Monthly Progressive Test

Class: XII

Subject: PCMB

Test Booklet No.: MPT07

Test Date: | 2 | 2 | 1 | 1 | 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 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.

Physics

1. Ratio of intensities of two waves is given by 4 : 1. The ratio of the amplitudes of the waves is :

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

2. In Young's double slit experiment, the maximum intensity is I_0. When one slit is closed, the intensity becomes :

   Ⓐ $\dfrac{I_0}{2}$ Ⓑ $\dfrac{I_0}{8}$ Ⓒ $\dfrac{I_0}{4}$ Ⓓ I_0

3. In a certain double slit experimental arrangement, interference fringes of width 1.0 mm each are observed when light of wavelength 5000 Å is used. Keeping the set-up unaltered if the source is replaced by another of wavelength 6000 Å, the fringe-width will be :

   Ⓐ 0.5 mm   Ⓑ 1.00 mm   Ⓒ 1.2 mm   Ⓓ 1.5 mm

4. In a Young's double slit experiment, the fringe-width is found to be 0.4 mm. If the whole apparatus is immersed in water of refractive index (4/3), without disturbing the geometrical arrangement, the new fringe-width will be :

   Ⓐ 0.30 mm   Ⓑ 0.40 mm   Ⓒ 0.53 mm   Ⓓ 450 microns

5. In Young's double slit experiment the angular width of a fringe formed on a distant screen is 1°. The wavelength of light used is 6000 Å. The spacing between the slits is approximately :

   Ⓐ 1 mm   Ⓑ 0.05 mm

   Ⓒ 0.03 mm   Ⓓ 0.01 mm

6. The first diffraction minima due to a single slit diffraction is at $\theta = 30°$ for a light of wavelength 5000 Å. The width of the slit is :

   Ⓐ 5×10^{-5} cm   Ⓑ 10×10^{-5} cm

   Ⓒ 2.5×10^{-5} cm   Ⓓ 1.25×10^{-5} cm

7. In propagation of electromagnetic waves, the angle between the direction of propagation and plane of polarisation is :

   Ⓐ 0°   Ⓑ 45°   Ⓒ 90°   Ⓓ 180°

8. A beam of light strikes a piece of glass at an angle of incidence 60° and the reflected beam is completely plane polarised. The refractive index of the glass is :

   Ⓐ 1.5   Ⓑ $\sqrt{3}$ Ⓒ $\sqrt{2}$ Ⓓ $(^4/_3)$

9. An electron changes its position from orbit $n = 4$ to $n = 2$ of an atom. Wavelength of the emitted radiation is : (R-Rydberg's constant)

   Ⓐ $\dfrac{16}{R}$ Ⓑ $\dfrac{16}{7R}$ Ⓒ $\dfrac{16}{5R}$ Ⓓ $\dfrac{16}{3R}$

10. The shortest and longest wavelength limits (in Å) of Lyman series for hydrogen are :

    Ⓐ 909 Å and 1212 Å   Ⓑ 9091 Å and 12120 Å

    Ⓒ 303 Å and 104 Å   Ⓓ 1000 Å and 3000 Å

11. The de Broglie wavelength of an electron whose speed is half that of light is :

    Ⓐ 3.6×10^{-12} m   Ⓑ 4.2×10^{-12} m

    Ⓒ 8.4×10^{-12} m   Ⓓ 0.12×10^{-12} m

12. Alpha particles that come closer to nuclei :

    Ⓐ are deflected more   Ⓑ are deflected less

    Ⓒ make more collision   Ⓓ are slowed down more

13. An electron of mass m_e and a proton of mass m_p are accelerated through the same potential difference; the ratio of the wavelengths associated with an electron to that associated with a proton is :

    Ⓐ $\sqrt{m_p / m_e}$ Ⓑ m_p / m_e Ⓒ m_e / m_p Ⓓ one

14. The de Broglie wavelength of an electron accelerated to a potential difference of V volt is :

    Ⓐ $\sqrt{\dfrac{150}{V}}$ Å   Ⓑ $\dfrac{h}{\sqrt{2mE}}$ Å   Ⓒ $\dfrac{h}{\sqrt{2mkT}}$ Å   Ⓓ $\sqrt{\dfrac{1226}{V}}$ Å

15. A proton and an α-particle are accelerated through the same potential difference. The ratio of their de Broglie wavelengths is :

    Ⓐ $\sqrt{2}$ Ⓑ $1/\sqrt{2}$ Ⓒ $2\sqrt{2}$ Ⓓ 2

16. The activity of a radioactive sample decreases to one-third of the original intensity I_0 in a period of 9 year. After 9 year more its activity would be :

    Ⓐ Same   Ⓑ $\dfrac{1}{2} I_0$ Ⓒ $\dfrac{2}{3} I_0$ Ⓓ $\dfrac{1}{9} I_0$

17. After 1 hour, $\dfrac{1}{8}$ of the initial mass of a certain radioactive isotope remains undecayed. The half-life of the isotope is :

    Ⓐ 20 minute   Ⓑ 30 minute   Ⓒ 45 minute   Ⓓ 8 minute

Assertion-Reason type Questions (18–22):

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.

18. **Assertion:** Heavy water is preferred over ordinary water as moderator in reactors.

    Reason: Heavy water, used for slowing down the neutrons, has lesser absorption probability of neutrons than ordinary water.

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

19. **Assertion:** Energy released in one fusion process is less than the energy released in a single fission event.

    Reason: Fusion is a weaker source of energy than fission.

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

20. When a *P-N* junction is reverse biased :

    Ⓐ holes and electrons move away from the junction

    Ⓑ holes and electrons move towards the junction

    Ⓒ movement of holes and electrons stops

    Ⓓ width of depletion region decreased

21. Which of the following is necessary for transistor action?

    Ⓐ base region must be very wide   Ⓑ Base region must be very narrow

    Ⓒ Base region must be made of some insulating material

    Ⓓ Collector region must be heavily doped

22. In a transistor α is related to β by the relation :

    Ⓐ $\beta = \dfrac{\alpha + 1}{\alpha}$ Ⓑ $\beta = \dfrac{\alpha - 1}{\alpha}$ Ⓒ $\beta = \dfrac{\alpha}{1 - \alpha}$ Ⓓ $\beta = \dfrac{\alpha}{1 + \alpha}$

23. Fig. consists of two NOT Gates followed by a NOR Gate. This combination is equivalent to a single :
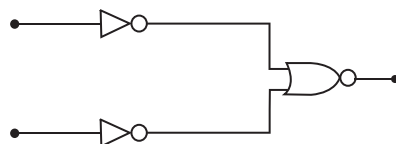
    Ⓐ NAND Gate   Ⓑ AND Gate   Ⓒ OR Gate   Ⓓ XOR Gate

Assertion-Reason type Questions (18–22):

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.

24. **Assertion:** Thermal energy produces fewer minority carriers in silicon than in germanium

    Reason: The forbidden gap between V.B. and C.B. is more in silicon than in germanium.

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

25. **Assertion:** NOR gate or NAND gate care the basic building blocks of digital circuits.

    Reason: NOR gate is a combination of OR gate and NOT gate whereas NAND gate is a combination of AND gate and NOT gate.
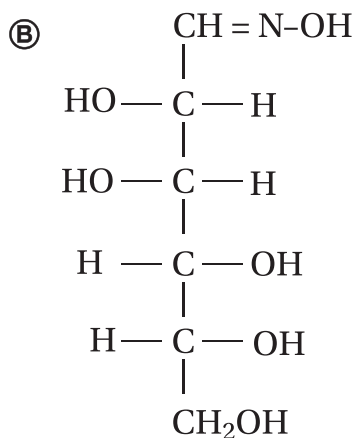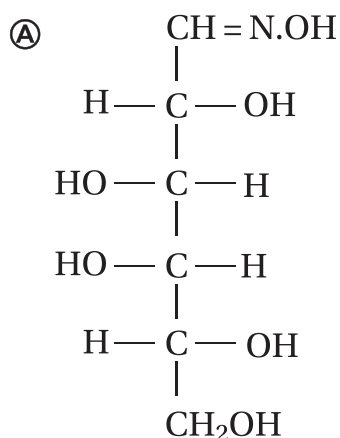
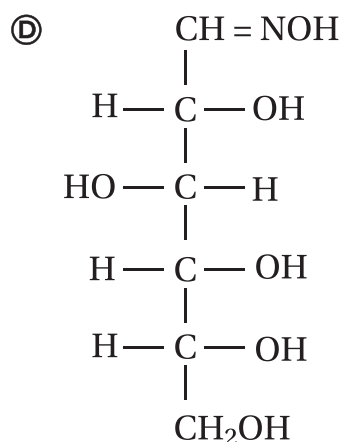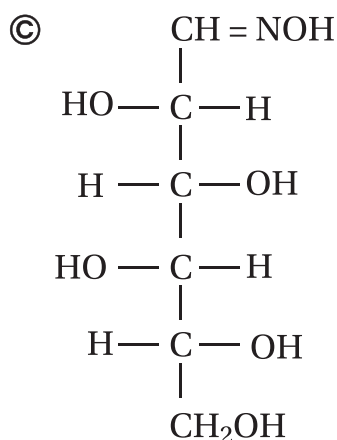   Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Chemistry

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26. Which of the following statement is not true about glucose?

    Ⓐ It is an aldohexose   Ⓑ On heating with HI it forms n-hexane

    Ⓒ it is present in pyranose form   Ⓓ it gives 2, 4 –DNP test.

27. D (+) glucose reacts with hydroxyl amine and yields an oxime. the structure of the oxime would be :

    Ⓐ
    $$
    \begin{array}{c}
    CH = N.OH \\
    | \\
    H - C - OH \\
    | \\
    HO - C - H \\
    | \\
    HO - C - H \\
    | \\
    H - C - OH \\
    | \\
    CH_2OH
    \end{array}
    $$

    Ⓑ
    $$
    \begin{array}{c}
    CH = N-OH \\
    | \\
    HO - C - H \\
    | \\
    HO - C - H \\
    | \\
    H - C - OH \\
    | \\
    H - C - OH \\
    | \\
    CH_2OH
    \end{array}
    $$

Ⓒ

$$CH = NOH$$
$$|$$
$$HO — C — H$$
$$|$$
$$H — C — OH$$
$$|$$
$$HO — C — H$$
$$|$$
$$H — C — OH$$
$$|$$
$$CH_2OH$$

Ⓓ

$$CH = NOH$$
$$|$$
$$H — C — OH$$
$$|$$
$$HO — C — H$$
$$|$$
$$H — C — OH$$
$$|$$
$$H — C — OH$$
$$|$$
$$CH_2OH$$

28. Which one of the following statement is correct about sucrose?

Ⓐ it can reduce Tollens reagent however can not reduce Fehling's reagent

Ⓑ It undergoes mutarotation like glucose and fructose

Ⓒ It undergoes inversion in the configuration on hydrolysis

Ⓓ It is laevorotatory in nature

Assertion Reason Type Question (29–30):

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

29. **Assertion (A):** Fructose is a reducing sugar

Reason (R): Fructoase does not reudce Fehling solution and Tollen's reagent

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

30. **Assertion (A):** Enzymes are very specific for a particular reaction and for a particular substrate

Reason (R): Enzymes are biocatalysts

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

31. Curdling of milk is an example of :

Ⓐ breaking of peptide linkage   Ⓑ hydrolysis of lactose

Ⓒ breaking of proteins intto amino acids   Ⓓ denaturation of protein

32. Deficiency of Vitamin B causes :

  Ⓐ rickets   Ⓑ muscular weakness

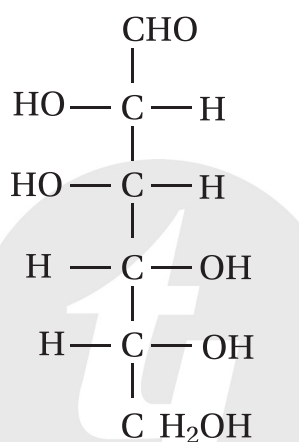 Ⓒ scurvy   Ⓓ beri-beri

33. β pleaed sheet structure in proteins referred to :

  Ⓐ primary structure   Ⓑ secondary structure

  Ⓒ tertiary structure   Ⓓ quarternary structure

34. Number of chiral carbon atoms in β-D(+) glucose is :
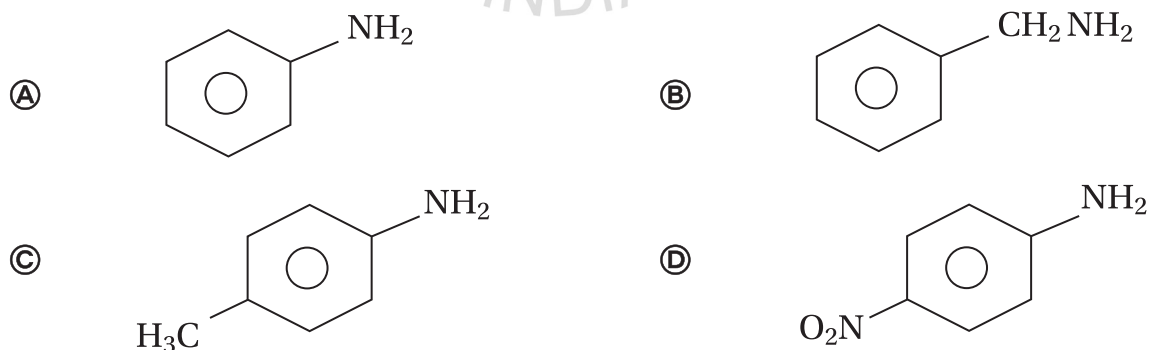
  Ⓐ 5   Ⓑ 6   Ⓒ 3   Ⓓ 4

35. Glucose and mannose

$$
\begin{bmatrix}
\text{CHO} \\
\text{HO}-\text{C}-\text{H} \\
\text{HO}-\text{C}-\text{H} \\
\text{H}-\text{C}-\text{OH} \\
\text{H}-\text{C}-\text{OH} \\
\text{C H}_2\text{OH}
\end{bmatrix}
$$

  Ⓐ epimers   Ⓑ anomers   Ⓒ ketohexose   Ⓓ disacchrides

36. Among tthe following which has the lowest basic strength?

37. Arrange the following in the increasing order of their boiling points.

  A : Butanamine   B : N, N – dimethylamine   C : N – ethylethanamine

  Ⓐ C < B < A   Ⓑ A < B < C   Ⓒ A < C < B   Ⓓ B < C < A

38. During mutarotation of β-D glucose in aqueous solution angle of optical rotation

  Ⓐ Remains constant value of +111°

  Ⓑ Remains constantt value of +19.2°

© Changes from an angle of +112° to a constant value of +52.5°

Ⓓ Changes from an angle of +19.2° to a constant value of +52.5°.

Case Based Questions (39–40):

Monosaccharides can be either aldoses or ketoses. Whereas glucose and galactose are aldoses, fructose is a ketose. All monosaccharides are reducing ie. they reduce Tollen's reagent and Fehling's solution, undergo mutarotation and form osazones. However, glucose does not give some of the characteristic reactions of aldehydes.

Based on the above paragraph answer question 39 and 40.

39. Glucose does not react with :

   Ⓐ hydroxylamine   Ⓑ acetic anhydride

   © sodium bisulphite   Ⓓ Br_2 / H_2O

40. Fructose reduces Tollen's reagent due to :

   Ⓐ asymmetric carbons

   Ⓑ primary alcoholic group

   © secondary alcoholic group

   Ⓓ enolisation of fructose followed by conversion to aldehyde by base

41. Silver fluoride in acetone is the correct reagent of which reaction ?

   Ⓐ Swarts reaction   Ⓑ Sandmayer reaction

   © Hunsdiecker reaction   Ⓓ Finkelstein reaction

42. 0.004 M Na_2SO_4 solution is isotonic with 0.010 M $C_6H_{12}O_6$ solution at 298 K. What is the apparent degree of dissociation of Na_2SO_4 ?

   Ⓐ 90%   Ⓑ 80%   © 75%   Ⓓ 85%

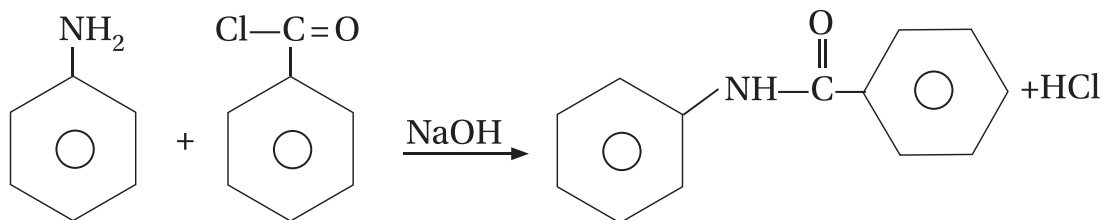**43.** The correct increasing order of basic strength for the following compounds is:
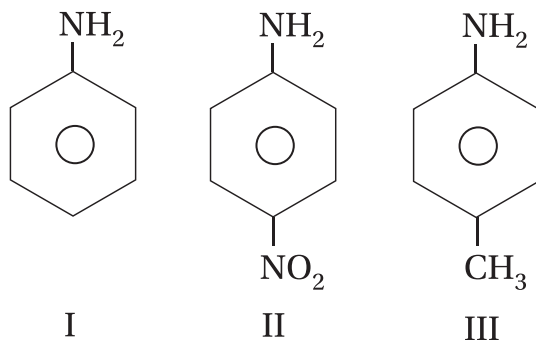
   Ⓐ II < III < I   Ⓑ III < I < II   © III < II < I   Ⓓ II < I < III

44. The spin only magnetic moment value (in Bohr Magneton Units) of $Cr(CO)_5$ is:

Ⓐ 0   Ⓑ 2.84   Ⓒ 4.90   Ⓓ 5.92

45. The following reaction:

is known by the name:

Ⓐ Acetylation reaction   Ⓑ Schotten-Baumon reaction

Ⓒ Friedel-Craft's reaction   Ⓓ Perkin's reaction

46. Which of the following gives a positive test with ninhydrin?

Ⓐ celulose   Ⓑ polyvinyl chloride

Ⓒ Egg albumin   Ⓓ starch

47. Alanine at its isoelectric point exist in solution as :

Ⓐ $H_2N — CH — COO^-$ with CH_3 branch

Ⓑ $H_3N^+ — CH — COOH$ with CH_3 branch

Ⓒ $H_3N^+ — CH — COO^-$ with CH_3 branch

Ⓓ $H_2N^+ — CH — COO^-$ with CH_3 branch

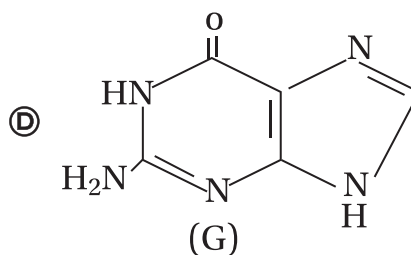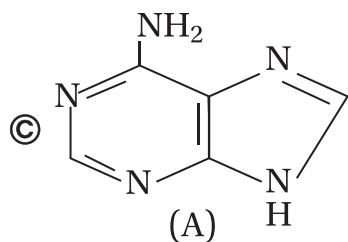**48.** Which of the following pair is found in DNA?

Ⓐ Adenine with thymine   Ⓑ Guanine with adenine

Ⓒ Thymine with Guanine   Ⓓ Uracil with adenine

49. Continuous bleeding from an injured part of the body is due to deficiency of :

Ⓐ Vitamin A   Ⓑ Vitamin B

Ⓒ Vitamin E   Ⓓ Vitamin K

50. The base present in RNA but not found in DNA is :

(A)

(G)

Mathematics

51. If α, β, γ are the angles which a directed line makes with the positive directions of the coordinate axes, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is equal to

Ⓐ 1   Ⓑ 2   Ⓒ 3   Ⓓ 4

52. If lines $\dfrac{x-1}{-3} = \dfrac{y-2}{2k} = \dfrac{z-3}{2}$ and $\dfrac{x-1}{3k} = \dfrac{y-5}{1} = \dfrac{z-6}{-5}$ are mutually perpendicular, then k is equal to

Ⓐ $-\dfrac{10}{7}$ Ⓑ $-\dfrac{7}{10}$ Ⓒ -10 Ⓓ -7

53. If $\vec{a}, \vec{b}, \vec{c}$ are three mutually perpendicular vectors each of magnitude unity, then $|\vec{a} + \vec{b} + \vec{c}|$ is equal to

Ⓐ 3   Ⓑ 1   Ⓒ $\sqrt{3}$ Ⓓ none of these

54. If $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 12$, then $|\vec{a} \times \vec{b}|$ is equal to

Ⓐ 12   Ⓑ 14   Ⓒ 16   Ⓓ 18

55. The objective function of a linear programming problem is

Ⓐ a constraint   Ⓑ a function to be optimised

Ⓒ a relation between the variables   Ⓓ none of these

56. A set of values of decision variables that satisfies the linear constraints and non-negativity conditions of an L.P.P is called its

Ⓐ unbounded solution   Ⓑ optimum solution

Ⓒ feasible solution   Ⓓ none of these

57. The probability of drawing a ticket having a number, which is a multiple of 3 or a multiple of 7 from the 20 tickets numbered 1, 2, 3 ...., 20 is

Ⓐ $\dfrac{3}{10}$ Ⓑ $\dfrac{2}{5}$ Ⓒ $\dfrac{3}{100}$ Ⓓ 0

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 reas on (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) :** Corner points of the feasible region for an L.P.P are: (0, 2), (3, 0), (6, 0), (6, 8) and (0, 5). Let $Z = 4x + 6y$ the objective function. The minimum value of Z occurs at any point on the line segment joining the points (0, 2) and (3, 0).

    Reason(R) : If the objective function $Z = ax + by$ attains its optimal value at two points P and Q, then Z attains the same value at every point on the line segment PQ.

    Ⓐ a   Ⓑ b   Ⓒ c   Ⓓ d

59. **Assertion(A) :** If the projection of a line segment on the coordinate axes are 2, 3, 6, then the length of the line segment is 7 units.

    Reason(R) : A line having direction cosines ℓ, m, n and length r has projections on the coordinate axes $\ell r, mr, nr$.

    Ⓐ a   Ⓑ b   Ⓒ c   Ⓓ d

Case Study Based Questions (60–62):
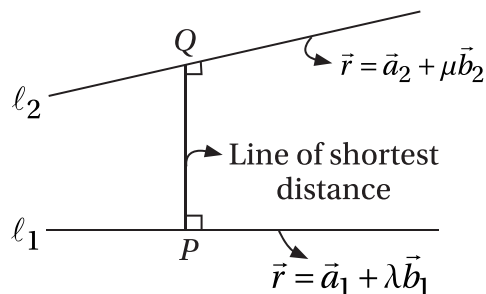
The shortest distance between the lines $\vec{r} = \vec{a}_1 + \lambda\vec{b}_1$ and $\vec{r} = \vec{a}_2 + \mu\vec{b}_2$ is given by

$$\text{S.D} = \left| \frac{(\vec{b}_1 \times \vec{b}_2).(\vec{a}_2 - \vec{a}_1)}{|\vec{b}_1 \times \vec{b}_2|} \right|$$

Based on this answer the following questions.

60. If $\vec{r_1} = \vec{a_1} + \lambda \vec{b}$ and $\vec{r_2} = \vec{a_2} + \mu \vec{b}$ be two lines, then S.D is given by

Ⓐ $\dfrac{|(\vec{a_2} - \vec{a_1}) \times \vec{b}|}{|\vec{b}|}$ Ⓑ $\dfrac{|(\vec{a_2} + \vec{a_1}) \times \vec{b}|}{|\vec{b}|}$ Ⓒ $\dfrac{|(\vec{a_2} - \vec{a_1}) \cdot \vec{b}|}{|\vec{b}|}$ Ⓓ none of these

61. Let $\vec{r_1} = (4\hat{i} - \hat{j}) + \lambda(\hat{i} + 2\hat{j} - 3\hat{k})$

$\vec{r_2} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(2\hat{i} + 4\hat{j} - 5\hat{k})$

then S.D between $\vec{r_1}$ and $\vec{r_2}$ is

Ⓐ $\dfrac{\sqrt{5}}{6}$ units   Ⓑ $\dfrac{6}{\sqrt{5}}$ units   Ⓒ $\dfrac{\sqrt{6}}{7}$ units   Ⓓ $\dfrac{\sqrt{7}}{6}$ units

62. Let $\vec{r_1} = (4\hat{i} - \hat{j}) + \lambda \hat{k}$

$\vec{r_2} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu \hat{k}$

then S.D between $\vec{r_1}$ and $\vec{r_2}$ is

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

63. If two events A and B are such that $P(A^c) = 0.3$, $P(B) = 0.4$ and $P(A \cap B^c) = 0.5$, then $P(B/A \cup B^c) =$

Ⓐ 0.25   Ⓑ 0.2   Ⓒ 0.8   Ⓓ 0.5

64. The value of λ, for which the four points $2\hat{i} + 3\hat{j} - \hat{k}, \hat{i} + 2\hat{j} + 3\hat{k}, 3\hat{i} + 4\hat{j} - 2\hat{k}, \hat{i} - \lambda\hat{j} + 6\hat{k}$ are coplanar, is

Ⓐ –2   Ⓑ 8   Ⓒ 6   Ⓓ 0

65. The maximum value of $Z = 3x + 4y$ subject to constraints $x + y \leq 4$, $x \geq 0$ and $y \geq 0$ is

Ⓐ 12   Ⓑ 14   Ⓒ 16   Ⓓ none of these

66. The solution of the differential equation $(1 + x^2)\dfrac{dy}{dx} + 2xy = \cos x$ is

Ⓐ $y(1 + x^2) = c + \cos x$ Ⓑ $y(1 + x^2) = c + \sin x$

Ⓒ $y = x + c$ Ⓓ $y = \cos x + x^2$

67. $\displaystyle\int \dfrac{1}{x(x^4 - 1)} dx =$

Ⓐ $\log\left(\dfrac{x^4}{x^4 - 1}\right)$ Ⓑ $\dfrac{1}{2}\log\left(\dfrac{x^2 - 1}{x^2 + 1}\right)$

Ⓒ $\dfrac{1}{4}\log\left(\dfrac{x^4 - 1}{x^4}\right)$ Ⓓ $\log\left(\dfrac{x^2 - 1}{x^2 + 1}\right)$

68. If $y = \cos^{-1}\left(\dfrac{2\cos x - 3\sin x}{\sqrt{13}}\right)$, then $\dfrac{dy}{dx}$ is

Ⓐ zero

Ⓑ constant = 1

Ⓒ constant ≠ 1

Ⓓ none of these

69. If $f(x) = \begin{cases} \dfrac{1-\cos\lambda x}{x\sin x} & , \quad x \neq 0 \\ \dfrac{1}{2} & , \quad x = 0 \end{cases}$ is continuous at $x = 0$, then λ is

Ⓐ 0   Ⓑ ±1   Ⓒ 1   Ⓓ none of these

70. The roots of the equation $\begin{vmatrix} 1-x & 2 & 3 \\ 0 & 2-x & 0 \\ 0 & 2 & 3-x \end{vmatrix} = 0$ are

Ⓐ 1, –2   Ⓑ 2, 3   Ⓒ 1, 3   Ⓓ 1, 2, 3

71. The chances of solving a question by 3 students are $\dfrac{1}{2}, \dfrac{1}{3}, \dfrac{1}{4}$, then probability that the question will be solved is equal to

Ⓐ $\dfrac{1}{4}$ Ⓑ $\dfrac{3}{4}$ Ⓒ $\dfrac{2}{3}$ Ⓓ none of these

72. The minimum value of $Z = 3x + 5y$ subject to constraints $x + 3y \geq 3$, $x + y \geq 2$, $x \geq 0$, $y \geq 0$ is

Ⓐ 5   Ⓑ 7   Ⓒ 10   Ⓓ 11

73. Let $\vec{a} = \hat{j} - \hat{k}$ and $\vec{c} = \hat{i} - \hat{j} - \hat{k}$. Then the vector $\vec{b}$ satisfying $\vec{a} \times \vec{b} + \vec{c} = \vec{0}$ and $\vec{a} \cdot \vec{b} = 3$ is

Ⓐ $-\hat{i} + \hat{j} - 2\hat{k}$ Ⓑ $2\hat{i} - \hat{j} + 2\hat{k}$ Ⓒ $\hat{i} - \hat{j} - 2\hat{k}$ Ⓓ $\hat{i} + \hat{j} - 2\hat{k}$

74. Cartesian form of the equation of line $\vec{r} = 3\hat{i} - 5\hat{j} + 7\hat{k} + \lambda(2\hat{i} + \hat{j} - 3\hat{k})$ is

Ⓐ $\dfrac{x-2}{3} = \dfrac{y-1}{-5} = \dfrac{z+3}{7}$

Ⓑ $\dfrac{x-3}{2} = \dfrac{y+5}{1} = \dfrac{z-7}{-3}$

Ⓒ $\dfrac{x-2}{1} = \dfrac{y-1}{2} = \dfrac{z-7}{5}$

Ⓓ none of these

75. The shortest distance between the straight lines $\dfrac{x-6}{1} = \dfrac{2-y}{2} = \dfrac{z-2}{2}$ and $\dfrac{x+4}{3} = \dfrac{y}{-2} = \dfrac{1-z}{2}$ is

Ⓐ 9 units   Ⓑ $\dfrac{25}{3}$ units   Ⓒ $\dfrac{16}{3}$ units   Ⓓ 4 units

Biology

76. The total number of biodiversity hotspots in the world is

    Ⓐ 30   Ⓑ 24   Ⓒ 40   Ⓓ 34

77. In Khasi and Jaintia Hills in Meghalaya, Aravalli Hills in Rajasthan, etc. specific tracts of forests are set aside and all trees and animals of that area are venerated and given total protection by the locals. Such areas are called _____ .

    Ⓐ Mangroves   Ⓑ Reserve forests

    Ⓒ Sacred groves   Ⓓ Biological library

78. Since the origin of life on earth, _____ episodes of Mass Extinction of Species have occured.

    Ⓐ 4   Ⓑ 5   Ⓒ 6   Ⓓ 7

79. Pyramid of biomass in sea is _____ generally, because the biomass of fishes _____ that of phytoplanktons.

    Ⓐ Upright, exceeds   Ⓑ Inverted, is less than

    Ⓒ Inverted, exceeds   Ⓓ Upright, is less than

80. Name the process by which humus is decomposed by some specific microbes to release inorganic nutrients in nature.

    Ⓐ Mineralization   Ⓑ Demineralization

    Ⓒ Decomposition   Ⓓ Humification

81. Gross Primary Productivity (GPP) – _____ = Net Primary Productivity (NPP). Complete the equation.

    Ⓐ Photosynthesis   Ⓑ Mineralisation

    Ⓒ Respiration   Ⓓ Any one of A, B or C

82. Only _____ percent of energy is transferred to each trophic level from the lower trophic level.

    Ⓐ 5   Ⓑ 10   Ⓒ 100   Ⓓ 25

Assertion-Reason type Questions (83–84):

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.

83. **Assertion:** Tropical rain forests are disappearing fast from developing countries like India.

    Reason: No value is attached to these forest because they are poor in biodiversity.

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

84. **Assertion:** A network of food chains existing together in an ecosystem is known as a food web.

    Reason: An animal, like vulure, which is a scavenger, cannot be part of a food chain.

    Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Case Based Questions (85–87):

According to the International Union for Conservation of Nature and Natural Resources (IUCN), the total number of plant and animal species is over 1.5 million. The occurence of different types of genes, gene pools, species, habitats and ecosystems in a particular place and various parts of the earth is called biodiversity. The term 'biodiversity' was given by Edward Wilson. Biodiversity is subdivided into three levels of biological organisation. :

85. There are more than 50,000 different strains of rice and 1000 varieties of mangoes in India. In this sentence, we are talking about.

    Ⓐ Genetic diversity   Ⓑ Species diversity

    Ⓒ Ecological diversity   Ⓓ Both A and B

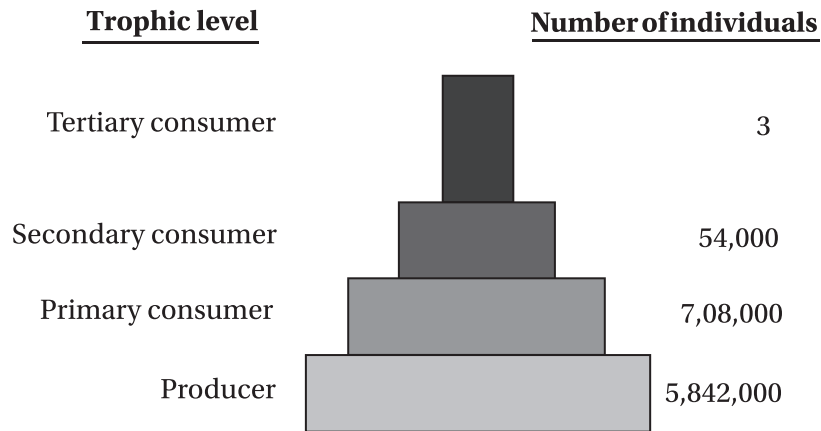86. Greater biological diversity is observed in the tropies because :

    Ⓐ Temperate regions have been subjected to frequent glaciations in the past, but tropical regions remained undisturbed.

    Ⓑ Temperate environment, unlike the tropics, are more seasonal, less constant and unpredictable.

    Ⓒ Tropical regions have greater solar energy exposure

    Ⓓ All

87. In the equation depicting Species-Area relationship, $\log S = \log C + Z \log A$, Z stands for

    Ⓐ Species richness   Ⓑ Area

    Ⓒ Y - intercept   Ⓓ Slope of the line (regression coefficient)

Case Based Questions (88–90):

Study the diagram given below and answer the following questions :

Trophic level	Number of individuals
Tertiary consumer	3
Secondary consumer	54,000
Primary consumer	7,08,000
Producer	5,842,000

88. Which of the following is not an ecological pyramid?

    Ⓐ Pyramid of number   Ⓑ Pyramid of biomass

    Ⓒ Pyramid of ecological succession   Ⓓ Pyramid of energy

89. Which ecological pyramid is never inverted?

    Ⓐ Pyramid of number   Ⓑ Pyramid of biomass

    Ⓒ Pyramid of energy   Ⓓ None

90. When we count the member of insects feeding a big tree, we find: –

    Ⓐ The Pyramid of Number is upright

    Ⓑ The Pyramid of Number is inverted

    Ⓒ The Pyramid of Energy is inverted

    Ⓓ The Pyramid of Energy cannot be constructed

91. Entry of pollen tube through the micropyle is called

    Ⓐ Chalazogamy   Ⓑ Porogamy

    Ⓒ Chasmogamy   Ⓓ None

92. Saheli, a female antifertility pill, is used

    Ⓐ Yearly   Ⓑ Weekly   Ⓒ Quarterly   Ⓓ Monthly

93. A free living nitrogen fixing bacteria found in soil is

    Ⓐ *Azotobacter*   Ⓑ *Rhizobium*

    Ⓒ *Streptococcus*   Ⓓ None

94. A segment of DNA that codes for a polypeptide is

Ⓐ Cistron   Ⓑ Exon   Ⓒ Intron   Ⓓ Gene

95. Ori stands for

Ⓐ The sequence from where replication starts

Ⓑ Selectable marker

Ⓒ Cloning site

Ⓓ Restriction site

Case Based Questions (96–98):

Study the diagram given below and answer the following questions :
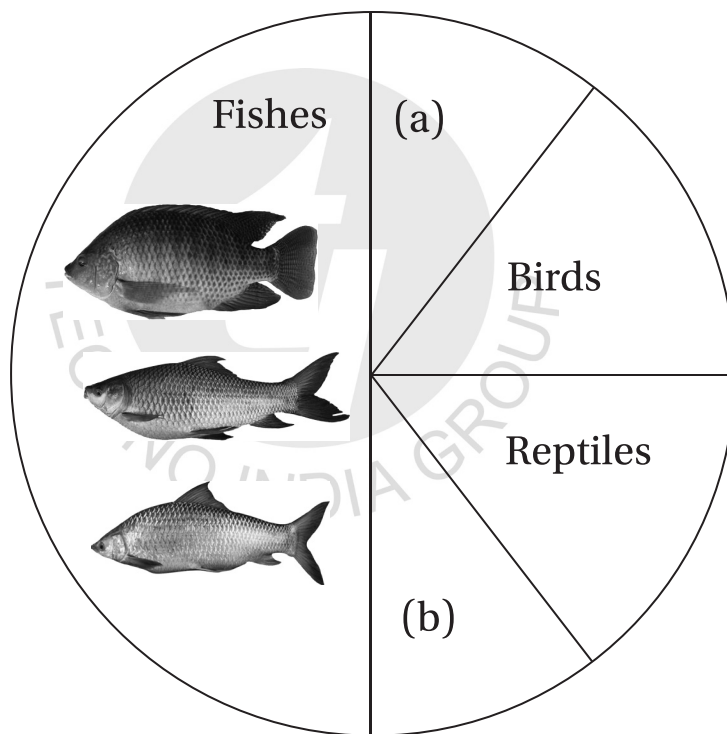
96. Identify 'a' and 'b', in the right order

Ⓐ Mammals and birds   Ⓑ Birds and mammals

Ⓒ Mammals and amphibians   Ⓓ Amphibians and mammals

97. The number of _____ species in the world is more than the combined total of the species of fishes, amphibians, reptiles and mammals.

Ⓐ algae   Ⓑ fungi

Ⓒ birds   Ⓓ ferns

98. Which group of invertebrates make up the second largest group, after insects?

Ⓐ Crustaceans
Ⓑ Molluscs

Ⓒ Echinoderms
Ⓓ Sponges

99. In an aquatic ecosystem, zooplanktons form the

Ⓐ Producers
Ⓑ Primary consumers

Ⓒ Secondary consumers
Ⓓ Decomposers

100. Limitations of ecological pyramids :

Ⓐ It is based on food chains and not on food webs.

Ⓑ Saprophytes are not given any place in it

Ⓒ It does not take into account the same species belonging to two or more trophic levels.

Ⓓ All

Space For Rough Works