Monthly Progressive Test

Class: X (G)

Subject: PCMB

Test Booklet No.: MPT06 (G)	Test Date: 03102024
Time: 120 mins	Full Marks: 200

Solutions (Set-G)

Physics

1. Ⓓ

   Alnico (Aluminium, nickel and cobalt)

2. Ⓐ

   Parallel equispaced lines.

3. Ⓒ

   For circular current.

4. Ⓑ

   Clockwise current gives s-pole on front face.

5. Ⓐ

   As magnetic needle will be deflected.

6. Ⓒ

   By scientist Oerested.

7. Ⓐ

   It has no effect.

8. Ⓒ

   Both in science lab and Toys.

9. Ⓐ

   Earth behaves as small bar magnet.

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10. Ⓓ

Magnetic resonance imaging, a diagnostic technique, magnetism inside human body.

11. Ⓓ

Natural magnets, magnetic compound, N-S direction.

12. Ⓓ

Alnico, C-steel, Co-steel.

13. Ⓑ

14. Ⓐ

15. Ⓒ

N-N and S-S : Repulsive force.

16. Ⓓ

$u \rightarrow$ infinity then $v = f$.

17. Ⓑ

$u = 2f$, then $v = 2f$ and $|m| = 1$.

18. Ⓐ

$u < f$

19. Ⓓ

$(24 - 8) = 16$ cm

20. Ⓑ

$f = 20$ cm, $u = +10$ cm

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \quad \Rightarrow v = 6.67 \text{ cm}$$

21. Ⓐ

Magnetic field $\propto$ number of turns (n).

22. Ⓑ

Magnetic field $\propto$ current (i) in coil.

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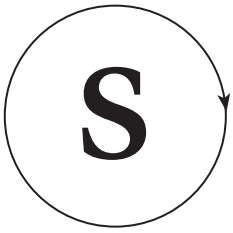
23. ©

$B(\text{testa}) \propto (n)(i)$

24. Ⓐ



25. ©

It represent current I

(mIddle finger)

Chemistry

26. Ⓑ

As_2O_3 is an amphoteric oxide

N_2O is a neutral oxide

CaO and Fe_2O_3 are basic oxide

27. ©

Electronic configuration of the element is 2, 8, 8, 2. In the modern periodic table it is at 4^{th} period and 2^{nd} group. Number of orbit gives the number of period. Valence electron gives the group number.

28. Ⓐ

Correct order of atomic radius is N > O > F. Atomic radius decreases across the period from left to right.

29. Ⓐ

Nitrogen is used as a food preservative.

30. ©

During galvanization Zinc (Zn) is coated over iron material.

31. Ⓓ

In N_2 molecule $(\ddot{N} \equiv \ddot{N})$ lone pair = 2(X) and bonds present = 3(Y). The value of X + Y = 2 + 3 = 5.

32. ©

Due to corrosion of Aluminum, $AlCl_3$ is formed—This statement is wrong.

Sodium is extracted by electrolytic reduction method—This statement is is correct.

Roasting is done for sulphide ores—This statement is correct.

33. Ⓑ

According I.U.P.A.C rules of naming of elements the formula of the element having atomic number 108 is UnO (Un—nil-octium)

34. Ⓓ

Electronic configuration of

X_{20} = 2, 8, 8, 2. So valency = 2

E.c. of Y_{16} = 2, 8, 6. So, valency = (8 – 6) = 2

Chemical formula = XY

35. Ⓐ

Assertion : Mendeleev's periodic table can not give complete idea about the chemical properties of the elements. This is correct.

Reason : This periodic table is based on the atomic weight of the elements. This is also correct. Atomic number is the most fundamental part of the element.

36. Ⓑ

Assertion : In the modern periodic table, if we move from top to bottom in a group then radius increases. This is correct.

Reason : All elements in the same group have same number of electrons in the outermost shell. This is also correct, but not the correct explanation of assertion. Radius increases as the number of orbit increases top to bottom in a group.

37. Ⓓ

In modern periodic table the elements are arranged according to their number of protons (atomic number).

38. ©

Transitional elements are placed in the groups 3 and 12.

39. ©

Metal 'X' reacts with both $FeSO_4$ and $CuSO_4$ solution. So, 'X' is above Fe. Metal 'Y' reacts with only $CuSO_4$ solution. So, 'Y' is above Cu. 'Z' does not react neither $FeSO_4$ nor $CuSO_4$ solution. So, correct order of reducing power of the metal is X > Y > Z.

40. Ⓑ

$xAl_2O_3 + yNaOH \rightarrow zNaAlO_2 + pH_2O$

Balanced equation is :

$1Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + 1H_2O$

So, comparing $x = 1$; $y = 2$; $z = 2$; $p = 1$

Now, $x + y + z + p = 1 + 2 + 2 + 1 = 6$

41. Ⓑ

Na, K, Ca, reacts with cold water.

Fe, Mg, Zn, Al all reacts with steam only.

42. Ⓐ

E.c. of $N_7 = 2, 5$

$P_{15} = 2, 8, 5$

$Ca_{20} = 2, 8, 8, 2$

$C_6 = 2, 4$

$Cl_{17} = 2, 8, 7$

$Na_{11} = 2, 8, 1$

$B_5 = 2, 3$

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

43. Ⓐ

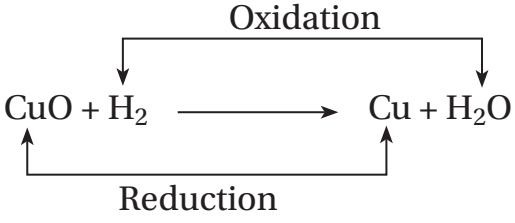
Carbonate ore needs calcination.

Ex: $CaCO_3 \xrightarrow{\Delta} CaO + CO_2\uparrow$

Calcination means heating of ore in absence of air.

44. Ⓑ

CuO reacts with H_2 gas to give Cu & H_2O. Here CuO is reduced to Cu and H_2 is oxidised to H_2O.



45. ©

When a small amount of phenolphthalein is added to dilute sulphuric solution then the colour of the solution becomes colourless.

46. Ⓐ

Reactivity of metals decreases

Mg > Al > Zn > Fe

47. Ⓑ

Magnesium ribbon form an oxide layer of magnesium oxide. So, magnesium ribbon need to be cleaned before burning it in air.

48. Ⓐ

Sodium is kept immersed in Kerosene oil. This is correct. Sodium is very reactive metal. This is also correct and the correct explanation of Assertion.

49. Ⓐ

Platinum, gold and silver are used to make Jewelery because they are very lustrous. Also, they are very less reactive and do not corrode easily. Thus both Assertion and reason are correct and reason is the correct explanation of Assertion.

50. ©

Iron does not react with cold and hot water, but it reacts with steam to form metal oxide and hydrogen.

$$\underset{\text{(Red hot iron)}}{3Fe} + \underset{\text{steam}}{4H_2O} \xrightleftharpoons{> 800°C} \underset{\text{(Ferrosoferric oxide)}}{Fe_3O_4} + 4H_2\uparrow$$

Mathematics

51. Ⓑ

$x^2 = 121 \quad \Rightarrow x = 11$

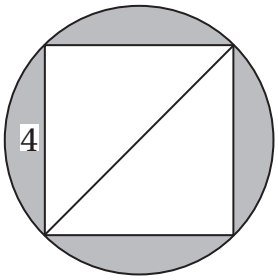
Perimeter = 4 × 11 cm = 44 cm

$2\pi r = 44$

$\Rightarrow r = \frac{44 \times 7}{2 \times 22} = 7 \text{ cm}$

$\text{Area} = \pi r^2 = \frac{22}{7} \times 7 \times 7 \text{ cm}^2 = 154 \text{ cm}^2$

52. Ⓑ



$4\sqrt{2}$ = diameter $\Rightarrow r = \dfrac{4\sqrt{2}}{2} = 2\sqrt{2}$

$\text{Required area} = \pi r^2 - a^2 = \left(\dfrac{22}{7} \times 2\sqrt{2} \times 2\sqrt{2} - 4^2\right) \text{cm}^2 = \left(\dfrac{176}{7} - 16\right) \text{cm}^2 = \left(\dfrac{176-112}{7}\right) \text{cm}^2 = \dfrac{64}{7} \text{ cm}^2 = 9\dfrac{1}{7} \text{ cm}^2$

53. Ⓐ

$$\frac{30^\circ}{360^\circ}\pi \cdot 7^2 - \frac{30^\circ}{360^\circ}\pi \cdot 3 \cdot 5^2 = \frac{30}{360} \times \left(\frac{22}{7} \times 7 \times 7 - \frac{22}{7} \times 3.5 \times 3.5\right) \text{m}^2$$

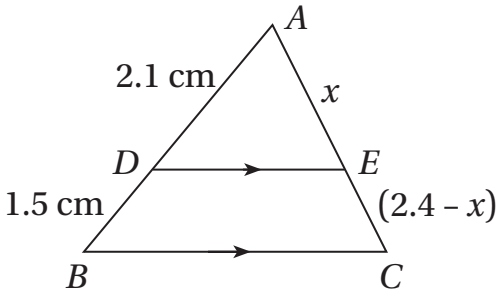
$$= \frac{30}{360} \times 22 \times \left(7 - \frac{7}{4}\right) \text{m}^2 = \frac{30}{360} \times 22 \times \frac{21}{4} \text{ m}^2 = \frac{77}{8} \text{ m}^2 = 9.625 \text{ m}^2$$

54. Ⓐ

$t_n = 3 + 2n$

$$\sum_{n=1}^{20} t_n = \sum_{n=1}^{20} (3 + 2n) = 3 \times 20 + 2\sum_{n=1}^{20} n = 60 + 2 \times \frac{20 \times (21)}{2} = 60 + 420 = 480$$

55. Ⓐ



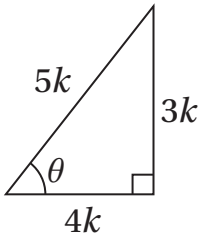
$AB = 3.6$ cm; $AC = 2.4$ cm; $AD = 2.1$ cm; $DB = (3.6 - 2.1)$ cm $= 1.5$ cm

$\dfrac{2}{1.5} = \dfrac{x}{2.4 - x}$ (by BPT) $\Rightarrow 5x = 7(2.4 - x) \Rightarrow 5x = 7 \times 2.4 - 7x \Rightarrow 12x = 7 \times 2.4 \Rightarrow x = \dfrac{7 \times 2.4}{12} = 1.4$ cm

56. Ⓑ

$\left(\dfrac{-5+9}{2}, \dfrac{4-8}{2}\right) = (2, -2)$

57. ©



$$\frac{1-\frac{9}{16}}{1+\frac{9}{16}}=\frac{7}{25}$$

58. Ⓐ

$\theta = 150°$

Arc length $= \frac{150}{360}\times 2\pi r = \frac{5}{12}\times 2\times\frac{22}{7}\times 21 \text{ cm} = 55 \text{ cm}$

A → True

B → True and correct explanation

59. Ⓐ

Area $= \left[\pi(4)^2 - \pi(3)^2\right] \text{cm}^2 = \pi(16-9)\text{ cm}^2 = \frac{22}{7}\times 7 \text{ cm}^2 = 22 \text{ cm}^2$

A → True

B → True and correct explanation

60. Ⓐ

$DE = FG = HI = 3$ cm

61. Ⓑ

$$\frac{2\pi r}{3} = \frac{2\times\pi\times 1}{3} = \frac{2\pi}{3} \text{ cm}$$

62. ©

$$\left(3\times 3 + 3\times\frac{2\pi}{3}\right)\text{cm} = (9+2\pi)\text{ cm}$$

63. ©

$$t_n < 0 \Rightarrow a+(n-1)d<0 \Rightarrow 15+(n-1)\left(\frac{-5}{4}\right)<0$$

$$\Rightarrow (n-1)\left(\frac{-5}{4}\right)<-15 \Rightarrow (n-1)<+15\times\frac{+4}{5}=12 \Rightarrow n>13$$

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64. Ⓐ

$\Delta BRD \sim \Delta CSD$ and $\Delta BDT \sim \Delta BCS$

$\frac{z}{x} = \frac{q}{p+q} \qquad \frac{z}{y} = \frac{p}{p+q}$

$\frac{\frac{z}{y}}{\frac{z}{x}} = \frac{\frac{p}{p+q}}{\frac{q}{p+q}} = \frac{p}{q} \qquad \Rightarrow \frac{x}{y} = \frac{p}{q}$

65. Ⓑ

$(2,3) \quad k \quad P \quad 1 \quad (-5,7)$

$A \qquad\qquad\qquad\qquad B$

$\therefore P = \left(\frac{-5k+2}{k+1}, \frac{7k+3}{k+1}\right)$

$\frac{7k+3}{k+1} = 0 \Rightarrow k = \frac{-3}{7} \qquad \therefore AP : PB = -3 : 7$

66. Ⓒ

LCM is always divisible by HCF.

1200 is not divisible by 500

67. Ⓒ

$7x - 3y = 4 \qquad 3x + \frac{k}{7}y = 4$

$\frac{7}{3} = \frac{-3}{\frac{k}{7}} = \frac{4}{4} \Rightarrow \begin{Bmatrix} k = -9 \\ k = -21 \end{Bmatrix}$ not possible

$\frac{7}{3} \neq \frac{-3}{\frac{k}{7}} \Rightarrow \frac{1}{3} \neq \frac{-3}{k} \Rightarrow \boxed{k \neq -9} \Rightarrow$ unique solution

68. Ⓑ

$x^2 + k(4x + k - 1) + 2 = 0 \Rightarrow x^2 + 4kx + \left(k^2 - k + 2\right) = 0$

$(4k)^2 - 4 \cdot 1 \cdot \left(k^2 - k + 2\right) = 0 \Rightarrow 16k^2 - 4k^2 + 4k - 8 = 0 \Rightarrow 12k^2 + 4k - 8 = 0$

$\Rightarrow 3k^2 + k - 2 = 0 \Rightarrow 3k^2 + 3k - 2k - 2 = 0 \Rightarrow 3k(k+1) - 2(k+1) = 0 \Rightarrow (k+1)(3k-2) = 0$

$\therefore k = -1, \frac{2}{3}$

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69. Ⓓ

T	U
y	x
x	y

$\rightarrow 10y + x$

$\rightarrow 10x + y$

$x + y = 9 \qquad \ldots (1)$

$10x + y = 10y + x + 27$

$\Rightarrow 9x - 9y = 27$

$\Rightarrow x - y = 3 \qquad \ldots (2)$

Adding (1) & (2)

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

$y = 9 - 6 = 3 \qquad \therefore$ required number = 36

70. Ⓓ

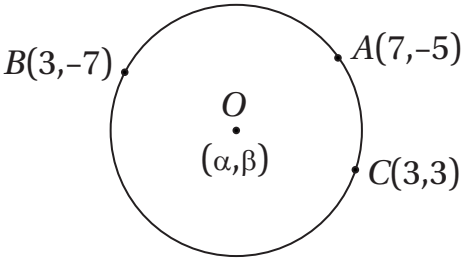
$\angle AOB = (180° - 75°) = 105°$

71. Ⓒ

$\pi 3^2 + \pi 4^2 = \pi r^2 \quad \Rightarrow 3^2 + 4^2 = r^2$

$\therefore r = \sqrt{3^2 + 4^2} = 5 \text{ cm}$

72. Ⓓ



Let (α,β) be the centre of the circle.

$OA = OB = OC \quad \Rightarrow OA^2 = OB^2 = OC^2$

$\Rightarrow (7 - \alpha)^2 + (\beta + 5)^2 = (\alpha - 3)^2 + (\beta + 7)^2 = (\alpha - 3)^2 + (\beta - 3)^2$

$(7 - \alpha)^2 + (\beta + 5)^2 = (\alpha - 3)^2 + (\beta + 7)^2$

$\Rightarrow 49 + \alpha^2 - 14\alpha + \beta^2 + 25 + 10\beta = \alpha^2 + 9 - 6\alpha + \beta^2 + 49 + 14\beta$

$\Rightarrow -8\alpha - 4\beta + 74 = 58 \quad \Rightarrow -8\alpha - 4\beta = -16$

$\Rightarrow 2\alpha + \beta = 4 \qquad \ldots (1)$

$(7-\alpha)^2+(\beta+5)^2=(\alpha-3)^2+(\beta-3)^2$

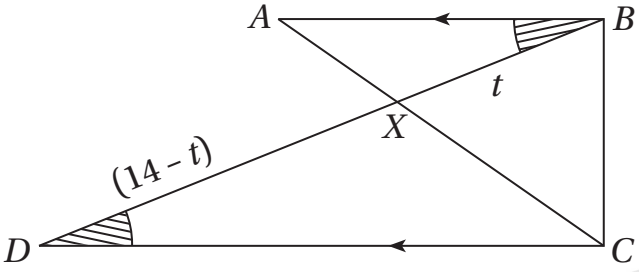
$\Rightarrow\ 49+\alpha^2-14\alpha+\beta^2+25+10\beta=\alpha^2+9-6\alpha+\beta^2+9-6\beta$

$\Rightarrow\ -8\alpha+16\beta=-56$

$\Rightarrow\ \alpha-2\beta=7 \qquad \ldots(2)$

Solving (1) and (2) we get, $\alpha=3,\ \beta=-2$

73. Ⓑ



$AX=4$ cm; $XC=6$ cm; $BD=14$ cm;

Let $BX=t$ cm

$\Delta AXB\sim\Delta CXD$ (by AA) $\Rightarrow \dfrac{AX}{CX}=\dfrac{XB}{XD} \Rightarrow \dfrac{4}{6}=\dfrac{t}{14-t} \Rightarrow 3t=28-2t \Rightarrow 5t=28 \quad \therefore t=\dfrac{28}{5}=5.6$

$\therefore\ BX=5.6$ cm

74. Ⓒ

$a=17, \qquad l=-12\dfrac{3}{8} \qquad \boxed{d=?}$

$S_n=25\dfrac{7}{16}$

$S_n=\dfrac{n}{2}(a+l)=\dfrac{n}{2}\left(17-12\dfrac{3}{8}\right)$

$25\dfrac{7}{16}=\dfrac{n}{2}\left(17-\dfrac{99}{8}\right)=\dfrac{n}{2}\times\dfrac{37}{8} \Rightarrow \dfrac{407}{16}=\dfrac{n}{2}\times\dfrac{37}{8} \quad \therefore n=11$

$a=17, \qquad a_{11}=-12\dfrac{3}{8}$

$\Rightarrow -12\dfrac{3}{8}=17+10\times d \Rightarrow 10d=\dfrac{-99}{8}-17=\dfrac{-235}{8} \Rightarrow d=\dfrac{-235}{80}=\dfrac{-47}{16}$

75. Ⓑ

$$\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}=\frac{\sin^2\theta+(1+\cos\theta)^2}{(1+\cos\theta)\sin\theta}=\frac{\sin^2\theta+1+\cos^2\theta+2\cos\theta}{(1+\cos\theta)\sin\theta}=\frac{2(1+\cos\theta)}{(1+\cos\theta)\sin\theta}=2\operatorname{cosec}\theta$$

76. Ⓑ

Walter Cannon

77. Ⓓ

Every cell in body

Every cell produces wastes during metabolic reactions

78. Ⓓ

Ureter

Ureters connect kidneys to the urinary bladder.

79. Ⓑ

Coordination and movement

80. Ⓑ

Receptor to CNS.

81. Ⓑ

Zygote

The zygote inherits one set of chromosomes from both parents, hence diploid.

82. Ⓐ

Condom

It prevents the union between sperms and ovum by forming a physical barrier.

83. Ⓐ

CO_2

CO_2 is released through the exhaled air.

84. Ⓐ

Kidney

The structural and functional units of the kidney are nephrons.

85. Ⓒ

Micturition

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86. Ⓐ

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

Kidneys purify blood and removes water and nitrogenous wastes in the form of urine.

87. Ⓑ

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

88. Ⓑ

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

89. Ⓒ

Lipoproteins

90. Ⓒ

Nephron

91. Ⓐ

Pituitary

It controls the development and functions of other endocrine glands of the body.

92. Ⓐ

Forebrain

93. Ⓐ

2, 4-D

94. Ⓓ

Amino acids

95. Ⓓ

All of these

96. Ⓒ

Posture

97. Ⓒ

Meninges

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98. Ⓐ

I & III

The CSF acts as a shock absorber.

99. Ⓐ

Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.

100. Ⓓ

Assertion is false but the Reason is true.

Fusion of Y-sperm and ovum produces a male foetus.

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