Monthly Progressive Test

Class: X

Subject: PCMB (S)

Test Booklet No.: MPT04	Test Date: 24072024
Time: 180 mins	Full Marks: 200

Solutions

Physics

1. Ⓓ

$u \to \infty \quad \therefore \; v = f = 20$ cm

2. Ⓑ

$|m| = \frac{2f}{2f} \quad u \to 2f \quad$ then $v \to 2f$

$= 1$

3. Ⓐ

$u < f$ for virtual image

4. Ⓓ

Virtual: $\frac{1}{-3x} - \frac{1}{-x} = \frac{1}{12}$

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

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

$x = 8$ cm

$3x = 24$ cm Distance between object and image is 16 cm.

5. Ⓓ

$Q = \pm ne$ n is integer.

6. Ⓓ

Neutron has mass but neutral in nature.

7. Ⓒ

$$UUD = \frac{2}{3}e + \frac{2}{3}e - \frac{1}{3}e = +e$$

8. Ⓒ

$u = -25$ cm $\quad f = -25$ cm

$$\frac{1}{v} - \frac{1}{-25} = \frac{1}{-25}$$

$$\Rightarrow \frac{1}{v} + \frac{1}{25} = -\frac{1}{25}$$

$\Rightarrow v = -12.5$ cm.

9. Ⓐ

$$P = \frac{1}{f(m)} = \frac{100}{f(cm)}$$

$P = 1D \quad \Rightarrow \quad 1\ m^{-1}$

10. Ⓐ

$$P = \frac{100}{f(cm)} \quad f \text{ is in cm.}$$

11. Ⓐ

Positive as it is measured in the direction of incident Ray.

12. Ⓑ

(A): f(concave lens) is –ve

(R): f(convex lens) is +ve

13. Ⓓ

(A): virtual image, so false

(R): virtual images, so false

14. Ⓐ

$P = 3.5\ D - 2.5\ D = +1D$

15. Ⓑ

$1D = \frac{100}{f} \quad \therefore\ f = +100\ cm.$

16. Ⓐ

As $\angle L^{\circ\circ} = \angle r^{\circ}$

17. Ⓓ

$D = 180° - 60° = 120°$

18. Ⓐ

As virtual, magnified.

19. Ⓒ

Independent of medium.

20. Ⓒ

Water; as r.i is less.

21. Ⓑ

$V = 1R \Rightarrow (4) = (I)(4)$

$I = 1A.$

22. Ⓒ

$V = IR = \text{constant} \quad \therefore\ i \propto \frac{1}{R}$

23. Ⓑ

$P = 6 - 2 = +4D$ (convex nature)

24. Ⓑ

A $\rightarrow$ true

B $\rightarrow$ true

25. Ⓑ

As measured against the incident Ray

26. Ⓓ

Alkaline solutions make red litmus blue. Hence, p^H of the medium is 10.

27. Ⓒ

In case of indigestion some extra HCl comes to the stomach. To neutralize this acid, antacids are used.

28. Ⓑ

CH_3COOH is an organic acid hence it is weak.

29. Ⓑ

Sodium bicarbonate is commonly known as baking soda.

30. Ⓓ

Correct equation is

$$\underset{\text{(Blue)}}{CuSO_4(aq)} + Fe(s) \rightarrow \underset{\text{(Light green)}}{FeSO_4(aq)} + Cu(s)$$

Copper deposits over iron and hence a brown coating is developed over the iron nail

31. Ⓓ

Correct equation is

$$\underset{\text{(colourless)}}{BaCl_2(aq)} + \underset{\text{(colourless)}}{Na_2SO_4(aq)} \longrightarrow \underset{\text{(White)}}{BaSO_4(S)} + 2NaCl(aq)$$

32. Ⓑ

Correct equation is

$$\underset{\text{(green)}}{FeSO_4.7H_2O} \xrightarrow{\Delta} \underset{\text{(anhydrous)}}{FeSO_4} + 7H_2O(\text{vapour})$$

So, water droplet is found at the mouth of the test tube

$$2\,FeSO_4 \xrightarrow{\text{strong heat}} \underset{\text{(brown)}}{Fe_2O_3} + SO_2\uparrow + SO_3\uparrow$$

The smell of SO_2 is of burning sulpher

33. Ⓑ

Correct equation is $CuO + H_2 \longrightarrow Cu + H_2O$

Copper is releasing oxygen and hence it is reduced and hydrogen is accepting oxygen hence it is oxidised

34. Ⓓ

In case of displacement reactions one cation becomes attached with anion and the other cation turns into the pure element. Hence it is an oxidation - reduction reaction

But in case of double displacement reaction, both cations and anions are exchanged. Hence, none of to reactants suffer either oxidation or reduction. In case of either displacement or double displacement reaction, anion does not suffer either oxidation or reduction.

35. Ⓐ

Correct equation is

$Zn(s) + CuSO_4(aq) \longrightarrow ZnSO_4(aq) + Cu(s)$

In this reaction Zn turns into Zn^{2+} ion by loosing 2 electrons hence zinc is oxidised and Cu^{2+} turns into copper by accepting 2 electrons hence it is reduced.

36. Ⓒ

A balanced chemical equation gives the informations about mass of the reactants and products, conditions needed for the reaction, physical states of the reactants and products.

Now, it is not a mandatory that every reaction must have atleast one gaseous product

37. Ⓐ

Mixing of water in concentrated sulphuric acid is a highly exothermic process and in this process, there is a fair chance of sulphuric acid splash.

38. Ⓒ

Lemon juice contains acids and they cannot react with glass and hence lemon juice remains unaltered through out.

39. Ⓓ

Due to various chemical reactions, bacteria can change the p^H inside the mouth. Nettle

string contains methanoic acid for their defence purpose. Tamarind contains tartaric acid.

40. Ⓐ

Correct equation is $NaCl + H_2O + NH_3 + CO_2 \longrightarrow NH_4Cl + NaHCO_3$

So, X = 1, Y = 1, Z = 1, P = 1

(X + Y + Z + Q) = 4

Now, $p^H = 4$ so, the solution is acidic

41. Ⓑ

Rancidity is a chemical change and the rate of chemical reaction decreases with the decrease in temperature.

42. Ⓐ

The correct equation is

$$Na_2CO_3 + 2HCl \xrightarrow{\text{room temperature}} 2NaCl + CO_2\uparrow + H_2O$$
$$(\text{colourless})$$

43. Ⓑ

The correct equation is $2NaOH + SO_2 \longrightarrow Na_2SO_3 + H_2O$

Na_2SO_3 is sodium sulphite

44. Ⓓ

In the reaction, the charges on the ions are not changing and hence both NaOH and HCl are not facing either oxidation or reduction.

45. Ⓐ

When vegetable matters turns into composts then the products are very stable. So, it is exothermic process.

46. Ⓒ

For, different plants, the pH of the soil must be different. Otherwise, the biochemical reactions cannot happen properly. Toothpaste performs some chemical reactions inside mouth and hence pH of the system remains balanced. The atmosphere of Venus is composed of 96.5% carbon dioxide, 3% nitrogen and sulphur oxides.

47. Ⓐ

When fire breaks out at the oil refineries then excessive heat is generated and in this case, soda - acid type extinguishers are not used.

48. Ⓐ

Balanced equation is $MnO_2 + 4\,HCl \longrightarrow MnCl_2 + Cl_2 + 2\,H_2O$

So, a = 1, b = 4, c = 1, d = 1, e = 2

(a + b) = 5 and at this pH, the medium is alkaline

3b = 12 and the medium is strongly alkaline. This solution can change the colour of phenolphthalein indicator into pink.

(a + b + c + d) = 7 and it is the p^H of the pure water.

49. Ⓒ

When plaster of Paris comes contact with water vapour then the following reaction occurs

$$CaSO_4.\frac{1}{2}H_2O \xrightarrow{\text{water vapour}} CaSO_4.2H_2O$$

(Plaster of paris) (Gypsum)

The powder becomes very hard but white colour remains same

50. Ⓓ

When sodium metal is exposed in air then the following reaction occurs

$$2Na + 2H_2O \longrightarrow 2NaOH + H_2$$

(vapour)

$$4Na + O_2 \longrightarrow 2Na_2O$$

Mathematics

51. Ⓑ

21, 42, 63, 84, ..., 210.

Let $t_n = 210$

$\Rightarrow\ 21 + (n-1) \times 21 = 210$

$\Rightarrow\ \cancel{21} + 21n - \cancel{21} = 210$

$\Rightarrow \quad n = \frac{210}{21} = 10$

52. Ⓓ

$3 + 7 + 11 + 15 + 19 + ...$

$t_n = a + (n-1).d$

$= 3 + (n-1) \times 4$

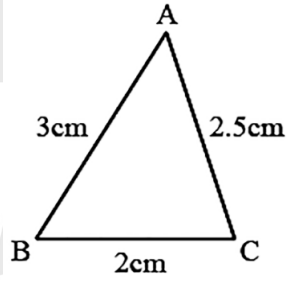
$= 4n - 1$

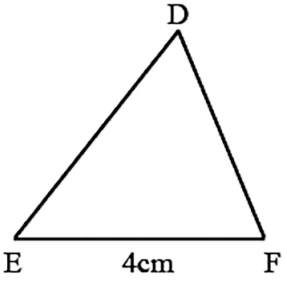
53. Ⓑ

$\because \ \Delta ABC \sim \Delta DEF$

$\Rightarrow \frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$

$\Rightarrow \frac{3\,\text{cm}}{DE} = \frac{2}{4} = \frac{2.5\,\text{cm}}{FD}$





$\Rightarrow \ DE = 6\text{cm}; \quad FD = 5\text{cm}$

Perimeter of $\Delta DEF = 6\text{cm} + 4\text{cm} + 5\text{cm}$
$= 15\text{cm}.$

54. Ⓓ

$\angle A = \angle F, \angle B = \angle E, \angle C = \angle D$

$\therefore \ \Delta ABC \ \sim \ \Delta FED$

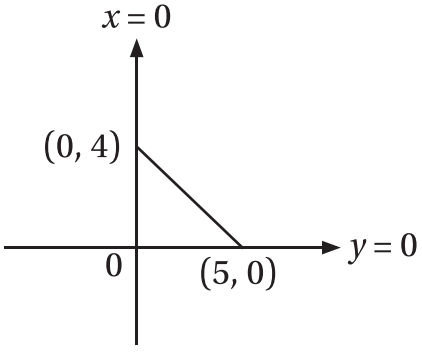
55. Ⓑ

$\frac{4x}{20} + \frac{5y}{20} = 1$

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

Area $= \frac{1}{\cancel{2}} \times 5 \times \cancel{4}^{2}$ sq.units

$= 10$ sq.units.



56. Ⓑ

In ΔABD and ΔCBD,

$\angle ABD = \angle CBD$

$\angle ADB = \angle CDB$

$\therefore\ \Delta ABD \sim \Delta CBD \quad (A - A)$

$\therefore\ \frac{AB}{CB} = \frac{AD}{CD}$

57. ©

Given: $\frac{S_n}{S'_n} = \frac{\frac{n}{2}\{2a + (n-1)d\}}{\frac{n}{2}\{2a' + (n-1)d'\}} = \frac{3n-13}{5n+21}$

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

Put $\frac{n-1}{2} = 23$

$\Rightarrow\ n - 1 = 46 \quad \Rightarrow\ \frac{a+23d}{a'+23d'} = \frac{3\times 47 - 13}{5\times 47 + 21} = \frac{128^{1}}{256_{2}}$

$\Rightarrow\ n = 47 \quad \Rightarrow\ \frac{t_{24}}{t'_{24}} = \frac{1}{2} = 1:2$

58. ©

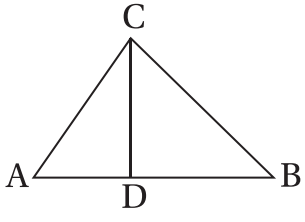
$AP_1 : 2 + 5 + 8 + 11 + \ldots + 98 \qquad d = 3$

$AP_2 : 3 + 8 + 13 + 18 + \ldots + 198 \qquad d' = 5$

LCM(3, 5) = 15

8, 23, 38, 53, 68, 83, 98

59. Ⓑ



$\angle CAB = \angle CAD$

$\angle ACB = \angle CDA$

$\therefore\ \Delta ACD \sim \Delta ABC \quad (A - A)$

$\therefore \frac{AC}{AB} = \frac{AD}{AC}$

$\Rightarrow \frac{8\,cm}{AB} = \frac{3\,cm}{8\,cm}$

$\Rightarrow AB = \frac{64}{3}\,cm$

$\therefore BD = \left(\frac{64}{3} - 3\right)cm$

$= \frac{55}{3}\,cm$

60. Ⓐ

$P = (4, 5)$

$A = (x, 0),\ B(0, y)$

$AP : PB = 5 : 3$

$\therefore P = \left(\frac{3x}{8}, \frac{5y}{8}\right)$

$\therefore \left(\frac{3x}{8}, \frac{5y}{8}\right) = (4, 5)$

$\Rightarrow \frac{3x}{8} = 4 \Rightarrow x = \frac{32}{3}$ and $\frac{5y}{8} = 5 \Rightarrow y = 8$

$\therefore A\left(\frac{32}{3}, 0\right)$ and $B(0, 8)$

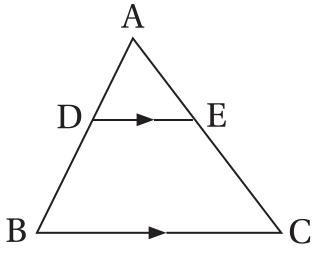
61. Ⓒ

(A) : $a_n = S_n - S_{n-1}$ True

(R) : $a_{10} = 5 + 9 \times 3 = 32$ False

62. Ⓑ

(A) :



$$\frac{AD}{BD}=\frac{AE}{EC}$$

$\Rightarrow \frac{4}{x-4}=\frac{8}{3x-19}$

$\Rightarrow\ 12x - 76 = 8x - 32$

$\Rightarrow\ 4x = 44$

$\Rightarrow\ x = 11$

$\therefore$ True

(R) : True

But reason (R) is not the correct explanation of assertion (A).

63. Ⓑ

$RS=\sqrt{(6-0)^2+(-2-2)^2}=\sqrt{36+16}=\sqrt{52}$

$=2\sqrt{13}$ units

$= 7.21$ units

64. Ⓒ

Origin (0, 0)

65. Ⓓ

$L(0, -2),\ S(6, -2)$

$\therefore\ \left(\frac{0+6}{2}, \frac{-2-2}{2}\right)=(3,-2)$

66. Ⓑ

$f(x) = 6x^2 - 7x - 3$

$\alpha+\beta=\frac{7}{6}$

$\alpha\beta=-\frac{3}{6}=-\frac{1}{2}$

$(\alpha + 1)\,(\beta + 1)$

$= \alpha\beta+\beta+\alpha+1$

$=\frac{7}{6}+\left(-\frac{1}{2}\right)+1$

$= \frac{7}{6} + \frac{1}{2} = \frac{7+3}{6} = \frac{10}{6} = \frac{5}{3}$

67. Ⓑ

Let $x = \sqrt{3\sqrt{3\sqrt{3\sqrt{3.....\infty}}}}$

$x^2 = 3\sqrt{3\sqrt{3\sqrt{3.....\infty}}}$

$\Rightarrow\ x^2 = 3x$

$\Rightarrow\ x^2 - 3x = 0$

$\Rightarrow\ x(x-3) = 0$

As $x \neq 0, \quad x = 3$

68. Ⓒ

$x^3 + 3x^2.2 + 3x.2^2 + 2^3 = x^3 - 4$

$= 6x^2 + 12x + 8 + 4 = 0$

$= 6x^2 + 12x + 12 = 0$

$= x^2 + 2x + 2 = 0$

$D = (2)^2 - 4.1.2 = 4 - 8 = -4$

69. Ⓒ

$p(x) = ax^2 + bx + c\,;\ a + c = b$

$ax^2 + (a+c)\,x + c$

$= ax^2 + ax + cx + c \qquad x + 1 = 0 \ \Rightarrow\ x = -1$

$= ax(x+1) + c(x+1) \qquad ax + c = 0 \ \Rightarrow\ \boxed{x = -\frac{c}{a}}$

$= (x+1)\,(ax+c)$

70. Ⓑ

$ax^2 + bx + c$

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

$\alpha\beta = \frac{c}{a}$

$a^3x^2 + abcx + c^3$

$= a^3\left(x^2 + \frac{abc}{a^3}x + \left(\frac{c}{a}\right)^3\right)$

$= a^3\left(x^2 + \left(\frac{b}{a}\right)\left(\frac{c}{a}\right)x + \left(\frac{c}{a}\right)^3\right)$

$= a^3\,(x^2 - (\alpha+\beta)\,\alpha\beta x + (\alpha\beta)^3)$

$= a^3\,(x^2 - \alpha^2\beta x - \alpha\beta^2 x + \alpha^3\beta^3)$

$= a^3\,(x(x - \alpha^2\beta) - \alpha\beta^2(x - \alpha^2\beta))$

$= a^3\,(x - \alpha\beta^2)\,(x - \alpha^2\beta)$

$\therefore$ Zeros are $\alpha\beta^2$ and $\alpha^2\beta$.

71. Ⓑ

$a_5 = ₹[40{,}000 + (5-1)\times 2000] = ₹[40{,}000 + 8{,}000] = ₹48{,}000$

72. Ⓐ

$S_5 = \frac{5}{2}(a+\ell) = ₹\left[\frac{5}{2}(40{,}000 + 48{,}000)\right] = ₹\left(\frac{5}{2}\times 88000\right) = ₹2{,}20{,}000$

73. Ⓒ

$a_{10} = ₹(40{,}000 + 9\times 2000) = ₹58{,}000$

$\therefore$ Ratio $= 48{,}000 : 58{,}000$

$= 48 : 58$

$= 24 : 29$

74. Ⓐ

(A): $t_m = n$

$\Rightarrow\ a + (m-1)d = n$

$\underline{a \pm (n-1)d = m}$

$(\cancel{m-n})d = -(\cancel{m-n}) \quad \therefore\ d = -1$

$a + (m-1)(-1) = n$

$a = (m + n - 1)$

$t_{m+n} = a + (m+n-1)d$

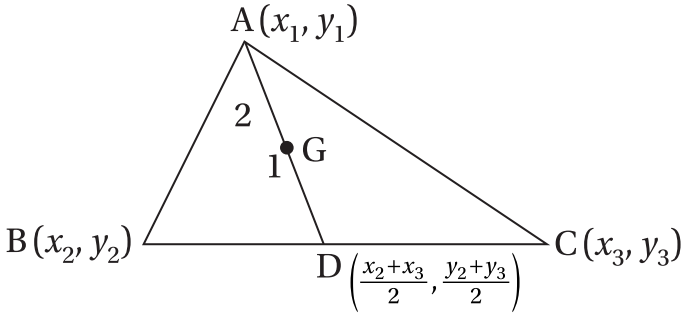
$= (m + n - 1) + (m + n - 1)(-1)$

$= 0$ True

Reason: $t_n = a + (n-1)d$. True

75. ©

(A) :



$$G = \left(\frac{1 \times x_1 + 2.\frac{x_2 + x_3}{2}}{2+1}, \frac{1 \times y_1 + 2 \times \frac{y_2 + y_3}{2}}{1+2} \right)$$

$$= \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right)$$ True

(R) : $AB = \sqrt{(x_2 + x_1)^2 + (y_2 - y_1)^2}$ False

Biology

76. Ⓑ

Lizard and bird

77. Ⓑ

Vasopressin

78. Ⓐ

Pituitary

It controls the development and working of the other endocrine glands

79. Ⓐ

Forebrain

80. Ⓐ

Liver

81. Ⓐ

Nasal cavity

82. Ⓑ

Ethylene

83. Ⓐ

1-Cerebrum; 2- Mid brain; 3- Cerebellum; 4- Medulla oblongata

84. Ⓑ

Cerebellum

85. Ⓑ

Spinal cord

86. Ⓒ

Part 3

87. Ⓓ

Part 4

88. Ⓑ

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

89. Ⓐ

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

90. Ⓐ

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

91. Ⓒ

Nicotinamide Adenine Dinucleotide Phosphate

92. Ⓓ

Croton

93. Ⓑ

2

1 auricle and 1 ventricle

94. ©

Serum

95. Ⓐ

Increase

96. Ⓐ

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

97. Ⓓ

A is false but R is true

98. Ⓑ

Cranium

99. Ⓐ

Pons

Pons is a part of brain. The other three are layers of the meninges

100. ©

The cerebrospinal fluid provides buoyancy.