Monthly Progressive Test

Class: X (S)

Subject: PCMB

Test Booklet No.: MPT07

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

Time: 120 mins

Full Marks: 200

Solutions

Physics

1. Ⓒ

   A magnetic field can not exert a force on a stationary electric charge.
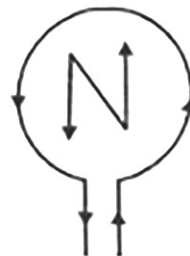
2. Ⓑ

   Apply Fleming's left hand rule.

3. Ⓒ

   Into the page ⊕. Apply Flemings left hand rule.

4. Ⓑ

   Clockwise current:

   Anticlockwise current:
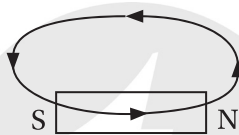
5. Ⓐ

The core of electromagnet is soft iron.

6. Ⓓ

$$B = \mu_0\, ni = 4\pi \times 10^{-7} \times \frac{100}{\left(\frac{50}{100}\right)} \times 2.5$$

$$= 4\pi \times 10^{-7} \times 200 \times 2.5$$

$$= \pi \times 10^{-7} \times 2000 = 2\pi \times 10^{-4}\ T$$

$$= 6.28 \times 10^{-4}\ T$$

7. Ⓐ

M = N (iA)

8. Ⓐ

9. Ⓑ

Iron nail is magnetic material. So, in normal condition, iron nail cannot attract another nail.

10. Ⓒ

Reversing the current in the straight wire, reverses the direction of magnetic field produced.

11. Ⓒ

As $B = \dfrac{\mu_0}{4\pi} \dfrac{2i}{r}$, therefore $B\, \alpha\, \dfrac{1}{r}$

12. Ⓑ

True, we can apply right hand thumb rule.

13. Ⓐ

As $B \propto N$ (number of turns)

14. Ⓐ

As $B \propto i$ where i is current in the coil

15. Ⓒ

As statement of Right Hand Thumb Rule is correct in the assertion part

16. Ⓐ

$P = P_1 + P_2 = 3.5 + (-2.5) = +1D$

17. Ⓑ

$P = 3.5 + (-2.5) = 1D = \dfrac{100}{f(cm)}$

∴ f = 100 cm

18. Ⓐ

Series : 3 + 3 = 6 ohm

Parallel : $\dfrac{6 \times 3}{6+3} = 2$ ohm

Series : 3 + 3 + 2 = 8 ohm

$i = \dfrac{12}{8} = \dfrac{3}{2} = 1.5A$

19. Ⓑ

$R_{AB} = 1 + \dfrac{1}{3}$

$= \dfrac{4}{3}$ ohm

20. Ⓐ
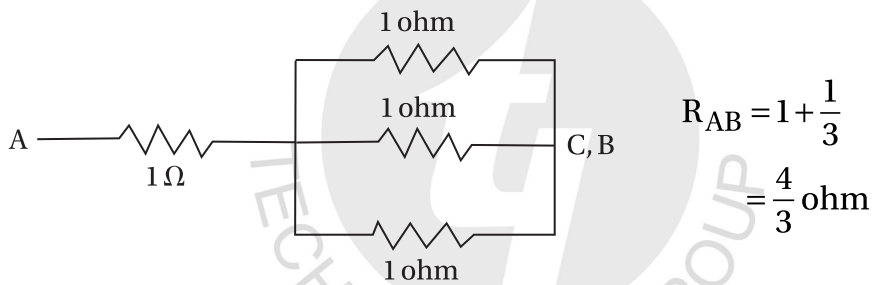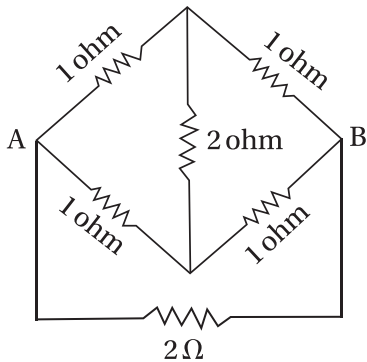
Balanced wheatston bridge circuit.
Remove 2 ohm resistor.

$\dfrac{1}{R} = \dfrac{1}{2} + \dfrac{1}{2} + \dfrac{1}{2} = \dfrac{3}{2}$

$$\therefore \ R = \frac{2}{3} \ \text{ohm}$$

21. Ⓐ

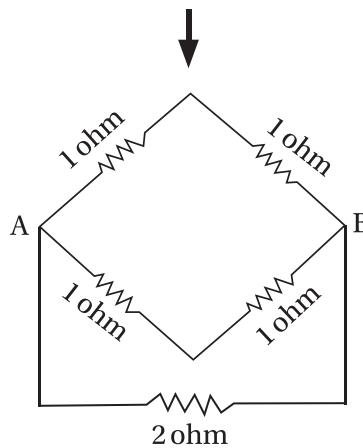$$r = \frac{mv}{qB}$$

$$r_\alpha = \frac{4m_p}{(+2e)} \times \frac{v}{B} = 2r_p$$

22. Ⓑ

$$r_\alpha = \frac{m_\alpha \cdot v_\alpha}{(+2e)B} \implies \text{given} \ m_\alpha \cdot v_\alpha = m_p \cdot v_p$$

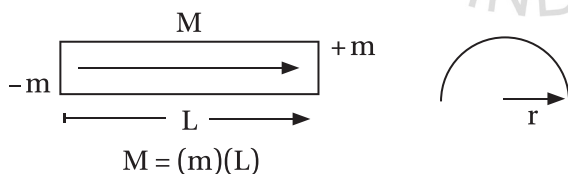$$r_p = \frac{m_p \cdot v_p}{(+e)B} \implies r_p = \frac{m_\alpha \cdot v_\alpha}{(+e)B}$$

$$\therefore \ r_\alpha = \frac{r_p}{2} \implies 2 : 1 = r_p : r_\alpha$$

23. Ⓓ

We know $P = \sqrt{2km}$ $\quad \therefore \quad r = \frac{\sqrt{2km}}{B}$

$$\frac{r_P}{r_\alpha} = \sqrt{\frac{m_P}{m_\alpha}} \times \frac{q_\alpha}{q_P} = \sqrt{\frac{1}{4} \times \frac{2}{1}} = 1$$

24. Ⓓ

$$M = (m)(L)$$

$$\pi r = L \implies r = \frac{L}{\pi}$$

$$M' = (m)(2r) = 2 \cdot \frac{mL}{\pi} = \frac{2M}{\pi}$$

25. Ⓐ

$$\text{Area} = \left(\frac{\pi a^2}{4} \times 2 \right) + a^2 = \frac{(\pi + 2) a^2}{2}$$

$$M = \left(\frac{\pi + 2}{2} \right) a^2 I$$

Chemistry

26. Ⓐ

Wrong statement is : Diamond is a good conductor of electricity.

27. Ⓒ

C_3H_6 and C_2H_2 both are unsaturated compound. C_2H_4 is also unsaturated compound. C_2H_6, C_4H_{10}, saturated hydrocarbon.

28. Ⓒ

In case of esterification reaction the role of concentrated H_2SO_4 is dehydrating agent.

29. Ⓐ

Electrical conductivity of methane is very low because methane is a gaseous molecule.

30. Ⓒ

Ethanol and dimethyl ether are functional group isomerism as they have different functional group but same molecular formula C_2H_6O.

ethanol : $C_2H_6O \Rightarrow CH_3CH_2OH$

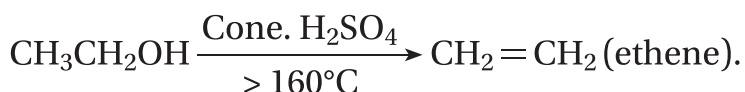Dimethyl ether : $C_2H_6O \Rightarrow CH_3 — O — CH_3$

31. Ⓐ

Methane forms methyl chloride and hydrochloric acid after reacting with chlorine gas in diffused sunlight. This is an example of substitution reaction.
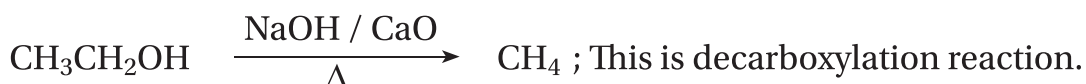
$$CH_4(g) + Cl_2(g) \xrightarrow{\text{sunlight}} CH_3Cl(g) + HCl(g)$$

32. Ⓑ

Formation of polyethene from ethene is an example of polymerization reaction.

$$CH_3CH_2OH \xrightarrow[>160°C]{\text{Cone. } H_2SO_4} CH_2 = CH_2 \text{ (ethene)}.$$

This is Dehydration reaction.

$$CH_3CH_2OH \xrightarrow[\Delta]{\text{NaOH / CaO}} CH_4 \text{ ; This is decarboxylation reaction.}$$

$$CH_4 \xrightarrow[-4HCl]{4Cl_2} CCl_4 \text{ ; Chlorination reaction (Substitution reaction)}$$

33. Ⓑ

Assertion (A) : C^{4-} ion is a very stable. This is correct.

Reason (R) : C^{4-} ion has 10 electrons and 6 protons.

This is also correct, but it is not the correct explanation of Assertion (A). Thus, the answer is B.

34. Ⓓ

Covalent molecules :
→ have low melting and Boiling point
→ are bad conductors of electricity
→ are insoluble in polar solvent.

35. Ⓒ

Denatured alcohol means methanol and other additive are added to ethanol to make unfit for drinking.

36. Ⓒ

Artificial diamond is formed by applying pure carbon to high temperature and pressure.

37. Ⓓ

Carbon – Iodine bone is weakest as the electronegativity of Iodine is least amongst F, Cl, Br, I. Electronegaivity decreases F > Cl > Br > I.

38. Ⓑ

Assertion (A) : is correct. $CH_3 CH_2 CH_2 OH$ is oxidised with alkaline $KMnO_4$.
Reason (R) : is also correct. $KMnO_4$ is an ionic compound.
This is also correct, but not correct explanation of Assertion. Thus, the answer is B.

39. Ⓑ

When magnesium and oxygen form magnesium oxide then correct statement is : metal releases 2 electrons and non-metal accepts 2 electrons.

40. Ⓑ

x = Total number of electrons in the outer most shell of N^{3-} ion
$$= 5 + 3 = 8 \; [N_7 = K_2 L_5]$$
y = Total number of electrons in the outermost shell of oxygen atom = 6
$$[O_8 = K_2 L_6]$$
$$\therefore \; x + y = 8 + 6 = 14$$

41. Ⓒ

When calcium comes contact with water then it starts floating as the Produced gas (H_2) sticks to the metal.

$$Ca + 2H_2O \longrightarrow Ca(OH)_2 + H_2 \uparrow$$
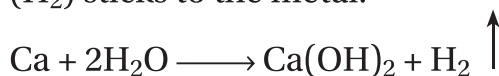
42. Ⓑ

Assertion (A) : Aluminium is used to make utensils for cooking. This is correct.
Reason (R) : Aluminium is highly reactive metal. This is also correct, but it is not the correct explanation of Assertion (A) ; thus, the option 'B' is answer.
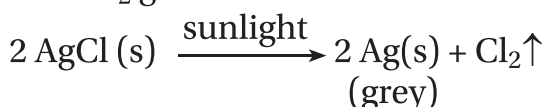
43. Ⓐ

Assertion (A) : Sodium is kept immersed in kerosene oil. This is correct.
Reason (R) : Sodium is a very reactive metal. This is correct & the correct explanation of Assertion (A). Thus the answer is (A).

44. Ⓓ

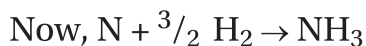When silver chloride is exposed to sunlight grey coloured silver is produced along with Cl_2 gas.

$$2\,AgCl\,(s) \xrightarrow{\text{sunlight}} 2\,Ag(s) + Cl_2\uparrow$$
$$\text{(grey)}$$

45. Ⓒ

Both octet rule and duplet rules arre properly obeyed.

$$\underset{X \qquad Y}{Fe_2O_3 + 2Al} \longrightarrow \underset{P \qquad Z}{2\,Fe + Al_2O_3}$$

$X = 1,\ Y = 2,\qquad P = 2,\ Z = 1$

$\therefore X + Y + 2Z + P = 1 + 2 + 2 + 2 = 7 \Rightarrow (Q) = $ Nitrogen atom (N_7)

Now, $N + {}^3/_2\,H_2 \to NH_3$

46. Ⓓ

Assertion (A) : In CCl_4 molecule octet of carbon is satisfied but not satisfied for chlorine – This is wrong.
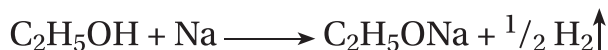**Reason (R) :** Total number of bonds present in CH_3COOH is 8 :

$$H - \underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}} - \underset{}{\overset{\overset{O}{\|}}{C}} - O - H$$
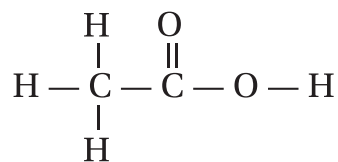
This is correct. Thus the Answer is 'D' .

47. Ⓒ

Assertion (A) : Two isomeric hydrocarbons are possible having molecular formula C_4H_{10}. this is correct.
Reason (R) : General formula for alkene is $C_nH_{2n} + 2$. This is wrong. Thus, the answer is 'C'.

48. Ⓓ
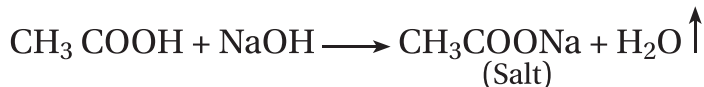
$$C_2H_5OH + Na \longrightarrow C_2H_5ONa + {}^1/_2\,H_2\uparrow$$

(I) There is only one bond in he produced gaseous compound ie. $H_2(H–H)$. this is correct.

(II) The salt produced in this reaction is same when a salt produced during the

reaction between ethanoic acid and sodium hydroxide. This is not correct.

$$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O \uparrow$$
$$\text{(Salt)}$$

(III) Ethanol and sodium metal is a reducing agent. This is correct as it gives hydrogen. Thus the option 'D' is correct.

49. Ⓑ

The number of carbon atoms surrounding each carbon atom in a diamond are 4.

50. Ⓑ

Assertion (A) : A mixture of pure oxygen and ethyne is used for welding. This is correct.

Reason (R) : Oxygen molecule contains double bond while ethyne molecule contains triple bond. This is also correct but it is not the correct explanation of Assertion.

Mathematics

51. Ⓒ

Radius = 5x cm

height = 7x cm

$\therefore$ volume = $\pi(5x)^2 \times 7x$ cm^3

$\qquad = \pi \times 25 \times 7x^3$ cm^3

$\therefore \pi \times 25 \times 7 \times x^3 = 550$

$\Rightarrow \dfrac{22}{7} \times 25 \times 7 \times x^3 = 550$

$\Rightarrow x^3 = \dfrac{550^{\,50^{\,25}}}{22_{\,2} \times 25} = 1$

$\therefore x = 1$

$\therefore$ radius = 5 cm

52. Ⓐ

Canvas used for making the tent

$= 2\pi rh + \pi rl$

$= \pi r(2h + l)$

$= \dfrac{22}{7} \times 4\,(2 \times 2 + 5)m^2$

$$= \frac{22}{7} \times 4 \times 9 \, m^2 = 36\pi \, m^2$$

53. Ⓓ

Cross-section of the river $= 3 \times 60 \, m^2$

Rate of flow $= 2.4 \, km/h$

$$= 2.4 \times \frac{5}{18} \, m/s$$

$$= \frac{\overset{4}{\cancel{24}}^2 \times \cancel{5}}{\cancel{10}_2 \times \cancel{18}_3} = \frac{2}{3} \, m/s$$

∴ Volume of water flows in one second $= \cancel{3} \times 60 \times \frac{2}{\cancel{3}} \, m^3$

$$= 120 \, m^3$$

∴ Volume of water flows in one minute $= 120 \times 60 \, m^3$

$$= 7200 \, m^3$$

54. Ⓐ

x	f	fx
4	5	20
6	10	60
9	10	90
10	7	70
15	8	120
	40	360

∴ Mean $= \frac{\Sigma fx}{\Sigma f} = \frac{360}{40} = 9$

55. Ⓒ

Mode = 19   (∵ it occurs maximum time)

56. Ⓐ

Total outcomes = 17

Favourable outcomes = 0

∴ Required probability $= \frac{0}{17} = 0$

57. Ⓒ

Let number of white balls = x.

∴ Probability (drawing a white ball) $= \dfrac{x}{10+x}$.

Probability (drawing a red ball) $= \dfrac{10}{10+x}$.

∴ $\dfrac{x}{10+x} = 2 \times \dfrac{10}{10+x}$

⇒ x = 20

58. Ⓐ

Amount of water flow out through the pipe = 5 × 30 cm³/sec

= 150 cm³/sec.

∴ Amount of water flow in one minute = 150 × 60 cm³ = 9000 cm³

= 9 litres

∴ Assertion is true.

Reason is also true and reason is the correct explanation of assertion.

59. Ⓒ

Mean $= \dfrac{1+3+4+5+7+4}{6} = \dfrac{24}{6} = 4$

∴ m = 4

Again, $\dfrac{3+2+2+4+3+3+p}{7} = \dfrac{17+p}{7}$

∴ $\dfrac{17+p}{7} = 3$

⇒ 17 + p = 21 ⇒ p = 4

Now, 2, 2, 3, 3, 3, 4, 4

∴ Median = 3

∴ q = 3

∴ p + q = 4 + 3 = 7

∴ Assertion is true

But reason is false.

60. Ⓑ

Total number of outcomes = 6² = 36

61. Ⓐ

Total number of outcomes = 36

Number of favourable outcomes = 0

$\therefore$ Required probability $= \dfrac{0}{36} = 0$

62. Ⓐ

Total outcomes = 36

Number of favourable outcomes = 6   [(1, 2), (1, 3), (1, 5), (2, 1), (3, 1), (5, 1)]

$\therefore$ Required probability $= \dfrac{6}{36} = \dfrac{1}{6}$

63. Ⓑ

Volume of water in half of the tank $= \dfrac{2}{3}\pi r^3 \times \dfrac{1}{2}$

$$= \dfrac{1}{\cancel{3}} \times \dfrac{\cancel{22}^{11}}{7} \times \dfrac{\cancel{3}}{\cancel{2}} \times \dfrac{3}{2} \times \dfrac{3}{2} \ m^3$$

$$= \dfrac{99}{28} \ m^3 = \dfrac{9900000}{28} \ cm^3$$

$$= \dfrac{99000}{28} \ litres$$

$\therefore$ Time required $= \dfrac{99000}{\cancel{28}_4} \times \dfrac{\cancel{7}}{25}$ seconds

$= 990$ seconds

$= \dfrac{990}{60}$ minutes

$= \dfrac{33}{2}$ minutes

$= 16.5$ minutes.

64. Ⓓ

Height (in cm)	Number of students
160–162	15
163–165	118
166–168	142
169–171	127
172–174	18

Modal class = 165.5 – 168.5

$$\text{Mode} = 165.5 + \frac{142-118}{2\times142-118-127}\times3$$

$$= 165.5 + \frac{24}{\cancel{39}_{13}}\times\cancel{3}$$

$$= 165.5 + 1.85 = 167.35 \text{ cm}$$

65. Ⓑ

$$A = \frac{x}{12}$$

$$B = \frac{x+6}{18}$$

$$\therefore \quad 2A = B$$

$$\Rightarrow \quad \frac{\cancel{2}x}{\cancel{12}_{6}} = \frac{x+6}{\cancel{18}_{3}}$$

$$\Rightarrow \quad 3x = x+6$$

$$\Rightarrow \quad 2x = 6$$

$$\Rightarrow \quad x = 3$$

66. Ⓐ

$$\text{Area of shaded region} = \frac{30°}{360°}\times\pi\left(7^2 - \frac{7^2}{2^2}\right)\text{m}^2$$

$$= \frac{1}{\cancel{12}_{4}}\times\frac{\cancel{22}^{11}}{7}\times\frac{\cancel{21}^{7}}{\cancel{2}}\times\frac{7}{2}\text{ m}^2$$

$$= \frac{77}{8}\text{ m}^2 = 9.625\text{ m}^2$$
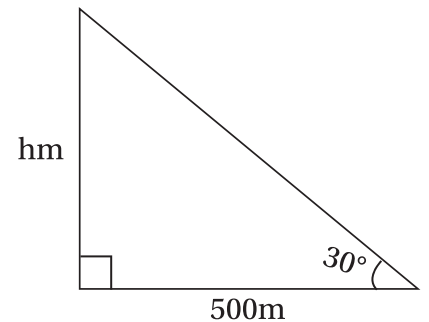
67. Ⓐ

$$\tan 30° = \frac{h}{500}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{h}{500}$$

$$\therefore \quad h = \frac{500}{\sqrt{3}} = \frac{500\sqrt{3}}{3}\text{ m}$$

$$\therefore \text{ The height of the tower} = \frac{500\sqrt{3}}{3}\text{ m}$$

68. Ⓒ

$$\frac{S_n}{S'_n} = \frac{3n-13}{5n+21}$$

$$\Rightarrow \frac{\frac{n}{2}\{2a+(n-1)d\}}{\frac{n}{2}\{2a'+(n-1)d'\}} = \frac{3n-13}{5n+21}$$

$$\Rightarrow \frac{2a+(n-1)d}{2a'+(n-1)d'} = \frac{3n-13}{5n+21}$$

$$\Rightarrow \frac{a+\frac{(n-1)}{2}d}{a'+\frac{(n-1)}{2}d'} = \frac{3n-13}{5n+21}$$

Putting n = 47

$$\frac{a+23d}{a'+23d'} = \frac{141-13}{235+21}$$

$$\Rightarrow \frac{a_{24}}{a'_{24}} = \frac{\overset{1}{\cancel{128}}}{\underset{2}{\cancel{256}}} = \frac{1}{2}$$

$$= 1:2$$

69. Ⓑ

$$ax^2 + bx + c = 0$$

$$\therefore x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= -\frac{b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$$

70. Ⓒ

Let the fraction be $\frac{x}{y}$

$$\frac{x+1}{y+1} = \frac{4}{5} \Rightarrow 5x+5 = 4y+4$$

$$\Rightarrow 5x - 4y = -1$$

Again, $\frac{x-5}{y-5} = \frac{1}{2}$

$$\Rightarrow 2x - 10 = y - 5$$

$$\Rightarrow 2x - y = 5$$

$\Rightarrow$ 8x – 4y = 20

5x – 4y = –1

(–) (+) (+)

$\overline{}$

3x = 21

x = 7

$\therefore$ y = 2x – 5 = 2 ×7 – 5 = 9

$\therefore$ Fraction $= \dfrac{7}{9}$

71. Ⓑ

Curved surface area $= 2\pi rh + \pi rl$

$= \pi r\,(2h + l)$

$= \dfrac{22}{7} \times \cancel{84}^{12} \times (2 \times 50 + 91)\, m^2$

$= 22 \times 12 \times 191\ m^2$

$= 50424\ m^2$

$\therefore$ quantity of canvas required $= \left(50424 + 50424 \times \dfrac{1}{5}\right) m^2$

$= (50424 + 10084.8)\, m^2$

$= 60508.8\ m^2 \simeq 60509\ m^2$

72. Ⓒ

Surface area of hemispherical bowl $= 2\pi R^2 + 2\pi r^2 + \pi(R^2 - r^2)$

$= 3\pi R^2 + \pi r^2$

$= \pi(3R^2 + r^2)$

$= \dfrac{22}{7}\left\{3\times\left(\dfrac{17}{2}\right)^2 + \left(\dfrac{15}{2}\right)^2\right\} cm^2$

$= \dfrac{22}{7}\times\left(\dfrac{867}{4} + \dfrac{225}{4}\right) cm^2$

$= \dfrac{22}{\cancel{7}}\times\dfrac{\cancel{1092}^{\,\cancel{156}^{39}}}{\cancel{4}}\ cm^2$

$= 22 \times 39\ cm^2$

$\therefore$ Cost of polishing $= ₹ \dfrac{1}{\cancel{4}_2} \times \cancel{22}^{11} \times 39$

$$= ₹ \dfrac{429}{2}$$

$$= ₹ 214.50$$

73. Ⓐ

$$1^2 + 2^2 + 3^2 + \ldots + n^2 = \dfrac{n(n+1)(2n+1)}{6}$$

$$\therefore \text{Mean} = \dfrac{n(n+1)(2n+1)}{6} \times \dfrac{1}{n} = \dfrac{(n+1)(2n+1)}{6}$$

74. Ⓒ

Mode = 3 median – 2 mean

75. Ⓐ

Total outcomes = 20

Total favourable outcomes = 3

$\therefore$ Required probability $= \dfrac{3}{20}$

Biology

76. Ⓐ

23 pairs

77. Ⓐ

Phenotype

Phenotype is the expression of a trait

78. Ⓑ

Tt

Heterozygous or hybrid

79. Ⓒ

CFC

When CFCs rise up into the atmosphere, they are broken down by UV radiation and release chlorine atoms which break ozone molecules.

80. Ⓒ

Trait

Trait is the phenotypic expression of a character

81. Ⓓ

All

82. Ⓓ

Incineration

83. Ⓐ

Purple flowers

Purple colour of flowers is the dominant trait.

84. Ⓐ

Emasculation of flowers of one of the parent plant.

Emasculation made the flowers unisexual thus helping to prevent self pollination.

85. Ⓓ

Man

Man is at the highest trophic level, hence shows highest concentration of the pesticide.

86. Ⓐ

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

87. Ⓓ

A is false but R is true.

As the eggs bear only X chromosome, so human females are homogametic.

88. Ⓒ

UV and O_2 , respectively

89. Ⓐ

Both A and B

90. Ⓓ

United Nations Environment Programme

91. Ⓑ

Gall bladder

92. Ⓓ

All of these

93. Ⓐ

Simple diffusion

The organisms throw out wastes across their cell surface into the surrounding medium, along the concentration gradient.

94. Ⓑ

2

Incomplete breakdown of pyruvate causes lesser production of energy.

95. Ⓑ

Vasopressin

96. Ⓒ

Scavenger

97. Ⓑ

Decreases

The energy transferred along the food chain gradually decreases, hence the number of individuals at each trophic level is lesser than the previous one.

98. Ⓒ

Phenotypic ratio of the F2 offsprings

99. Ⓐ

Yellow and rounded seeds

100. Ⓓ

RrYy

Heterozygotes having both pairs of the contrasting alleles for each trait.