Monthly Progressive Test

Class: XI

Subject: PCMB

Test Booklet No.: MPT06

Test Date: | 0 | 3 | 1 | 0 | 2 | 0 | 2 | 4 |

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 MPT0603102024.

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. The value of G

    Ⓐ Decreases with height
    Ⓑ Is zero at the centre of Earth
    Ⓒ Increases with height
    Ⓓ Remains same everywhere

2. If the distance between the Sun and Earth is increased to twice then the F_{new} will

    Ⓐ Decrease by 75% Ⓑ Increase 25% Ⓒ Remain same Ⓓ Decrease by 25%

3. Two bodies having masses u and v are separated by a distance x, then the gravitational force between them will be $F =$

    Ⓐ $\dfrac{gu.v}{x}$
    Ⓑ $\dfrac{Gu.v}{x^2}$
    Ⓒ $\dfrac{Gu^2}{x}$
    Ⓓ $\dfrac{gu}{x^2}$

4. If the masses of two objects are halved (each) and separation between them is also halved, the new gravitation force between them becomes $F_{new} =$

    Ⓐ $F_{initial}$
    Ⓑ $2F_{initial}$
    Ⓒ $0.5 \times F_{initial}$
    Ⓓ $4F_{initial}$

5. A stone is allowed to fall from the top of a tower 100 m high and at the same time another stone is projected vertically upwards from the ground with a velocity of 25 m/s, then

    Ⓐ Two stones meet after 4 s at a height 10 m from the ground
    Ⓑ Two stones meet after 4 s at a height of 20 m from the ground
    Ⓒ Two stones meet after 5 s
    Ⓓ Two stones meet at a height of 30 m

6. If the weight of a body is same at height h and depth d (where h and d are much smaller than the radius of earth), then $h : d =$

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

7. If g_e and g_p denote accelerations due to gravity on the surface of the earth and on a planet respectively whose mass and radius are twice that of the earth, then

    Ⓐ $g_e = g_p$
    Ⓑ $g_e = 2g_p$
    Ⓒ $2g_e = g_p$
    Ⓓ $g_e = 4g_p$

8. Radius of gyration of a ring of mass M and radius R, about a rotational axis perpendicular to plane passing through the centre of mass

    Ⓐ R^2
    Ⓑ R
    Ⓒ $\dfrac{R}{2}$
    Ⓓ None of these

9. Moment of inertia of a ring of mass M and radius R, about a rotational axis perpendicular to plane passing through the centre of mass

    Ⓐ MR^2
    Ⓑ $\dfrac{MR^2}{3}$
    Ⓒ $\dfrac{MR^2}{2}$
    Ⓓ None of these

10. Moment of inertia of a ring of mass M and radius R, about a rotational axis passing through the diameter is

Ⓐ MR^2 Ⓑ $\dfrac{MR^2}{3}$ Ⓒ $\dfrac{MR^2}{2}$ Ⓓ None of these

11. Radius of gyration of a ring of mass M and radius R, about a rotational axis passing through diameter in the plane is

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

12. Moment of inertia of a ring of mass M and radius R, about a rotational axis which is a tangent perpendicular to the plane is

Ⓐ MR^2 Ⓑ $\dfrac{MR^2}{3}$ Ⓒ $\dfrac{MR^2}{2}$ Ⓓ $2MR^2$

Assertion-Reason type Questions (13–14):

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.

13. Assertion: Every point in the rotating rigid body has the same angular velocity at any instant of time.

Reason: In rotation about a fixed axis, every particle of the rigid body moves in a circle which lies in a plane perpendicular to the axis and has its centre on the axis.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

14. Assertion: Centre of gravity of an extended body may coincides with its centre of mass.

Reason: Coincides only if gravitational field doesn't vary from one part of the body to the other part.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Case Study Based Question (15):

A wheel starting from rest is uniformly accelerated at 4 rad/s² for 10 s. It is allowed to rotate uniformly for the next 10 s and is finally brought to rest in the next 10 s.

15. The total angle rotated by the wheel

Ⓐ 800 rad   Ⓑ 400 rad   Ⓒ 600 rad   Ⓓ 500 rad

16. For a projectile with initial velocity $\vec{u}(4\vec{i}+3\vec{j})$ m/s. The range is ($g = 10\,\text{m/s}^2$)

Ⓐ 2.4 m Ⓑ 4.8 m Ⓒ 6 m Ⓓ 2 m

17. Two projectiles A and B are projected with angle of projection 15° for projectile A and 45° for the projectile B. Then range R_A and R_B

Ⓐ $R_A < R_B$ Ⓑ $R_A = R_B$ Ⓒ $R_A > R_B$ Ⓓ Insufficient data

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

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

Assertion-Reason type Questions (19–20):

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.

19. 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

20. 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

21. Two discs of same moment of inertia rotating about their regular axis passing through centre and perpendicular to the plane of disc with angular velocities ω_1 and ω_2. They are brought into contact face to face coinciding the axis of rotation. The expression for loss of energy during this process is

Ⓐ $\dfrac{I}{4}(\omega_1 - \omega_2)^2$ Ⓑ $I(\omega_1 - \omega_2)^2$ Ⓒ $\dfrac{I}{8}(\omega_1 - \omega_2)^2$ Ⓓ $\dfrac{I}{2}(\omega_1 + \omega_2)^2$

22. A solid sphere of mass m and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation $(E_{sphere}/E_{cylinder})$ will be

Ⓐ $2:3$ Ⓑ $1:5$ Ⓒ $1:4$ Ⓓ $3:1$

23. A child is standing with folded hands at the centre of a platform rotating about its central axis. The kinetic energy of the system is K. The child now stretches his arms so that the moment of inertia of the system doubled. The kinetic energy of the system now is

Ⓐ $2K$ Ⓑ $\dfrac{K}{2}$ Ⓒ $\dfrac{K}{4}$ Ⓓ $4K$

24. When a mass is rotating in a plane about a fixed point, its angular momentum is directed along

Ⓐ A line perpendicular to the plane of rotation

Ⓑ The line making an angle of 45° to the plane of rotation

Ⓒ The radius

Ⓓ The tangent to the orbit

25. A disc of radius 20 cm and mass $\dfrac{1}{2}$ kg is rolling on an inclined plane. Find out the frictional force such that disc performs pure rolling. (given $\theta = 45°$)

Ⓐ $\dfrac{5\sqrt{2}}{3}$ N Ⓑ $\dfrac{5}{3\sqrt{2}}$ N Ⓒ $\dfrac{5}{\sqrt{2}}$ N Ⓓ $\dfrac{5}{2\sqrt{3}}$ N

Chemistry

26. Enthalpy of vaporization of a substance is 8400 J·mol⁻¹ and its boiling point is –173°C. The entropy of vaporization is

Ⓐ 84 J.K⁻¹·mol⁻¹ Ⓑ 21 J.K⁻¹·mol⁻¹ Ⓒ 49 J.K⁻¹·mol⁻¹ Ⓓ 12 J.K⁻¹·mol⁻¹

27. Considering the following two equations, what is the value of the enthalpy of formation of nitric oxide in KJ·mol⁻¹?

$N_2(g) + 2O_2(g) \rightarrow 2NO_2(g)$ + X KJ

$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$ + Y KJ

Ⓐ $(2X - 2Y)$ Ⓑ $(X - Y)$ Ⓒ $0.5(Y - X)$ Ⓓ $0.5(X - Y)$

28. In which of the following process, a maximum increase in entropy is observed ?

Ⓐ Dissolution of saline water

Ⓑ Condensation of water

Ⓒ Sublimation of naphthalene

Ⓓ Melting of ice

29. Molar heat capacity of a gas at constant T and P is :

Ⓐ $\dfrac{3}{2}R$

Ⓑ $\dfrac{5}{2}R$

Ⓒ infinity

Ⓓ depends on the atomicity of the gas.

30. 5 mol of ideal gas at 27°C expands isothermally and reversibly from a volume of 6 L to 60 L. The work done in KJ is

Ⓐ −14.7 Ⓑ −28.72 Ⓒ +28.27 Ⓓ +14.7

31. Which of the following defines $\Delta_f H$ (Enthalpy of formation)?

Ⓐ $C_{(diamond)} + O_{2(g)} \rightarrow CO_{2(g)}$

Ⓑ $\dfrac{1}{2}H_{2(g)} + \dfrac{1}{2}F_{2(g)} \rightarrow HF_{(g)}$

Ⓒ $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

Ⓓ $CO_{(g)} + \dfrac{1}{2}O_{2(g)} \rightarrow CO_{2(g)}$

32. Consider the following statements and select the correct option

Statement I : Methane is a polar molecule

Statement II : For all carbon atoms in butan - 1,3 - diene, the precentage of s - character is 33.33%

Ⓐ Both statements are correct

Ⓑ Statement I is correct and statement II is wrong

Ⓒ Statement I is wrong and statement II is correct

Ⓓ Both statements are wrong

33. Consider the following equations and what will the value of heat of formation of C_2H_2 ?

$$C_2H_2(g) + \dfrac{5}{2}O_2(g) \longrightarrow 2CO_2(g) + H_2O(l) \quad \Delta H_1 = -1301\,kJ$$

$$H_2(g) + \dfrac{1}{2}O_2(g) \longrightarrow H_2O(l) \quad \Delta H_2 = -286\,kJ$$

$$2C(g) + 2O_2(g) \longrightarrow 2CO_2(g) \quad \Delta H_3 = -787\,kJ$$

Ⓐ + 180 kJ Ⓑ – 800 kJ Ⓒ + 256 kJ Ⓓ + 228 kJ

34. Reaction $H_2(g) + I_2(g) \longrightarrow 2HI \quad \Delta H = +12.40\,kcal.$ According to this, heat of formation of HI will be

Ⓐ + 12.40 kcal Ⓑ – 12.40 kcal Ⓒ – 6.20 kcal Ⓓ + 6.20 kcal

35. How endothermic reactions can be made favourable ?

     Ⓐ By increasing temperature

     Ⓑ By decreasing temperature

     Ⓒ By increasing temperature at first then decreasing

     Ⓓ By decreasing temperature at first then increasing

Case Study Based Question (36–37):

The properties that depend on mass are known as extensive properties and the properties that do not depend on mass are known as intensive properties. If two extensive properties are divided by each other then an intensive property is received while addition of them results an extensive property. But any mathematical operation between two intensive properties results a new intensive property.

36. Which of the following is a unit less quantity ?

     Ⓐ Reactive index   Ⓑ Molarity

     Ⓒ Normality   Ⓓ Heat content of the system

37. Find out wrong statements

     (I) All extensive properties depend on temperature

     (II) Mole fraction is an unitless quantity

     (III) Volume of an ideal gas does not suffer any change with the change in temperature

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

Assertion Reason Type Question (38):

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

38. **Assertion:** Density is an intensive property

     Reason: Density changes with the change in temperature of the system

     Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Case Study Based Question (39–40):

Entropy, enthalpy, Gibbs free energy all are extensive properties and state functions. They are mathematically related to each other by the relationship. Gibbs free energy is defined as the net useful work done by the system. If the process is spontaneous then Gibbs free energy change is negative and it is positive in case of a non-spontaneous process. At equilibrium, Gibbs free energy change is zero.

39. For a reaction, $\Delta H = -15$ kJ.mol^{-1} and $\Delta S = -420$ J.K^{-1}.mol^{-1}. What is the value of Gibbs free energy change at 1000 K?

Ⓐ -405 kJ.mol^{-1} Ⓑ $+405$ kJ.mol^{-1} Ⓒ -202.5 kJ.mol^{-1} Ⓓ $+202.5$ kJ.mol^{-1}

40. For a reaction $\Delta H = 21$ kJ.mol^{-1} and $\Delta S = 105$ J.K^{-1}.mol^{-1}. At what temperature, the reaction will be at equilibrium ?

Ⓐ 200 K   Ⓑ 2000 K   Ⓒ 100 K   Ⓓ 400 K

Question number 41 is **_ASSERTION - REASON TYPE QUESTION._** Select the correct option

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

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

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

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

Ⓒ Assertion is correct but reason is wrong

Ⓓ Assertion is wrong but reason is correct

42. 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

43. 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

Case Study Based Question(44–45):

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

Ⓐ $C_2H_6 > C_2H_4 > C_2H_2$

Ⓑ $C_2H_6 > C_2H_2 > C_2H_4$

Ⓒ $C_2H_2 > C_2H_4 > C_2H_6$

Ⓓ $C_2H_2 > C_2H_6 > C_2H_4$

45. 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

46. The I.U.P.A.C name for the following compound is:

Ⓐ 3–bromo–3–methyl–1, 2–dimethyl prop–1–ene

Ⓑ 3–bromo–1, 2–dimethyl but–1–ene

Ⓒ 2–bromo–3–methylpent–3–ene

Ⓓ 4–bromo–3–methylpent–2–ene

47. How many are wrong nomenclature ?

(I) $H_2C = CHCH_2C \equiv CH$　　　　　　Pent - 4 - ene - 1 - yne
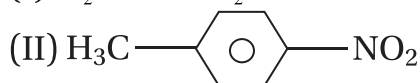
(II) H_3C—⬡—NO_2　　　　　　　4 -methylnitrobenzene

(III) $H_3CCOCH_2CH_2CHO$　　　　2 - ketopentan - 5 - al

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

48. Which molecule does not contain tertiary carbon atom ?

Ⓐ 2, 2, 4, 4 - tetramethylpentane　　　Ⓑ 2 - methylbutane

Ⓒ 2, 2, 3 - trimethylpentane　　　Ⓓ 2, 3 - dimethylbutane

49. The I.U.P.A.C name of the compound having the formula $CH_2 = CH — CH(CH_3)_2$ is :
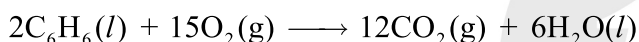
Ⓐ 1, 1—dimethlyl–2—butene　　　Ⓑ 3–methyl–1–butene

Ⓒ 2–vinyl propane　　　Ⓓ None of these

50. Consider the following equation at $27^{\circ}C$ and calculate the difference between $(\Delta H - \Delta E)$

$$2C_6H_6(l) + 15O_2(g) \longrightarrow 12CO_2(g) + 6H_2O(l)$$

Ⓐ - 3.7413 kJ　　　　　　Ⓑ + 3.7413 kJ

Ⓒ + 7.4826 kJ　　　　　　Ⓓ - 7.4826 kJ

Mathematics

51. $\left(1+\cos\dfrac{\pi}{8}\right)\left(1+\cos\dfrac{3\pi}{8}\right)\left(1+\cos\dfrac{5\pi}{8}\right)\left(1+\cos\dfrac{7\pi}{8}\right)$ is equal to

Ⓐ $\dfrac{1}{2}$　　　Ⓑ $\cos\dfrac{\pi}{8}$　　　Ⓒ $\dfrac{1}{8}$　　　Ⓓ $\dfrac{1+\sqrt{2}}{2\sqrt{2}}$

52. If $|z| \geq 3$, the least value of $\left|z+\dfrac{1}{z}\right|$ is

Ⓐ $\dfrac{8}{3}$　　　Ⓑ $\dfrac{3}{8}$　　　Ⓒ $\dfrac{10}{3}$　　　Ⓓ none of these

53. The minimum value of $f(x) = |3 - x| + 7$ is

Ⓐ 0　　　Ⓑ 6　　　Ⓒ 7　　　Ⓓ 8

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

Ⓐ $m = 8, n = 2$　　Ⓑ $m = 8, n = 3$　　Ⓒ $m = 6, n = 2$　　Ⓓ $m = 6, n = 3$

55. How many different words can be formed with the letters of the word "MATHEMATICS"

Ⓐ $\dfrac{11!}{2!2!2!}$　　Ⓑ $11!$　　Ⓒ $\dfrac{11!}{2!}$　　Ⓓ $\dfrac{11!2!7!4!}{2!2!2!2!2!2!}$

56. If the coefficients of rth and $(2r+5)^{\text{th}}$ terms of the expansion of $(1+x)^{15}$ are equal, then r is equal to

Ⓐ 4　　Ⓑ 6　　Ⓒ 7　　Ⓓ 3

57. The fifth term of a G.P. is its middle term and its value is 2. Then the product of all the terms of this progression is

Ⓐ 512　　Ⓑ 1024　　Ⓒ 256　　Ⓓ 32

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):** If $^{35}C_{n+7} = {}^{35}C_{4n-2}$ then $n = 3, 6$.

Reason(R): $^{n}C_{x} = {}^{n}C_{y} \Rightarrow x = y$ or $x + y = n$.

Ⓐ a　　Ⓑ b　　Ⓒ c　　Ⓓ d

59. **Assertion: (A):** The solution set of the equation $\dfrac{x-1}{x-2} > 2$ is $(2, 3)$

Reason (R): $\dfrac{a}{b} < 0$ if $(a < 0, b > 0) \cup (a > 0, b < 0)$

Ⓐ a　　Ⓑ b　　Ⓒ c　　Ⓓ d

Case Study Based Questions (60–62):

Number of terms in the expansion of

$$(a_1 + a_2 + a_3 + ... + a_k)^n = \frac{(n+1)(n+2)...(n+k-1)}{\lfloor k-1} = {}^{n+k-1}C_{k-1}, n \in N$$

Number of terms in the expansion of

$$(x+a)^n + (x-a)^n = \begin{cases} \dfrac{n+1}{2} & \text{if } n \text{ is odd} \\[2mm] \dfrac{n}{2} + 1 & \text{if } n \text{ is even} \end{cases}$$

Number of terms in the expansion of

$$(x+a)^n - (x-a)^n = \begin{cases} \dfrac{n+1}{2} & \text{if } n \text{ is odd} \\[2mm] \dfrac{n}{2} & \text{if } n \text{ is even} \end{cases}$$

60. Number of terms in the expansion of $(a + b + c + d)^{13}$ is

Ⓐ 455   Ⓑ 560   Ⓒ 680   Ⓓ 720

61. Number of terms in the expansion of $(x + a)^{56} + (x - a)^{56}$ is

Ⓐ 26   Ⓑ 27   Ⓒ 28   Ⓓ 29

62. Number of terms in the expansion of $(x + a)^{56} - (x - a)^{56}$ is

Ⓐ 26   Ⓑ 27   Ⓒ 28   Ⓓ 29

63. $\tan \alpha + 2 \tan 2\alpha + 4 \tan 4\alpha + 8 \cot 8\alpha =$

Ⓐ $\tan \alpha$ Ⓑ $\cot \alpha$ Ⓒ $\cot 16\alpha$ Ⓓ $16 \cot \alpha$

64. If $z = x - iy$ and $z^{1/3} = p + iq$, then $\dfrac{\left(\dfrac{x}{p} + \dfrac{y}{q}\right)}{(p^2 + q^2)}$ is equal to

Ⓐ 1   Ⓑ –1   Ⓒ 2   Ⓓ –2

65. If the first and the nth terms of a GP are a and b respectively and if P is the product of the first n terms, then P^2 is equal to

Ⓐ ab Ⓑ 4   Ⓒ $(ab)^n$ Ⓓ None of these

66. If A = {1, 2, 3, 4, 5}, B = {2, 4, 6}, C = {3, 4, 6} then $(A \cup B) \cap C$ is

Ⓐ {3, 4, 6}   Ⓑ {1, 2, 3}   Ⓒ {1, 4, 3}   Ⓓ None of these

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

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

68. If $\sin A + \sin B = a$ and $\cos A + \cos B = b$, then $\cos(A + B)$ is equal to

Ⓐ $\dfrac{a^2 + b^2}{b^2 - a^2}$ Ⓑ $\dfrac{2ab}{a^2 + b^2}$ Ⓒ $\dfrac{b^2 - a^2}{a^2 + b^2}$ Ⓓ $\dfrac{a^2 - b^2}{a^2 + b^2}$

69. If $(2 + i)(2 + 2i)(2 + 3i) \ldots (2 + 9i) = x + iy$, then $5.8.13\ldots 85 =$

Ⓐ $x^2 + y^2$ Ⓑ $x^2 - y^2$ Ⓒ $(x^2 + y^2)^2$ Ⓓ $(x^2 - y^2)^2$

70. 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

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

71. Let α, β be the roots of $x^2 - x + p = 0$ and γ, δ be the roots of $x^2 - 4x + q = 0$. If $\alpha, \beta, \gamma, \delta$ are in G.P., then the integral values of p and q respectively are

Ⓐ $-2, -32$ Ⓑ $-2, 3$ Ⓒ $-6, 3$ Ⓓ $-6, -32$

72. The coefficient of x^9 in $(1 + 9x + 27x^2 + 27x^3)^6$ is

Ⓐ $^{18}C_9 . 3^9$ Ⓑ $^{18}C_8 . 3^9$ Ⓒ $^{18}C_{10} . 3^8$ Ⓓ $^8C_9 . 3^7$

73. In how many ways can 5 boys and 5 girls stand in a row so that boys and girls are alternate?

Ⓐ $2(5!)^2$ Ⓑ $5! \times 4!$ Ⓒ $5! \times 6!$ Ⓓ $6 \times 5!$

74. The solution to $|3x - 1| + 1 < 3$ is

Ⓐ $2 < x < 3/4$ Ⓑ $-1/3 < x < 1$ Ⓒ $-1/3 < x < 1/4$ Ⓓ $-3 < x < 3$

75. The real part of $(1 - \cos\theta + 2i\sin\theta)^{-1}$ is

Ⓐ $\dfrac{1}{3 + 5\cos\theta}$ Ⓑ $\dfrac{1}{5 - 3\cos\theta}$ Ⓒ $\dfrac{1}{3 - 5\cos\theta}$ Ⓓ $\dfrac{1}{5 + 3\cos\theta}$

Biology

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76. Name the part of chlorophyll, where electron rearrangement takes place when chlorophyll gets excited

Ⓐ Mg atom   Ⓑ Phytol chain   Ⓒ Porphyrin ring   Ⓓ Hydrocarbon

77. Photorespiration involves an interaction of the organelles _____

Ⓐ Chloroplast, peroxisome, mitochondria

Ⓑ Peroxisome, chloroplast

Ⓒ Peroxisome, mitochondria

Ⓓ Vacuole, peroxisome, mitochondria

78. In CAM plants, CO_2 is taken up by the leaves in the night and is fixed to form malic acid, which is stored in the

Ⓐ Cytoplasm   Ⓑ Chloroplast   Ⓒ Vacuole   Ⓓ Mitochondria

79. 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

80. In CAM plants, stomata remain

    Ⓐ Open in the night   Ⓑ Open during day   Ⓒ Open for 24 hrs.   Ⓓ Closed for 24 hrs.

81. When the intensity of light falling on leaf increases beyond a point, chlorophyll is destroyed. This phenomenon occurs in the presence of

    Ⓐ CO_2 and is called photooxidation   Ⓑ O_2 and is called photorespiration

    Ⓒ O_2 and is called photooxidation   Ⓓ CO_2 and is called photorespiration

82. Among various nutrients, nitrogen has a direct relationship with photosynthesis because

    Ⓐ It is a basic constituent of chlorophyll

    Ⓑ It is a basic constituent of all enzymes involved in carbon reactions

    Ⓒ It is an essential element

    Ⓓ Both A and B

83. Which light range is least effective in photosynthesis?

    Ⓐ Blue   Ⓑ Green   Ⓒ Red   Ⓓ Violet

Assertion-Reason type Questions (84–85):

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.

84. **Assertion (A):** Photolysis of water is associated with PS II.

    Reason (R): Shorter wavelengths of light are absorbed by pigments of PS II

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

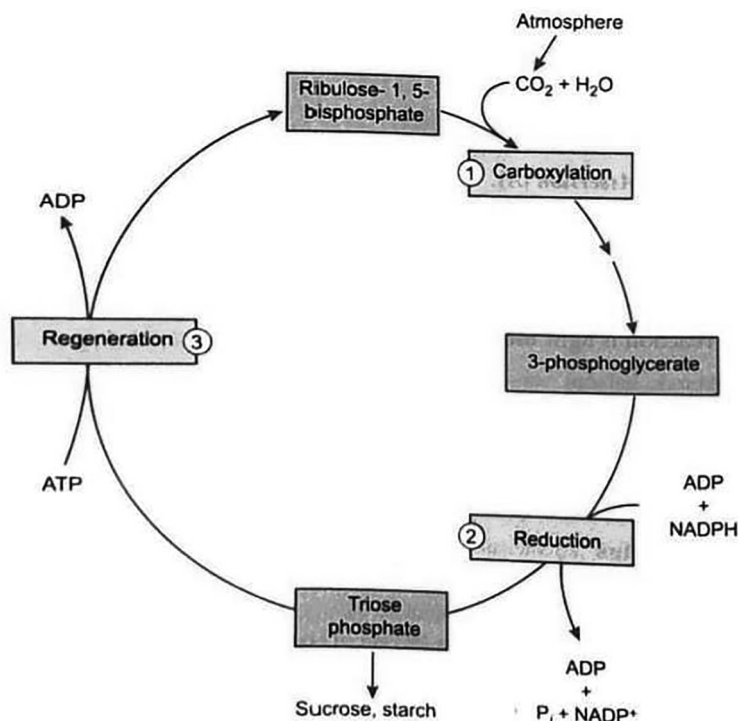85. **Assertion (A):** Dark reaction takes place only during night.

    Reason (R): Dark reaction is light independent.

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Case Study Based Questions (86-89) :

Study the diagram given below and answer the following questions :

86. Which enzyme catalyzes the carboxylation of Ribulose 1, 5 - bisphosphate to 3-phosphoglycerate?

Ⓐ RuBisCO   Ⓑ Nitrogenase

Ⓒ Cellulose synthase   Ⓓ Dehydrogenase

87. For synthesis of one molecule of glucose, how many ATP molecules would be required during the reduction phase?

Ⓐ 6   Ⓑ 12   Ⓒ 18   Ⓓ 24

88. For synthesis of one molecule of glucose, how many NADPH molecules would be required during the reduction phase?

Ⓐ 6   Ⓑ 12   Ⓒ 18   Ⓓ 24

89. For synthesis of one molecule of glucose, how many ATP molecules would be required during the regeneration phase?

Ⓐ 6   Ⓑ 12   Ⓒ 18   Ⓓ 24

90. Chemosynthetic bacteria obtain energy from

Ⓐ Sun   Ⓑ Infra red rays

Ⓒ Organic substances   Ⓓ Inorganic chemicals

91. Primary meristem is

Ⓐ Apical meristem

Ⓑ Intercalary meristem

Ⓒ Root apical meristem and shoot apical meristem

Ⓓ Both Ⓐ and Ⓑ

92. Water impermeable, waxy material secreted by endodermal cells in the form of Casparian strip is —

Ⓐ Lignin   Ⓑ Suberin

Ⓒ Conjunctive tissue   Ⓓ Pectin

93. A conjoint and open vascular bundle will be observed in the transverse section of—

Ⓐ Monocot root   Ⓑ Monocot stem   Ⓒ Dicot root   Ⓓ Dicot stem

94. Select the pair of flightless birds from the list given below :

I. *Corvus*   II. *Columba*   III. *Struthio*   IV. *Aptenodytes*

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

95. Reptiles have

Ⓐ Wet and glandular skin   Ⓑ Moist and spotted skin

Ⓒ Feathery skin   Ⓓ Dry and cornified skin

Case Study Based Questions (90):

In tropical rain forests, the canopy is thick and the shorter plants growing below it, receive filtered light. Shorter plants growing below the thick canopy are adapted to carry out the process of photosynthesis in low light intensity, which come down as filtered light. For this, the shade plants possess accessory pigments that can absorb green wavelength and then hand over the energy to chlorophyll a molecule for its photoconversion.

96. Which among the following sets, consist of only the accessory pigments?

Ⓐ Chlorophyll a, chlorophyll b, carotenoids

Ⓑ Chlorophyll b, carotenoids, xanthophyll

Ⓒ Chlorophyll a, xanthophyll

Ⓓ Chlorophyll a, lycopene

97. The accessory pigments not only absorb energy and transfer it to chlorophyll a, but also protect the chlorophyll molecule from

Ⓐ Photooxidation   Ⓑ Photo reduction   Ⓒ Photo radiation   Ⓓ Both A and B

98. $2H_2O \longrightarrow 4H^+ + 4e^- + X$

X stands for

Ⓐ O_2 Ⓑ $2O_2$ Ⓒ $4O_2$ Ⓓ $2H_2$

99. The CAM plants have scotoactive stomata. This means they

    Ⓐ Have Kranz anatomy   Ⓑ The stomata opens during day

    Ⓒ Inverted stomatal cycle

    Ⓓ The stomata are guarded by dumbell shaped guard cells

100. Which is true for C_4 plants ?

    Ⓐ High productivity, but more energy expensive photosynthesis

    Ⓑ The plants are adapted to high temperature

    Ⓒ Low transpiration rate   Ⓓ All of the above.