Monthly Progressive Test

Class: XI

Subject: PCMB

Test Booklet No.: MPT-01

Test Date: 0 7 0 7 2 0 2 5

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 MPT01 07072025.

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. [Surface tension] =

   (A) MLT
   (B) MT^{-2}
   (C) MLT^{-2}
   (D) ML^{-2}

2. Dimensional formula of charge

   (A) AT
   (B) AT^{-1}
   (C) $A^{-1}T$
   (D) $A^{-1}T^{-1}$

3. A body travels uniformly a distance of (13.8 ± 0.2) m in a time (2.0 ± 0.3)s. Its velocity with error limits is

   (A) $(6.9 \pm 1.1)ms^{-1}$
   (B) $(6.9 \pm 0.2)ms^{-1}$
   (C) $(3.4 \pm 1.1)ms^{-1}$
   (D) $(3.4 \pm 0.2)ms^{-1}$

4. The least count of a stop watch is $\frac{1}{5}$ s. The time for 20 oscillations of a pendulum is measured to be 25 seconds. Then % error in the measurement of time period is

   (A) 0.4%
   (B) 0.8%
   (C) 0.2%
   (D) 0.6 %

5. The heat generated in a circuit is given by $Q = I^2 Rt$, where I is current, R is resistance and t is time. If the percentage errors in measuring I, R and t are 2%, 1%, and 1% respectively, then the maximum percentage error in measuring heat will be

   (A) 5
   (B) 6
   (C) 8
   (D) 10

6. If $x = a + bt + ct^2$ where x is in m and t in second, then [c] =

   (A) LT^{-2}
   (B) LT^{-1}
   (C) LT
   (D) $L^{-1}T$

7. If $mvr = \frac{nh}{2\pi}$ then [h] =

   (A) $M°L^2T^{-1}$
   (B) ML^2T^{-1}
   (C) MLT^{-1}
   (D) MLT

8. 5.67×10^{-5} erg s^{-1} cm^{-2} k^{-4}

   $= x$ J s^{-1} m^{-2} k^{-4} then x =

   (A) 3.5×10^{-6}
   (B) 6.5×10^{-8}
   (C) 5.67×10^{-8}
   (D) 5.67×10^{-6}

9. The rotational kinetic energy (E) of a body is given by $E = \frac{1}{2} I \omega^2$ where ω is angular velocity $(\omega = \theta/t = 2\pi/T)$, then [I]

   (A) $M°LT$
   (B) MLT
   (C) $MLT°$
   (D) $ML^2T°$

10. $\left(p + \dfrac{a}{v^2} \right) (v - b) = RT$, in this expression P is the pressure and V is volume, then [a] =

    (A) ML^5T^{-2}
    (B) ML^6T^{-2}
    (C) ML^4T^{-2}
    (D) MLT^{-2}

11. The pressure on a square plate is measured by measuring the force on the plate and length of the side of the plate. If the maximum errors in the measurement of force and length are respectively 4% and 2%, then what is the maximum percentage error in the pressure measurement ?

    (A) 6%
   (B) 8%
    (C) 4%
    (D) 10%

12. What is the maximum percentage error in the measurement of kinetic energy if the percentage errors in mass and speed are 2% and 3% respectively.

   Ⓐ 6%   Ⓑ 4%   Ⓒ 8%   Ⓓ 10%

13. If $f = x^2$, then the relative error in f is

   Ⓐ $\dfrac{2\Delta x}{x}$ Ⓑ $\dfrac{\Delta x}{x}$ Ⓒ $\dfrac{1.5\,\Delta x}{x}$ Ⓓ $\dfrac{1.25\,\Delta x}{x}$

14. In general, least count of vernier instrument is

   Ⓐ 1 mm   Ⓑ 0.1 mm   Ⓒ 0.01 mm   Ⓓ 0.02 mm

15. If the temperature of a body increases from $28.6 \pm 0.1°c$ to $79.4 \pm 0.1°c$, then the increase in temperature is

   Ⓐ $50.8°\,C$ Ⓑ $45.8 \pm 0.2°\,C$ Ⓒ $50.8 \pm 0.2°\,C$ Ⓓ $50.8 \pm 1°\,C$

Assertion and Reason : (Q. 16 – 19)

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

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

     B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion.

     C: Assertion is correct but Reason is wrong.

     D: Assertion is wrong but Reason is correct.

16.
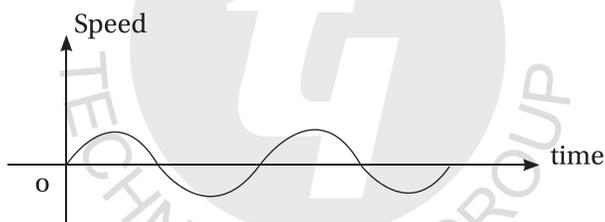
   Assertion (A) : The aforesaid graph is wrong

   Reason (R) : As speed cannot be negative

   Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

17.
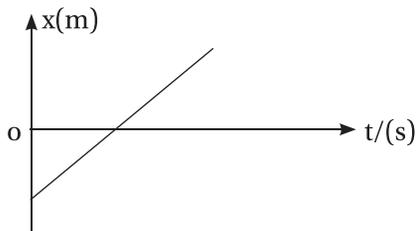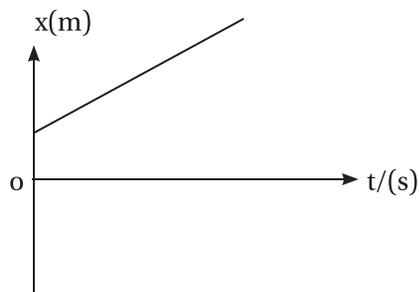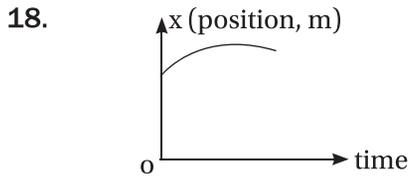

figure - 1

figure - 2

   Assertion (A) : Both figures represent positive velocity.

   Reason (R) : $\dfrac{dx}{dt}$ (slope) is negative.

   Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

18.

Assertion (A): The graph is for position-time of a particle moving with uniformly accelerated (a < 0).

Reason (R): The curve is a parabola.

Ⓐ A　　　　　　Ⓑ B　　　　　　Ⓒ C　　　　　　Ⓓ D

19. Displacement time relation using S, u, v, a (uniform) and t where u = initial velocity, s = displacement in time t, a = uniform acceleration, v = final velocity
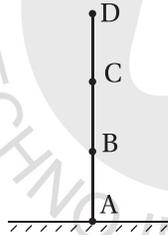
Assertion (A): Average velocity $= \dfrac{u+v}{2} = u + \dfrac{1}{2}$ at

Reason (R): average velocity $= \dfrac{S}{2t}$

Ⓐ A　　　　　　Ⓑ B　　　　　　Ⓒ C　　　　　　Ⓓ D

Case Base Question

Water drops from a water-tap on to the floor x metre below. The first drop strikes the floor at the instant the fourth one begins to fall and first one just strikes the floor. Assume that the drops fall at regular intervals of time.

20. CD =

Ⓐ $\dfrac{x}{9}$　　　　　Ⓑ $\dfrac{x}{4.5}$　　　　　Ⓒ $\dfrac{2x}{3}$　　　　　Ⓓ $\dfrac{2x}{9}$

21. BD =

Ⓐ $\dfrac{x}{9}$　　　　　Ⓑ $\dfrac{4x}{9}$　　　　　Ⓒ $\dfrac{2x}{9}$　　　　　Ⓓ $\dfrac{5x}{9}$

22. AB =

Ⓐ $\dfrac{x}{9}$　　　　　Ⓑ $\dfrac{4x}{9}$　　　　　Ⓒ $\dfrac{5x}{9}$　　　　　Ⓓ $\dfrac{x}{3}$

II. Oblique projectile

Consider a projectile thrown with velocity v at an angle θ with the horizontal. The velocity v can be resolved into two rectangular components (i) $v\cos\theta$ along x-axis (ii) $v\sin\theta$ along y-axis. The motion of the projectile is two dimensional motion. It can be supposed to be made up of two motions – horizontal motion (along x-axis) and vertical motion (along y-axis). The horizontal motion of the projectile is uniform motion. This is because the only force acting on the projectile is the force of gravity.
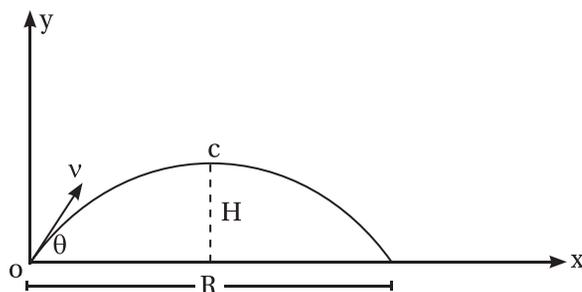
23. At highest point, the magnitude of velocity is

Ⓐ $v \cos \theta$ Ⓑ $v \sin \theta$ Ⓒ $v \tan \theta$ Ⓓ $v \sec \theta$

24. Range R =

Ⓐ $\dfrac{2H}{\tan\theta}$ Ⓑ $\dfrac{4H}{\tan\theta}$ Ⓒ $\dfrac{H}{\tan\theta}$ Ⓓ $\dfrac{H}{2\tan\theta}$

25. The trajectory of the projectile is

Ⓐ ellipse   Ⓑ circular   Ⓒ parabolic   Ⓓ hyperbolic

Chemistry

26. Calculate the molarity of HCl of 4% strength 1.17 g/cc.

Ⓐ 1.28   Ⓑ 2.18   Ⓒ 2.8   Ⓓ 1.82

27. The equivalent weight of H_3PO_4 in the given reaction is :

$$NaOH + H_3PO_4 \rightarrow NaH_2PO_4 + H_2O$$

Ⓐ 49   Ⓑ 98   Ⓒ 32.67   Ⓓ 24.5

28. Concentration of glucose in blood is approximately 90 mg/100 ml. The molarity of glucose solution in blood is :

Ⓐ $5 \times 10^{-3} \, M$ Ⓑ $5 \, M$ Ⓒ $10^{-3} \, M$ Ⓓ $10^{-2} \, M$

29. Calculate the normality of 4.9% (w/w) H_2SO_4 solution having density 1.02 g/ml :

Ⓐ 1.02 N   Ⓑ 0.51 N   Ⓒ 2.04 N   Ⓓ 4.9 N

30. Caffine has a molecular weight of 194. If it contains 28.9% by mass of nitrogen. How many 'N' atoms are there in one molecule of caffine ?

Ⓐ 4   Ⓑ 6   Ⓒ 2   Ⓓ 8

31. A piece of Mg is dissolved in 40 ml of $\dfrac{N}{10}$ HCl completely. The excess of acid was neutrallized by 15 ml of $\dfrac{N}{5}$ NaOH. The weight of Mg is :

Ⓐ 0.24 g   Ⓑ 0.024 g   Ⓒ 0.012 g   Ⓓ 0.40 g

32. The molefraction of glucose in aqueous solution is 0.2 ; then molality of solution will be :

Ⓐ 13.8   Ⓑ 55.56   Ⓒ 2   Ⓓ 12

33. A compound contain 3.2% of oxygen. The minimum molecular weight of the compound is :

Ⓐ 300   Ⓑ 440   Ⓒ 350   Ⓓ 500

34. The normality of solution obtained by mixing 100 ml of 0.2 (M) H_2SO_4 with 100 ml of 0.2 (M) NaOH is

Ⓐ 0.1   Ⓑ 0.2   Ⓒ 0.5   Ⓓ 0.3

35. 2.76 of silver carbonate on being strongly heated yields a residue weighting :

Ⓐ 2.16 g   Ⓑ 2.48 g   Ⓒ 2.32 g   Ⓓ 2.64 g

36. Choose the incorrect match regarding equivalent weight. (M = Molecular mass of acid).

    ACID   **EQUIVALENT WT.**

Ⓐ $H_3PO_2 \longrightarrow M$

Ⓑ $H_3PO_4 \longrightarrow \dfrac{M}{3}$

Ⓒ $H_3BO_3 \longrightarrow \dfrac{M}{3}$

Ⓓ $H_3SO_4 \longrightarrow \dfrac{M}{2}$

37. The weight of KOH in its 50 milli equivalent is :

Ⓐ 1.6 g   Ⓑ 2.2 g   Ⓒ 2.8 g   Ⓓ 4.8 g

38. 1 mole of aliphatic compound $C_nH_{3n}O_m$ is completed burnt in an excess of O_2. The number of moles of oxygen reacted are :

Ⓐ $n+\dfrac{3n}{4}-\dfrac{m}{2}$ Ⓑ $n+\dfrac{3n}{2}-\dfrac{m}{2}$ Ⓒ $n+\dfrac{3n}{4}+\dfrac{m}{2}$ Ⓓ $n+\dfrac{3n}{4}-\dfrac{m}{4}$

39. Given the abundance of isotopes ^{54}Fe, ^{56}Fe and ^{57}Fe are 5%, 90% and 5% respectively, the atomic mass of Fe is :

Ⓐ 55.85   Ⓑ 55.95   Ⓒ 55.75   Ⓓ 56.05

40. The number of neutrons in a drop of water (20 drops = 1 ml) at 4°C :

Ⓐ 6.023×10^{22} Ⓑ 1.338×10^{22} Ⓒ 6.023×10^{20} Ⓓ 7.338×10^{22}

Assertion and Reason : (Qs. 41-44)

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

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

    B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion.

    C: Assertion is correct but Reason is wrong.

    D: Assertion is wrong but Reason is correct.

41. **Assertion (A) :** 1 a.m.u = 1.66×10^{-24} g

  Reason (R) : 1 a.m.u = 1 gram molecular weigh

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

42. **Assertion (A) :** In the reaction : $2NaOH + H_3PO_4 \longrightarrow Na_2HPO_4 + 2H_2O$; equivalent weight of H_3PO_4 is $\dfrac{M}{2}$, where M is its molecular weight

  Reason (R) : Equivalent weight = $\dfrac{\text{Molecular weight}}{\text{n-factor}}$

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

43. **Assertion (A):** Mass of 1 gram molecule of H_2SO_4 is 98 g

   Reason (R): One gram atom contain Na atom

   Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

44. **Assertion (A):** When 4 mole of H_2 reacts with 2 mole of O_2, then 4 mole of water is formed.

   Reason (R): O_2 will act as limiting reagent.

   Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Case Base Question (Qs. 45- to Qs. 47)

Atoms of same element having same atomic number and different mass known as isotopes. It atomic masses of two isotopes of an element are A_1 and A_2 and they exist in the ratio $P_1 : P_2$, then average mass

$$\text{Average} = \frac{A_1 P_1 + A_2 P_2}{P_1 + P_1}$$

45. Which isotope can be used to decide the scale of atomic mass ?

   Ⓐ $^{12}C_6$ Ⓑ $^{15}N_7$ Ⓒ $^{24}Na_{11}$ Ⓓ $^{14}C_6$

46. If % abundance of two isotopes of carbon $^{12}C_6$ and $^{14}C_6$ are 90% and 10% respectively, then number of C –12 atoms is 12 g of same sample will be approximately.

   Ⓐ $0.44\,N_A$ Ⓑ $0.88\,N_A$ Ⓒ $0.22\,N_A$ Ⓓ $0.11\,N_A$

47. If average atomic man of Cl is 35.5. Chlorine exist in nature in the form of two isotope $^{35}Cl_{17}$ & $^{37}Cl_{17}$, then the ratio in which they exist in nature will be :

   Ⓐ $1:1$ Ⓑ $3:1$ Ⓒ $2:1$ Ⓓ $3:2$

Case Base Question (Q. 48- to Q. 50)

Avogadro's law states that under similar condition of 'T' & 'P', equal volumes of all gases contain equal number of particles. Experiments show that at one atmosphere pressure and at a temperature 273 k (i.e at S.T.P) one mole of any gas occupies a volume Approximately 22.42. So, number of moles of any sample of gas can be found by comparing its volumes at STP ith 22.4.

1 mole of any species contains 6.023×10^{23} particles which is denoted by symbol N_A. No. of atoms present in 1 gm atom. of an element or number of moleculer present in 1 gm molecule of any substance is equal to N_A. Hence, it is number of particles present in one mole of the substance.

48. If N_{AV} is Avogadro number, then 10 a.m.u will be equal to – gm.

   Ⓐ $10\,N_{AV}$ Ⓑ $\dfrac{N_{AV}}{10}$ Ⓒ $\dfrac{10}{N_{AV}}$ Ⓓ N_{AV}

49. At S.T.P 11.2 L of CO_2 contains.

   Ⓐ 1 mole   Ⓑ 2 mole   Ⓒ 0.5 mole   Ⓓ 3 mole

50. The number of gm atom of oxygen present in 0.2 mole of $H_2S_2O_8$ is :

   Ⓐ 0.2   Ⓑ 8   Ⓒ 1.6   Ⓓ 0.8

Mathematics

51. The domain of $f(x) = \dfrac{3^x + 3^{-x}}{3^x - 3^{-x}}$ is

Ⓐ $(-\infty, \infty)$ Ⓑ $(-\infty, 0) \cup (0, \infty)$ Ⓒ $(0, \infty)$ Ⓓ $(0, 1)$

52. If $\sin\theta + 7\cos\theta = 5$, then $\tan\dfrac{\theta}{2}$ is a root of the equation

Ⓐ $x^2 - 6x + 1 = 0$ Ⓑ $6x^2 - x - 1 = 0$ Ⓒ $6x^2 + x + 1 = 0$ Ⓓ $x^2 - x + 6 = 0$

53. Let A and B be two sets containing 2 elements and 4 elements respectively. The number of subsets of $A \times B$ having more than 2 elements is

Ⓐ 211   Ⓑ 256   Ⓒ 220   Ⓓ 219

54. Find the natural number a for which $\displaystyle\sum_{k=1}^{n} f(a+k) = 16\left(2^n - 1\right)$, where the function f satisfies the relation $f(x+y) = f(x)f(y)$ for all natural numbers x, y and further $f(1) = 2$

Ⓐ 4   Ⓑ 2   Ⓒ 3   Ⓓ 5

55. If $x + y + z = xyz$, then $\dfrac{2x}{1-x^2} + \dfrac{2y}{1-y^2} + \dfrac{2z}{1-z^2} =$

Ⓐ $\dfrac{2x}{1-x^2} \cdot \dfrac{2y}{1-y^2} \cdot \dfrac{2z}{1-z^2}$ Ⓑ $\dfrac{xyz}{\left(1-x^2\right)\left(1-y^2\right)\left(1-z^2\right)}$ Ⓒ 1   Ⓓ $(1-x^2)(1-y^2)(1-z^2)$

Case Study Based Question-I (Q.56–Q.58)

The below figure shows the compass. The East direction is along the positive X-axis (0° angle) and North direction is along the +ve Y-axis (90° angles). Initially the pointer is pointed towards North-East direction. Pointer is deflected in a magnetic field by some angle.
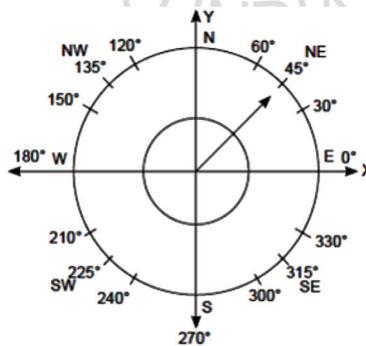
On the basis of above answer the following.

56. If pointer moves in anticlockwise direction by an angle of 90°, then find the value of sine of angle made by pointer from East direction.

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

57. If pointer moves an angle of 165° from its initial position in anticlockwise direction, then find the value of cosine of angle made by pointer from East direction.

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

58. If the sine and cosine of angle made by pointer with East direction is $\dfrac{-1}{\sqrt{2}}$, then find where the pointer pointed?

Ⓐ South-west direction   Ⓑ North-west direction   Ⓒ East-west direction   Ⓓ North-east direction

Case Study Based Question-II (Q.59–Q.61)

A class XI teacher, after teaching the topic of 'Relations; tries to assess the performance of her students over this topic. The figure shows a relation between the sets *P* and *Q*.
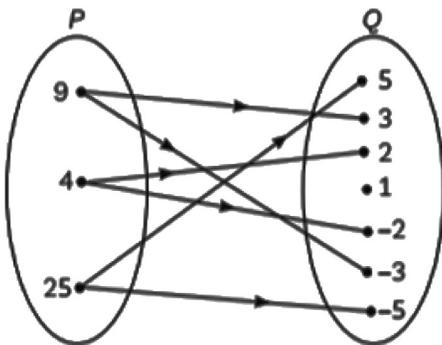
On the basis of above answer the following.

59. This relation in set builder form is :

Ⓐ $R = \{(x, y) : x$ is square root of $y, x \in P, \ y \in Q\}$ Ⓑ $R = \{(x, y) : y$ is square of $x, x \in P, \ y \in Q\}$

Ⓒ $R = \{(x, y) : x$ is square of $y, x \in P \ y \in Q\}$ Ⓓ none of these

60. The domain of relation is :

Ⓐ $\{1, 2, 3, 4, 5\}$ Ⓑ $\{4, 9, 25, 5\}$ Ⓒ $\{4, 9\}$ Ⓓ $\{4, 9, 25\}$

61. The range of relation is :

Ⓐ $\{4, 9, 25\}$ Ⓑ $\{1, 2, 3, 4, 5\}$ Ⓒ $\{-2, 2, -3, 3, -5, 5\}$ Ⓓ $\{-5, -3, -2, 1, 2, 3, 5\}$

Assertion-Reason based questions (Q.62–Q.65)

Directions:

Each of these questions contains two statements Assertion (A) and Reason (R). Each of the questions has four alternative choices, any one of the which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) A is true, R is true, R is a correct explanation of A

(b) A is true, R is true, R is not correct explanation of A

(c) A is true, R is false

(d) A is false R is true

62. **Assertion (A) :** If $f(x) = x + \dfrac{1}{x}$, then $[f(x)]^3 = f\left(x^3\right) + 3f\left(\dfrac{1}{x}\right)$

Reason (R) : If $f(x) = (x - a)^2 (x - b)^2$, then $f(a + b)$ is 0

Ⓐ a   Ⓑ b   Ⓒ c   Ⓓ d

63. Let $A = \{1, 2, 3, 4, 6\}$. If R is the relation on A defined by $\{(a, b) : a, b \in A, \ b$ is exactly divisible by $a\}$

Assertion (A) : The relation R in Roster form is $\{(6, 3), (6, 2), (4, 2)\}$.

Reason (R) : The domain and range of R is $\{1, 2, 3, 4, 6\}$.

Ⓐ a   Ⓑ b   Ⓒ c   Ⓓ d

64. **Assertion (A) :** $\cos\dfrac{\pi}{7}\cos\dfrac{2\pi}{7}\cos\dfrac{4\pi}{7} = \dfrac{-1}{8}$

   Reason (R) : $\cos\theta\cos2\theta\cos4\theta\cdots\cos2^{n-1}\theta = \dfrac{-1}{2^n}$ if $\theta = \dfrac{\pi}{2^n-1}$

   Ⓐ a   Ⓑ b   Ⓒ c   Ⓓ d

65. **Assertion (A) :** If A, B, C, D are angles of a cyclic quadrilateral, then $\sin A + \sin B + \sin C + \sin D = 0$.

   Reason (R) : If A, B, C, D are angles of a cyclic quadrilateral, then $\cos A + \cos B + \cos C + \cos D = 0$

   Ⓐ a   Ⓑ b   Ⓒ c   Ⓓ d

66. Find the value of $\sin6°\sin42°\sin66°\sin78°$.

   Ⓐ $\dfrac{1}{12}$ Ⓑ $\dfrac{1}{8}$ Ⓒ $\dfrac{1}{4}$ Ⓓ $\dfrac{1}{16}$

67. If θ is in the third quadrant, then $\sqrt{4\sin^4\theta + \sin^2 2\theta} + 4\cos^2\left(\dfrac{\pi}{4} - \dfrac{\theta}{2}\right) = ?$

   Ⓐ 2   Ⓑ –2   Ⓒ 0   Ⓓ 1

68. If $\sin x + \cos x + \tan x + \cot x + \sec x + \csc x = 7$ and $\sin 2x = a - b\sqrt{7}$, then ordered pair (a, b) can be

   Ⓐ (6, 2)   Ⓑ (8, 3)   Ⓒ (22, 8)   Ⓓ (11, 4)

69. Which of the following sets is not finite?

   Ⓐ $\left\{(x,y): x^2 + y^2 \le 1 \le x + y, \ \ x,y \in R\right\}$ Ⓑ $\left\{(x,y): x^2 + y^2 \le 1 \le x + y, \ \ x,y \in Z\right\}$

   Ⓒ $\left\{(x,y): x^2 \le y \le |x|, \ \ x,y \in Z\right\}$ Ⓓ $\left\{(x,y): x^2 + y^2 = 1, \ \ x,y \in Z\right\}$

70. Let A = {1, 2, 3, 4}, B = {2, 4, 6}. Then the number of sets C such that $A \cap B \subseteq C \subseteq A \cup B$ is

   Ⓐ 6   Ⓑ 9   Ⓒ 8   Ⓓ 10

71. If A and B are non-empty sets, then $P(A) \cup P(B)$ is equal to

   Ⓐ $P(A \cup B)$ Ⓑ $P(A \cap B)$ Ⓒ $P(A) \cap P(B)$ Ⓓ none of these

72. Let the sets $A = \{2, 4, 6, 8, \ldots\}$ and $B = \{3, 6, 9, 12, \ldots\}$. If $n(A) = 200$, $n(B) = 250$, then

   Ⓐ $n(A \cap B) = 67$ Ⓑ $n(A \cup B) = 450$ Ⓒ $n(A \cap B) = 90$ Ⓓ $n(A \cup B) = 384$

73. The domain for which the functions defined by $f(x) = 3x^2 - 1$ and $g(x) = 3 + x$ are equal is

   Ⓐ $\left\{-1, \dfrac{4}{3}\right\}$ Ⓑ $\left\{1, \dfrac{4}{3}\right\}$ Ⓒ $\left\{-1, -\dfrac{4}{3}\right\}$ Ⓓ $\left\{-2, \dfrac{4}{3}\right\}$

74. Range of $f(x) = \dfrac{1}{1 - 2\cos x}$ is

   Ⓐ $\left[\dfrac{1}{3}, 1\right]$ Ⓑ $\left[\dfrac{-1}{3}, 1\right]$ Ⓒ $\left[-1, \dfrac{1}{3}\right]$ Ⓓ $(-\infty, -1] \cup \left[\dfrac{1}{3}, \infty\right)$

75. The relation R defined on the set $A = \{1,2,3,4,5\}$ by $R = \left\{(a,b): \left|a^2 - b^2\right| < 16\right\}$ is given by

   Ⓐ {(1,1), (2,1), (3,1), (4,1), (2,3)}   Ⓑ {(2,2), (3,2), (4,2), (2,4)}

   Ⓒ {(3,3), (4,3), (5,4), (3,4)}   Ⓓ None of these

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76. In writing the botanical name of a plant, which part is never underlined?

    Ⓐ Generic name   Ⓑ Specific epithet   Ⓒ Author's name   Ⓓ None of the above

77. Maximum diversity of characteristics will be found in which of the following categories?

    Ⓐ Division   Ⓐ Order   Ⓓ Family   Ⓓ Genus

78. Ecologically, multicellular decomposers are

    Ⓐ saprotrophic plants   Ⓑ saprotrophic animals   Ⓒ fungi   Ⓓ monerans

79. Members of phycomycetes are found in:

    (I) aquatic habitats   (II) on decaying wood

    (III) moist and damp places   (IV) as obligate parasites on plants

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

80. Which of the following features of *Pinus* help it to tolerate extreme conditions?

    Ⓐ Needle like leaves   Ⓑ Sunken stomata   Ⓒ Pinnate leaves   Ⓓ All of the above

81. Which one of the following is a vascular cryptogam?

    Ⓐ *Equisetum*   Ⓑ *Gingko*   Ⓒ *Marchantia*   Ⓓ *Cedrus*

82. Select the incorrect match:

    Ⓐ *Cycas* – coralloid root   Ⓑ *Pinus* – Endomycorrhiza

    Ⓒ *Cedrus* – Branched stem   Ⓓ *Gingko* – Long and short shoot

83. There are only 70 living genera of gymnosperms. The decline in their numbers can be attributed to:

    Ⓐ unprotected seeds and ovules   Ⓑ dispersal of pollen through wind mainly

    Ⓒ absence of vessels   Ⓓ Both A and B

84. Metamerism is the characteristic feature of which of the following animals?

    Ⓐ Starfish   Ⓑ Snail   Ⓒ Earthworm   Ⓓ Tapeworm

85. Which of the following is an oviparous mammal?

    Ⓐ *Balaenoptera*   Ⓑ *Delphinus*   Ⓒ *Pteropus*   Ⓓ *Ornythorhynchus*

86. *Rattus rattus* is a _____

    Ⓐ Synonym   Ⓑ Tautonym   Ⓒ Autonym   Ⓓ Homonym

87. Type specimen used by the author in the original publication is called

    Ⓐ lectotype   Ⓑ neotype   Ⓒ holotype   Ⓓ syntype

88. A full grown *Amoeba* undergoes binary fission. The total surface area of one daughter *Amoeba*, soon after division, is likely to be

    Ⓐ slightly less than that of parent *Amoeba*   Ⓑ equal to half of that of parent *Amoeba*

    Ⓒ slightly more than half of that of parent *Amoeba*   Ⓓ less than half of that of parent *Amoeba*.

89. Identify A and B.

Ⓐ A is *Sphagnum*; B is *Funaria*   Ⓑ A is *Funaria*; B is *Marchantia*

Ⓒ A is *Marchantia*; B is *Funaria*   Ⓓ A is *Funaria*; B is *Sphagnum*

90. The first terrestrial plants to possess vascular tissues are:

Ⓐ Mosses   Ⓑ Pteridophytes   Ⓒ Gymnosperms   Ⓓ Angiosperms – dicots

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

Assertion and Reason : (Q. 91 – 94)

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

A: Both A and R are true and R is the correct explanation of A.

B: Both A and R are true but R is not the correct explanation of A.

C: A is true but R is false.

D: A is false but R is true.

91. **Assertion (A):** Platyhelminths perform anaerobic respiration.

Reason (R): Flatworms have hooks and suckers for attachment to the host.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

92. **Assertion (A):** Lichen is an example of symbiosis, where an algal and a fungal species live together for mutual benefit.

Reason (R): If the algal and fungal partners are separated, the fungi will die but the algae will continue to survive.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

93. **Assertion (A):** Systematics is an important branch of Biology.

Reason (R): Systematics help to name the organisms and divide them into groups and subgroups, according to set rules, to make their study easy.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

94. **Assertion (A):** Sometimes the sea surface glow in the dark.

Reason (R): Sea surface possesses planktonic dinoflagellates showing phosphorescence.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Read the given passage and answer the following questions: (Q.95 - 97)

Brown algae are mostly found in marine water but in temperate seas. Plant body is represented by profusely branched elaborate thalli, known as kelp. Some of them reach a height of 100 metres or more. Few members (non kelp) are simple branched filamentous type. Cell wall is cellulosic with a coating of algin, a hydracolloid. Cytoplasm possesses a large central vacuole.

95. Select the odd one out.

Ⓐ *Laminaria*   Ⓑ *Sargassum*   Ⓒ *Spirogyra*   Ⓓ *Fucus*

96. Which of the following algae does not have the pigment fucoxanthin?

Ⓐ *Chlorella*   Ⓑ *Gelidium*   Ⓒ *Volvox*   Ⓓ All of the above
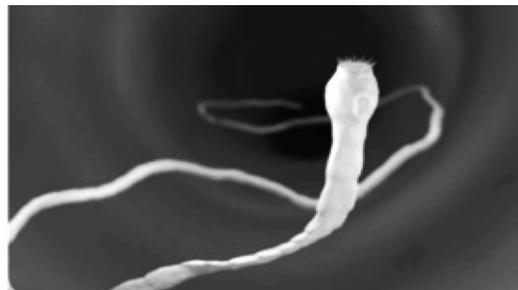
97. Select the incorrectly matched pair.

Ⓐ Chlorophyceae – Starch   Ⓑ Phaeophyceae – No flagella

Ⓒ Red algae – Phycoerythrin   Ⓓ Green algae – External fertilisation

Observe the pictures and read the given passage and answer the following questions: (98 - 100)

Pic : I   Pic : II

Helminths or parasitic intestinal worms include various flatworms and roundworms. Although, they thrive and grow in our body, most helminths cannot reproduce there. Instead they lay eggs, which exit our body along with the faeces. People become infected with helminthic diseases, when they consume water or food contaminated by such faeces.

98. What is shown in Pic. I?

Ⓐ Sexual dimorphism in earthworm   Ⓑ Sexual reproduction in tapeworm

Ⓒ Sexual dimorphism in roundworm   Ⓓ Sexual dimorphism in *Neries*

99. Select the correct statement about the phylum to which the animal given in Pic. II belongs to?

Ⓐ The digestive system is complete with mouth and anus.

Ⓑ These are pseudocoelomates.

Ⓒ They are monoecious.

Ⓓ They show organ system level of organisation.

100. From the list given below, select an organism which belongs to the phylum represented by the organism in Pic. II.

Ⓐ *Fasciola*   Ⓑ *Wuchereria*   Ⓒ *Ascaris*   Ⓓ All of the above