Monthly Progressive Test

Class: X (G)

Subject: PCMB

Test Booklet No.: MPT07	Test Date: 22112024
Time: 120 mins	Full Marks: 200

Solutions

Physics

1. ©

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

2. Ⓑ

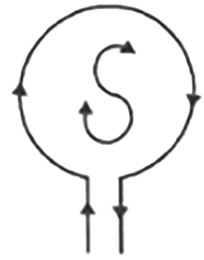
Supply Fleming's left hand rule.

3. ©

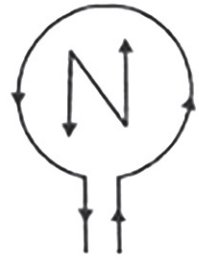
Into the page ⊕. Apply Flemings left hand rule.

4. Ⓑ

Clockwise current:



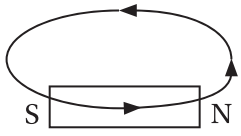
Anticlockwise current:



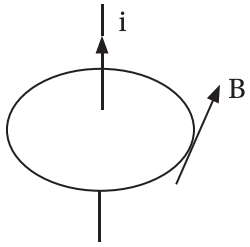
5. Ⓓ

Soft iron core, large number of turns, a powerful electromagnet.

6. Ⓐ



Bar magnet



7. Ⓐ

$B \propto \frac{i}{r} \qquad \left[\because B = \frac{\mu_0}{4\pi} \cdot \frac{2i}{r}\right]$

8. Ⓓ

In this case, direction of magnetic field line is given by right hand thumb rule.

9. Ⓓ

Alnico (Alloy), C-steel, cobalt steel.

10. Ⓒ

True

11. Ⓒ

As B(magnetic field) $\alpha \frac{\text{i(current)}}{\text{r(radial distance)}}$

12. Ⓑ

True

13. Ⓐ

$B \propto ni$

$n \rightarrow$ no of turns

$B \rightarrow$ Strength of magnetic field

14. Ⓐ

As $B \propto ni$

where i is current in the coil

15. Ⓒ

In this case, the stated rule is right hand thumb rule

16. Ⓓ

The distance of object should be less than 12 cm

$u = -x$ cm

$v = -3x$ cm

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{12}$$

$$\Rightarrow \frac{1}{-3x} + \frac{1}{x} = \frac{1}{12}$$

$$\Rightarrow -\frac{1}{3x} + \frac{3}{3x} = \frac{1}{12}$$

$$\Rightarrow \frac{2}{3x} = \frac{1}{12}$$

$x = 8$ cm $= u$

$v = 24$ cm

$d = v - u = 24 - 8 = 16$ cm

17. Ⓐ

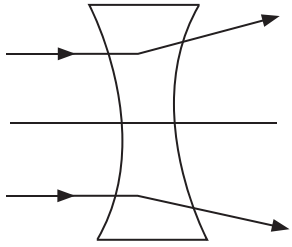
$V = LR \Rightarrow 10 = i \times 2 \Rightarrow i = 5.A$

18. Ⓐ

$6.8 = 0.4 \times R$

$\Rightarrow$ $R = 68/4 = 17$ ohm

19. Ⓐ



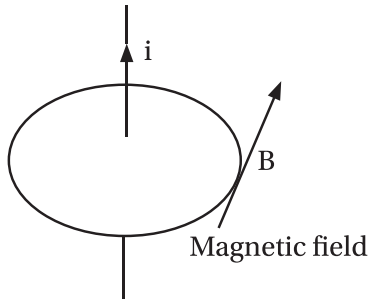
20. Ⓑ

As power $= \frac{100}{f(\text{in cm})}$

focal length for concave lens is negative.

focal length for convex lens is positive.

21. Ⓓ



22. Ⓓ

Downward into paper

23. Ⓒ

Current should be reversed

24. Ⓑ

Forefinger of left hand represents magnetic field

25. Ⓓ

as $B = (\mu_0 \mu_r)$ ni

Chemistry

26. Ⓐ

The major compound present in the marsh gas is methane (CH_4).

27. Ⓒ

When ethanol reacts with sodium metal then the gas released is hydrogen (H_2).

$C_2H_5OH + Na \longrightarrow C2H_5ONa + \frac{1}{2} H_2\uparrow$

28. Ⓐ

$CH_3COOC_2H_5$, ethyl accetate is an ester.

$CH_3 — O — C_2H_5$ is an ether

$CH_3CH_2\overset{\overset{O}{\|}}{C} — C_2H_5$ is a ketone

CH_3COONH_4 is a salt

29. Ⓐ

Ethanoic acid (CH_3COOH) does not react with NaCl.
Ethanoic acid (CH_3COOH) reacts with Na_2CO_3, NaOH & $NaHCO_3$ separately.

30. Ⓑ

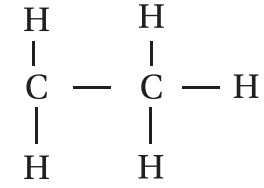
Cleansing action of a soap is associated with Micelle formation.

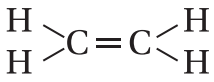
31. Ⓑ

Carbon atom achieves its nearest noble gas configuration by sharing 4 electrons.

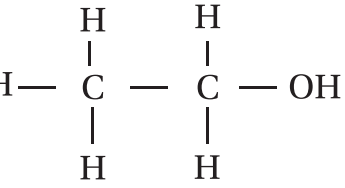
32. ⓓ

C_2H_4 has double bond between two carbon atom.

$C_2H_6 \Rightarrow$ 



$C_2H_2 \Rightarrow H - C \equiv C - H$

$C_2H_5OH \Rightarrow$ 

33. ⓑ

Allotropes have same chemical properties but different physical properties.

34. ⓒ

The reagent used to form CH_3COOH from C_2H_5OH is alkaline $KMnO_4$ solution.

$$C_2H_5OH \xrightarrow[\text{alkaline } KMnO_4]{(o)} CH_3COOH$$

35. ⓒ

Coal and petroleum are fossil fuels. Because they are formed from the remains of the ancient botanical and zoological services.

36. ⓒ

Carbon forms straight chain and giant molecular network. This property is known as catenation.

37. Ⓐ

CH_3COOH (acetic acid or vinegar) is used as a preservative in pickles.

38. ⓓ

Assertion (A) : CH_3OH and C_2H_5OH are allotrope to each other. This is wrong.

Reason (R) : Molar mass of C_2H_5OH is higher than CH_3OH. This is correct, as Molar mass of $C_2H_5OH = C_2H_6O = 2 \times 12 + 6 \times 1 + 16$

$= 24 + 6 + 16$

$= 46$

Molar mass of $CH_3OH = 12 + 3 + 16 + 1$

$= 32$

39. ⓓ

Functional groups give the idea of both physical and chemical properties of the molecule.

40. Ⓐ

Butane does not contain functional group.

ethanoicacid $\Rightarrow CH_3COOH$

propanone $\Rightarrow H_3C-\overset{\overset{O}{\|}}{C}-CH_3$

ethyl alcohol $\Rightarrow CH_3CH_2OH$

41. Ⓑ

boron can not form more than one oxide.

42. Ⓐ

Carbonate ore needs calcination. It means heating of carbonate ore in absence of air. Metal carbonate decompose to give metal oxide.

$MCO_3 \xrightarrow{\Delta} MO + CO_2$

(M = Zn, Fe etc.)

43. Ⓒ

When a small amount of phenolphthalein is added to dilute sulphuric acid then solutions remains colourless. In alkaline medium it gives pink colour.

44. Ⓐ

Nitrogen and phosphorous have same number of electrons in their outermost shells.

$\begin{cases} N_7 = K_2L_5 \\ P_{15} = K_2L_8M_5 \end{cases}$

$Ca_{20} = K_2L_8M_8N_2$

$C_6 = K_2L_4$

$Cl_{17} = K_2L_8M_7$

$Na_{11} = K_2L_8M_1$

$B_5 = k_2L_5$

45. Ⓐ

When quick lime reacts with water then calcium hydroxide is formed. It is an example of combination reaction.

$\underset{\text{(Quick lime)}}{CaO} + H_2O \longrightarrow \underset{\text{(Slaked lime)}}{Ca(OH)_2}$

46. Ⓒ

$\underset{\text{(ethanoicaid)}}{CH_3COOH} + \underset{\text{carbonate)}}{\underset{\text{(Sodium}}{NaHCO_3}} \longrightarrow \underset{\text{Acetate)}}{\underset{\text{(Sodium}}{CH_3COONa}} + \underset{\text{(Colourless gas)}}{CO_2} + H_2O\ \text{(water)}$

When ethanoic acid reacts with sodium bicarbonate correct statements are :
(ii) The solution remain colourless after the end of the reaction.
(iii) Water is produced as by product. Thus, the option (C) is correct.

47. Ⓑ

Statement (I) : Both carboxylic acid $\left(\begin{matrix}O\\ \|\\ -C-OH\end{matrix}\right)$ and amine $\left(-\underset{\underset{H}{|}}{NH}\right)$ functional groups contain double bond – This is wrong

Statements (II) : In case of ether molecules, (R — O —R') central oxygen atom is bonded with three alkyl group . This is also wrong.
Statement (III) : The correct I.U.P.A.C name of $CH_3CH_2COOCH_2CH_2CH_3$ is propyl propanoate. This is correct. Thus, the correct answer is option (B).

48. Ⓐ

Diamond does not conduct electricity becauase it does not contain free electrons.

49. Ⓑ

The correct percentage of acetic acid in vinegar is 4 – 6%./.

50. Ⓑ

Assertion (A) : Methane is a poor conductor of electricity. This is correct.
Reason (R) : Methane is a gaseous compound. This is also correct, but not the correct explanation of Assertion (A). Thus, the answer is (B).

Mathematics

51. Ⓒ

Radius = 5x cm

height = 7x cm

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

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

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

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

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

$\therefore x = 1$

$\therefore$ radius = 5 cm

52. Ⓐ

Canvas used for making the tent

$= 2\pi rh + \pi rl$

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

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

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

$= 36\pi\ \text{m}^2$

53. Ⓓ

Cross-section of the river $= 3 \times 60\ \text{m}^2$

Rate of flow $= 2.4$ km/h

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

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

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

$= 120\ \text{m}^3$

$\therefore$ Volume of water flows in one minute $= 120 \times 60\ \text{m}^3$

$= 7200\ \text{m}^3$

54. Ⓐ

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

$\therefore$ Mean $= \frac{\Sigma fx}{\Sigma f} = \frac{36\cancel{0}}{4\cancel{0}} = 9$

55. Ⓒ

Mode = 19 ($\because$ it occurs maximum time)

56. Ⓒ

Multiple of 2 ≤ 18 are 2, 4, 6, 8, 10, 12, 14, 16, 18

Multiple of 3 ≤ 18 are 3, 6, 9, 12, 15, 18

Multiple of 6 ≤ 18 are 6, 12, 18

∴ Number of favourable outcomes = (9 + 6 – 3) = 12

∴ Required probability $= \frac{\cancel{12}^{2}}{\cancel{18}_{3}} = \frac{2}{3}$

57. ©

Possible outcomes are (BB, BG, GB, GG).

∴ Required probability $= \frac{3}{4}$

58. Ⓓ

r = 7 cm, h = 24cm

∴ $\ell = \sqrt{r^2 + h^2} = \sqrt{49 + 576}$ cm

$= \sqrt{625}$ cm

= 25 cm

∴ half of slant height = 12.5 cm

∴ Assertion is false.

But reason is true.

59. ©

Mode = 3 Median – 2 Mean

60 = 3m – 2 × 63

⇒ 3m = 186 ⇒ m = 62

∴ Assertion is true

But reason is false.

60. Ⓐ

Required probability $= \frac{25}{40} = \frac{5}{8}$

61. Ⓑ

Required probability $= \frac{20}{40} = \frac{1}{2}$

62. ©

Required probability $= \frac{15}{40} = \frac{3}{8}$

63. Ⓓ

Radius = 3 cm

$\therefore$ Volume of sphere $= \frac{4}{3}\pi(3)^3 \text{ cm}^3$

$= 36\,\pi \text{ cm}^3$

Radius of cylindrical wire = 0.1 cm

Let length = x cm

$\therefore$ Volume $= \pi(0.1)^2 \times \text{x cm}^3$

$\therefore \quad \pi \times 0.01 \times \text{x} = 36\pi$

$\Rightarrow \quad \text{x} = \frac{36}{0.01} = 3600$

$\therefore$ length = 3600 cm = 36 m

64. Ⓒ

Factors of 10 are 1, 2, 5, 10.

$\therefore$ Mean $= \frac{1+2+5+10}{4} = \frac{\cancel{18}^{9}}{\cancel{4}_{2}} = \frac{9}{2} = 4.5$

65. Ⓑ

A leap year has 366 days.

For 52 weeks 52 Sundays.

For 2 extra days possible combinations are (SM, MT, TWed, WedTh, ThF, FSat, SatS).

$\therefore$ Required probability $= \frac{2}{7}$.

66. Ⓒ

$\sec\theta = \frac{5}{4}$

$\frac{1-\tan^2\theta}{1+\tan^2\theta} = \frac{1-(\sec^2\theta - 1)}{\sec^2\theta}$

$= \frac{2-\sec^2\theta}{\sec^2\theta}$

$= \frac{2-\frac{25}{16}}{\frac{25}{16}} = \frac{\frac{7}{16}}{\frac{25}{16}} = \frac{7}{25}$

67. Ⓓ

$\angle OAC = 90°,\ \angle OBC = 90°,\ \angle ACB = 75°$

$\therefore\ \angle AOB = 360° - (90° + 90° + 75°)$

$= 360° - 255° = 105°.$

68. Ⓓ

Distance between the points (a, b) and (–a, –b) is $\sqrt{(a+a)^2+(b+b)^2}$

$= \sqrt{4a^2+4b^2}$

$= 2\sqrt{a^2+b^2}$

69. Ⓐ

$\alpha+\beta = -\frac{b}{a},\ \alpha\beta = \frac{c}{a}$

$\therefore\ \alpha+\beta = \frac{1}{\alpha\beta}$

$\Rightarrow\ -\frac{b}{a} = \frac{a}{c}$

$\Rightarrow\ a^2 = -bc$

$\Rightarrow\ a^2 + bc = 0$

70. Ⓑ

Let cost of one chair be ₹x and cost of one table be ₹y.

$3x + 2y = 1850$

$5x + 3y = 2850$

$\Rightarrow\ 9x + 6y = 5550$

$10x + 6y = 5700$

$-x = -150$

$\Rightarrow\ x = 150$

$\therefore\ 450 + 2y = 1850$

$\Rightarrow\ 2y = 1400$

$\Rightarrow\ y = 700$

$\therefore$ Total cost of one chair and one table = ₹(150 + 700) = ₹850

71. Ⓐ

Volume of sphere $= \frac{4}{3}\pi(16)^3 \text{cm}^3$

Volume of one small sphere $= \frac{4}{3}\pi(2)^3 \text{ cm}^3$

$\therefore$ Number of small spheres $= \frac{\frac{4}{3}\pi \times 16^2 \times 16 \times 16}{\frac{4}{3}\pi \times 8}$

$= 512$

72. Ⓒ

Volume of ice cream in cylindrical container $= \pi(6)^2 \times 15 \text{ cm}^3$.

Volume of ice-cream in one cone $= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$

$= \frac{\pi}{3} r^2 (h + 2r)$

$= \frac{\pi}{3}(3)^2(9+6)\text{cm}^3$

$= \frac{\pi}{3} \times 9 \times 15 \text{ cm}^3$

$\therefore$ Number of cones $= \frac{\pi \times 36^{12} \times 15}{\frac{\pi}{3} \times 9^3 \times 15}$

$= 12$

73. Ⓐ

$1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$

$\therefore$ Mean $= \frac{\frac{n(n+1)}{2}}{n} = \frac{n+1}{2}$

74. Ⓒ

Total number of marbles = 17.

$\therefore$ Required probability $= \frac{13}{17}$.

75. Ⓐ

Total outcomes = 365 × 365.

Number of outcomes for the event "having same birthday" = 365.

$\therefore$ P(having same birthday) $= \frac{365}{365 \times 365}$

$= \frac{1}{365}$

$\therefore$ P(having different birthdays) $= 1 - \frac{1}{365} = \frac{364}{365}$

Biology

76. Ⓐ

23 pairs

77. Ⓐ

Phenotype

Phenotype is the physical expression of a trait in an individual

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. Ⓐ

Phenotypic ratio of monohybrid cross

81. Ⓑ

10%

Rest is lost as heat to the environment and in other physiological functions.

82. Ⓑ

Human males are heterogametic

Human males produce two types of sperms – X chromosome containing sperm and Y chromosome containing sperm.

83. Ⓑ

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

Dominant allele suppresses the recessive trait to express itself. The R given in the question is the rule for symbolic expression of the dominant trait.

84. Ⓓ

A is false but R is true

The sex of a child will be determined by the chromosomes received from the father.

85. Ⓑ

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

Food chains not only consist of green plants, but many other organisms.

86. Ⓑ

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

87. Ⓑ

Dwarf with round seeds

t stands for dwarfness and R for roundness of seeds.

88. Ⓑ

Tr

Gametes contain haploid set of chromosomes.

89. Ⓓ

tR

Gametes contain haploid set of chromosomes.

90. Ⓑ

Tall plant with round seeds

Tallness and roundness of seeds are dominant characters.

91. Ⓒ

48

Zygote contains diploid set of chromosomes (haploid set received from both gametes).

92. Ⓒ

Hydra

93. Ⓓ

Ureter

94. Ⓐ

Condom

Physically prevents sperm and ovum from coming in contact with each other.

95. Ⓑ

Trachea and bronchi

The C shaped rings keep the passages open at all times.

96. Ⓒ

A is true but R is false

One of the reasons why Mendel chose the pea plants is that they show a wide variety of contrasting traits.

97. Ⓐ

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

98. Ⓐ

Food web

99. Ⓑ

Trophic levels

100. Ⓓ

All the statements are correct

Energy flow in a food chain is unidirectional. Also, only 10% energy is transferred from one trophic level to the trophic level following it.