 　　　Ⓓ Aspartic acid

80. The enzyme used for alcohol formation by fermentation is—

Ⓐ Invertase 　　　Ⓑ Lipase 　　　Ⓒ Amylase 　　　Ⓓ Zymase

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81. What would be the change in the chromosome number, during S-phase?

Ⓐ No change

Ⓑ The number of chromosome doubles

Ⓒ The number of chromosome doubles only in case of diploid cell

Ⓓ The number of chromosome doubles only in the case of haploid cell

82. Stages in proper sequence of prophase-I are—

Ⓐ Zygotene, Leptotene, Pachytene, Diakinesis and Diplotene

Ⓑ Leptotene, Zygotene, Pachytene, Diplotene and Diakinesis

Ⓒ Leptotene, Zygotene, Pachytene, Diakinesis and Diplotene

Ⓓ Leptotene, Pachytene, Zygotene, Diakinesis and Diplotene

Assertion-Reason Based Questions (83–85):

Answer these questions selecting the appropriate option from the list given below.

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.

83. **Assertion:** Centromere holds two chromatids of a chromosome together.

Reason: Based on the position of centromere, chromosomes are classified as metacentric, sub metacentric, acrocentric and telocentric.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

84. **Assertion:** Cellulose is a polymeric polysaccharide.

Reason: Cellulose is a heteropolymer.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

85. **Assertion:** During Anaphase in mitosis, nuclear envelope assembles around the chromosome clusters.

Reason: Anaphase is one of the stages of nuclear division during mitosis.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Case Study Based Questions (86–90):

The endomembrane system includes the endoplasmic reticulum, Golgi complex, lysosomes and vacuoles. Since the functions of mitochondria, chloroplast and peroxisomes are not coordinated with the above components, these are not considered to be a part of the

system. The functions of the organelles making up the EM system are coordinated.

86. Lipid-like steroidal hormones are secreted by—

Ⓐ RER   Ⓑ SER   Ⓒ Golgi complex   Ⓓ Lysosome

87. _____ forms the acrosome of sperms.

Ⓐ ER   Ⓑ Golgi body   Ⓒ Lysosome   Ⓓ Both Ⓐ and Ⓑ

88. Proteins synthesised by the ribosomes of RER are released from the

Ⓐ Cis face of Golgi body   Ⓑ Trans face of Golgi body

Ⓒ Lysosome   Ⓓ Vacuoles

89. Lysosomal enzymes are optimally active at_____

Ⓐ Acidic pH   Ⓑ Basic pH   Ⓒ Neutral pH   Ⓓ All pH

90. Which organelle provides turgidity to the plant cells?

Ⓐ ER   Ⓑ Golgi body   Ⓒ Lysosomes   Ⓓ Vacuoles

91. What is the common name of *Sphagnum*?

Ⓐ Peat moss   Ⓑ Turf moss   Ⓒ Bog moss   Ⓓ All of the above

92. In which of the following animals, respiration occurs without any respiratory organ?

Ⓐ Frog   Ⓑ Fish   Ⓒ Cockroach   Ⓓ Earthworm

93. Connecting link between chordates and non chordates is

Ⓐ *Peripatus*   Ⓑ *Balanoglossus*   Ⓒ *Sphenodon*   Ⓓ *Tachyglossus*

94. 'Wheel organ' of Cephalochordates help in—

Ⓐ Excretion   Ⓑ Osmoregulation   Ⓒ Ingestion   Ⓓ Respiration

95. Which of the following plants is used to extract blue dye?

Ⓐ *Trifolium*   Ⓑ *Indigofera*   Ⓒ *Lupin*   Ⓓ *Cassia*

96. Which one of the following graphs show the relationship between the enzymatic activity and substrate concentration?

(a) V / s   (b) V / s   (c) V / s   (d) V / s
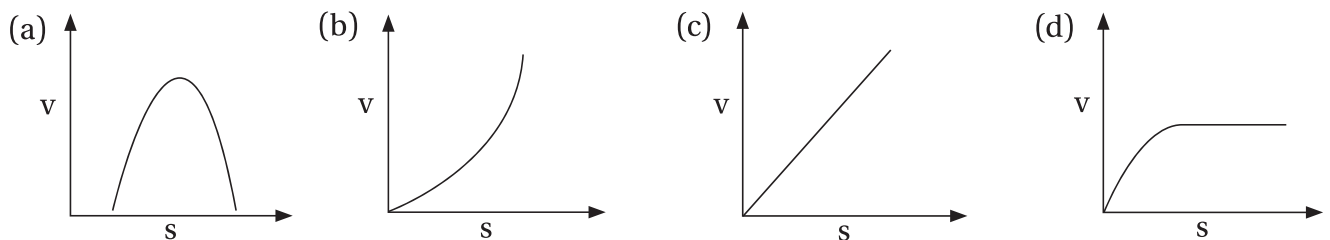
Ⓐ a   Ⓑ b   Ⓒ c   Ⓓ d

Assertion-Reason Based Questions (97):

Answer these questions selecting the appropriate option from the list given below.

    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.
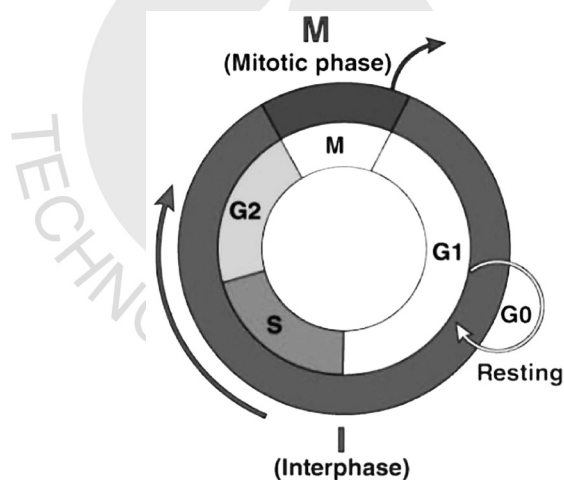
    D. Assertion is false but Reason is true.

97. **Assertion:** Starch is a non sugar.

    Reason: Starch is a polysaccharide

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Case Study Based Questions (98–100):

    The diagram of the Cell cycle given below and answer the following questions.

98. Name the phase where DNA synthesis occurs.

    Ⓐ G1   Ⓑ S   Ⓒ G2   Ⓓ M

99. During which stage does the cleavage furrow appear?

    Ⓐ Before karyokinesis   Ⓑ During cytokinesis

    Ⓒ After cytokinesis   Ⓓ During prophase

100. Diakinesis is the phase which represents the transition from—

    Ⓐ Prophase I to Metaphase I   Ⓑ Prophase II to Metaphase II

    Ⓒ Telophase I to Prophase II   Ⓓ Pachytene to Diplotene

Space For Rough Works