Monthly Progressive Test

Class: IX (S)

Subject: PCMB

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

Solutions

Physics

1. Ⓑ

$g_1 = g\left(1-\frac{2h}{R}\right)$ and $g_2 = g\left(1-\frac{d}{R}\right)$

$\therefore \quad d = 2h$

2. Ⓑ

$GM = gR^2$

$GM_p = g_p R_p^{\,2} \quad \Rightarrow 2GM = g_p \cdot 4R^2$

$\Rightarrow gR^2 = 2g_pR^2$

$\Rightarrow g = 2g_p$

3. Ⓒ

As time period = 24 hrs. which is same as one complete spin time of Earth.

4. Ⓐ

$GM = gR^2$

$gR^2 = (1.02)g \times R_1^2$

$\left(\frac{R_1}{R}\right)^2 = 1.02$

$\frac{R_1}{R} = \sqrt{\frac{102}{100}} = \left(1+\frac{2}{100}\right)^{\frac{1}{2}}$

$= \left(1+\frac{1}{2}\cdot\frac{2}{100}\right)$ (Binomial Approximation) $= \left(1+\frac{1}{100}\right)$

Ans. 1%

Cont.. 2

5. ©

$g' = g\left(1 - \frac{d}{R}\right) \Rightarrow 36 = 100\left(1 - \frac{d}{R}\right)$

$\Rightarrow \frac{d}{R} = 0.64$

$\Rightarrow d = 0.64\ R$

6. ©

As $T^2 \propto r^3$

7. Ⓐ

$\frac{GM\cancel{m}}{r} = \frac{\cancel{m}v^2}{r}$

$v = \sqrt{GM}$

8. ©

$F = mg \qquad F = \frac{mV^2}{r}, \qquad F = \frac{GMm}{r^2}$

9. Ⓐ

Keplar's law of period.

10. Ⓑ

As $T = \frac{2\pi r}{v}$

11. ©

As $GM = g \cdot R^2$ on earth surface.

12. ©

As $g' = g\left(1 - \frac{2h}{R}\right)$

13. Ⓐ

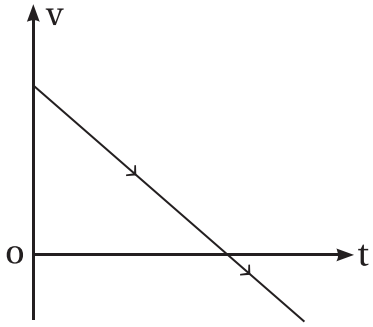
As $g' = g\left(1 - \frac{d}{R}\right)$

14. ©

15. ©

The force is mg.

16. Ⓑ As



17. Ⓐ

$F \propto m$ as acceleration is constant

18. Ⓓ

$F \propto M.\ m$

$$\frac{F'}{F} = \frac{(2M)(2m)}{Mm}$$

$F' = 4F$

19. Ⓐ

As it is Keplar's law of areal speed.

20. Ⓐ

We know, $T = 2\pi\sqrt{\frac{l}{g}}$

$$\Rightarrow T^2 = 4\pi^2 \frac{l}{g} = (k) \times \frac{1}{g}$$

A graph of straight line passing through origin.

21. Ⓐ

Mine to Earth surface → g increases. Earth surface to mountain top → g decreases

22. Ⓓ

$GM = gR^2$

$$\Rightarrow G \cdot \frac{4}{3}\pi R^3 \cdot p = gR^2$$

$$p = \frac{3g}{4\pi GR}$$

23. Ⓐ

$$\frac{g'}{g} = \left(\frac{R}{R+h}\right)^2 = \frac{1}{9}(\text{given})$$

$$\frac{R}{R+h}=\frac{1}{3}$$

$\Rightarrow 3R = R + h$

$\therefore h = 2R$

24. ©

$V_e \propto \sqrt{gR}$ and $g \propto Rp$.

$\therefore \quad V_e \propto \sqrt{gR}$

$V_e' = 2V_C = 2\times 11 = 22 kms^{-1}$

25. Ⓑ

$V_0 = \sqrt{\frac{GM}{r}} = \sqrt{\frac{GM}{3R}} = \sqrt{\frac{gR^2}{3R}} = \sqrt{\frac{gR}{3}}$

Chemistry

26. Ⓑ

According to Bohr's model electron absorb energy when jump into higher energy level.

27. ©

$^{40}Ca_{20}$ and $^{40}Ar_{18}$ are isobars.

28. Ⓓ

Number of valence electron in F^- is 10.

Since, $^{19}F_9$ has Atomic number = 9 = Total e's & it has 1 –ve sign.

29. Ⓓ

Isotope of Iodine is used in the treatment of goitre .

30. ©

Maximum numbers of electrons = $2n^2$

when $n = 4$, $2(4)^2 = 2 \times 16 = 32$

31. Ⓑ

a. Chadwick — (iii) Neutrons

b. Rutherford — (iv) Atomic numbers

c. J.J. Thomson — (i) electrons

d. Bohr — (ii) Atomic stability

32. ©

Isotopes are the elements having same atomic number but different mass number. So, option © $_6C^{12}$, $_{16}C^{13}$ is correct.

33. ©

$^{40}Ca_{20}$, electronic configuration = $K_2L_8M_8N_2$

$^{32}S_{16}$, electronic configuration = $K_2L_8M_6$

$^{40}Ar_{18}$, electronic configuration = $K_2L_8M_8$

$^{24}Mg_{12}$, electronic configuration = $K_2L_8M_2$

34. Ⓑ

Assertion : According to Sir Rutherford, electrons release energy when it rotates around the nucleus. This is correct.

Reason : Electron move around the nucleus in some circular path. This is also correct but it is not the correct explanation of Assertion. Thus the answer is Ⓑ.

35. Ⓓ

Assertion : $_2He^4$ is the lightest element in this world. This is wrong. Hydrogen is the lightest element.

Reason : $_2He^4$ has equal number of protons, electrons and neutrons. This is correct. Thus the correct option is Ⓓ.

36. Ⓓ

Assertion : Maximum number of electrons in *K*-shell is 4. This is wrong. $n = 1$, *K* shell. For *K* shell $2n^2 = 2(1)^2 = 2$.

Reason : Maximum number of electrons in *a* shell is $2n^2$. This is correct. Thus, the correct option is Ⓓ.

37. Ⓐ

Assertion : Chlorine can accept one electron spontaneously. This is correct. $^{35}Cl_{17} = K_2L_8M_7$. So, it can complete octet by gaining one electron.

Reason : On receiving one electron in the outermost shell, chlorine attains its nearest noble gas configuration and that brings the stability. This is also correct and the correct explanation of Assertion. So, option Ⓐ is correct.

38. Ⓑ

$$\text{Average atomic mass of argon} = \frac{40\times 99.6 + 36\times 0.337 + 38\times 0.063}{100} = \frac{3998.526}{100} \approx 39.985$$

39. Ⓐ

Average atomic weight of Neon $= \frac{20 \times 90.5 + 21 \times 0.27 + 22 \times 9.25}{100} = \frac{2019.17}{100} \approx 20.191$

40. ©

The average atomic weight does not depend on maximum number of electron(s) released during ionization.

41. Ⓓ

Aluminium bicarbonate is $Al(HCO_3)_3$ and atomicity = 16 = X

Aluminium sulphate is $Al_2(SO_4)_3$ and atomicity = 17 = Y

Calcium phosphate is $Ca_3(PO_4)_2$ and atomicity = 13 = Z

So, $Y > X > Z$

$\frac{X+Y}{2} = \frac{33}{2} = 16.5 > Z$

$\frac{Z+Y}{2} = \frac{30}{2} = 15 < X$

42. Ⓑ

Colloid is a heterogeneous mixture and in case of emulsion, both components are liquid.

43. ©

Sulphur = S_8

1 mole of S_8 molecule $\equiv 6.022 \times 10^{23}$ molecules

0.1 mole of S_8 molecule $\equiv 6.022 \times 10^{23} \times 0.1$ molecules

$\equiv 6.022 \times 10^{22}$ molecules

1 molecule of S_8 contains 8 atoms of S

6.022×10^{22} molecule of S_8 contains $8 \times 6.022 \times 10^{22}$ S

44. ©

2 gm calcium $= \frac{2}{40} = 0.05$ mole $= X$

18.066×10^{21} iron atom $= \frac{18.066}{6.022} \times \frac{10^{21}}{10^{23}} = 0.03$ mole $= Y$

0.1 gm $CaCO_3 = \frac{0.1}{100} = 0.001$ mole $= Z$

Now $(X + Y + Z) = (10.05 + 0.03 + 0.001) = 0.081$

45. Ⓐ

M.W. of $SO_2 = 32 + 2 \times 16 = 64$

No. of moles of SO_2, $nSO_2 = \frac{\text{Mass}(w)}{M.W.(m)} = \frac{32}{64}$

M.W. of $CH_4 = 16 = \frac{1}{2} = 0.5$ moles

No. of moles of CH_4, ${}^{n}CH_4 = \frac{w}{m} = \frac{8}{16} = 0.5$ mole

This, Assertion Both 32 g of SO_2 & 8 g CH_4 contains same number of moles.

Reasons-equal moles of two compounds contain same number of molecules.

Reason is the correct explanation of assertion.

46. ©

Let the percentage of ${}^{15}X_7 = x$

$\therefore$ The percentage of ${}^{11}X_7 = (100 - x)$

Average atomic weight $= \frac{x(15)+(100-x)\times 11}{100} = 14$

$15x + 1100 - 11x = 1400 \quad \Rightarrow 4x = 300 \quad \Rightarrow x = 75$

$\therefore$ The percentage of ${}^{11}X_7 = 100 - x = 100 - 75 = 25$

47. ©

Atomic models in the order of their chronological order (ii) Thomson's Atomic Model, (i) Rutherford's atomic model and (iii) Bohr's atomic model.

48. ©

The two O-atoms in $CH_3COOC_2H_5$ can have different number of neutrons only if the two O-atoms are isotopes (because no. of protons in the atoms of an element is always same but neutrons can be different if their mass numbers are different).

49. Ⓑ

Here both assertion and Reason are correct but reason is not the correct explanation of assertion.

According to Planck's equation of electrons jumps only from one orbit to another orbit.

Energy radiates or absorbs according to equation, $\Delta E = h\nu$, h = Planck's constant, γ = frequency, every orbit has fixed energy.

50. ©

Total number of electrons in NO_3^- in = Electrons in N +3 × electrons in O^{+1} (due to 1 –ve charge) = $7 + 3 \times 8 + 1 = 32$

51. Ⓑ

$S = \dfrac{13+14+15}{2}\text{ m} = \dfrac{42}{2}\text{ m} = 21\text{ m}$

$\therefore$ Area of one side of the board

$= \sqrt{21(21-13)(21-14)(21-15)}\text{ m}^2 = \sqrt{21\times 8\times 7\times 6}\text{ m}^2$

$= \sqrt{7\times 3\times 4\times 2\times 7\times 3\times 2}\text{ m}^2 = 7\times 3\times 2\times 2\text{ m}^2 = 84\text{ m}^2$

$\therefore$ Cost of painting $= ₹\, 8\dfrac{3}{4}\times 84 = ₹\, \dfrac{35}{4}\times 84 = ₹\, 735$

52. Ⓐ

Area of an equilateral triangle $= \dfrac{\sqrt{3}}{4}a^2$

$\therefore \dfrac{\sqrt{3}}{4}a^2 = 4\sqrt{3} \quad \Rightarrow a^2 = 16 \quad \Rightarrow a = 4$

$\therefore$ Length of each side = 4 cm

53. Ⓓ

Volume of cone $= \dfrac{1}{3}\pi r^2 h = \dfrac{\pi}{3}(6)^2\times 12\text{ cm}^3 = \dfrac{\pi}{3}\times 36\times 12\text{ cm}^3 = 144\pi\text{ cm}^3$

54. Ⓐ

Volume of sphere = 38808 cm^3

$\therefore \dfrac{4}{3}\pi r^3 = 38808 \quad \Rightarrow r^3 = \dfrac{38808\times 3\times 7}{4\times 22} \quad \Rightarrow r^3 = (21)^3 \quad \Rightarrow r = 21$

$\therefore$ Surface area of sphere $= 4\pi r^2 = 4\times\dfrac{22}{7}\times 21\times 21\text{ cm}^2 = 5544\text{ cm}^2$

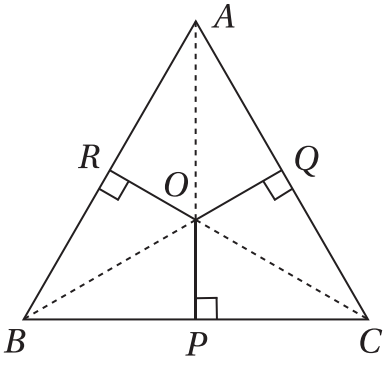
55. Ⓑ

Let $AB = BC = AC = a$ m

$ar(\Delta ABC) = \dfrac{1}{2}\times a\times(6+7+8)\text{ m}^2 = \dfrac{1}{2}\times a\times 21\text{ m}^2 = \dfrac{21}{2}a\text{ m}^2$

Again, $ar(\Delta ABC) = \dfrac{\sqrt{3}}{4}a^2\text{ m}^2$

$\therefore \dfrac{\sqrt{3}}{4}a^2 = \dfrac{21}{2}a \quad \Rightarrow a = \dfrac{21}{2}\times\dfrac{4}{\sqrt{3}} = \dfrac{42\times\sqrt{3}}{3} = 14\sqrt{3}$



$\therefore$ Area of the triangle $= \dfrac{21}{2}\times 14\sqrt{3}\text{ m}^2 = 147\sqrt{3}\text{ m}^2$

56. Ⓑ

$\frac{\sqrt{3}}{2}a = 9 \quad \Rightarrow a = \frac{9\times 2}{\sqrt{3}} = 6\sqrt{3}$

$\therefore$ Area $= \frac{\sqrt{3}}{4}\times 6\sqrt{3}\times 6\sqrt{3}\ \text{cm}^2 = \frac{\sqrt{3}}{4}\times 36\times 3\ \text{cm}^2 = 27\sqrt{3}\ \text{cm}^2 = 27\times 1.732\ \text{cm}^2 = 46.76\ \text{cm}^2$

57. Ⓑ

$r + h = 37$

$2\pi r(r+h) = 1628 \quad \Rightarrow 2\times\frac{22}{7}\times r\times 37 = 1628 \quad \Rightarrow r = \frac{1628\times 7}{2\times 22\times 37} = 7 \quad \therefore\ h = 30$

$\therefore$ Volume of the cylinder $= \frac{22}{7}\times 7\times 7\times 30\ \text{cm}^3 = 210\times 22\ \text{cm}^3 = 4620\ \text{cm}^3$

58. Ⓒ

$4\pi r^2 = 36\pi \quad \Rightarrow r^2 = 9 \quad \Rightarrow r = 3$

$\therefore$ Volume $= \frac{4}{3}\pi\times 3\times 3\times 3\ \text{cm}^3 = 36\pi\ \text{cm}^3$

$\therefore$ Assertion is true.

Volume of sphere $= \frac{4}{3}\pi r^3$ cu.units

$\therefore$ Reason is false

59. Ⓑ

$h_1 : h_2 = 1 : 2$

$r_1 : r_2 = 1 : 4$

$\therefore$ Ratio of the volumes $= \pi r_1^2 h_1 : \pi r_2^2 h_2 = \left(\frac{r_1}{r_2}\right)^2 \times \left(\frac{h_1}{h_2}\right) = \left(\frac{1}{4}\right)^2 \times \frac{1}{2} = \frac{1}{32} = 1:32$

$\therefore$ Assertion is true. Reason is also true. But Reason is not the correct explanation of (A).

60. Ⓐ

Height of the cylindrical part = (14 – 5) mm = 9 mm.

61. Ⓐ

Curved surface area of a hemispherical part $= 2\pi r^2$

$= 2\pi\left(\frac{5}{2}\right)^2\ \text{mm}^2 = 2\pi\times\frac{25}{4}\ \text{mm}^2$

$= 12.5\pi\ \text{mm}^2$

62. Ⓒ

Surface area of the capsule $= 2\pi rh + 2 \times 2\pi r^2 = 2\pi r(h + 2r)$

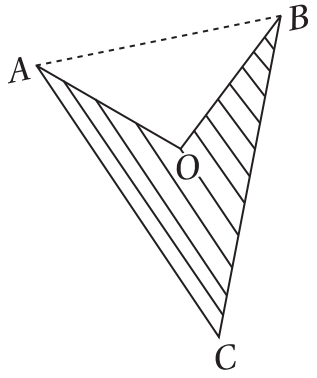
$= 2\pi \times \frac{5}{2}\left(9 + 2 \times \frac{5}{2}\right) \text{mm}^2 = 70\pi \text{ mm}^2$

63. Ⓐ

$S = \frac{14 + 10 + 6}{2} = 15 \text{ cm}$

Area of triangle $= \frac{4}{3}\sqrt{15 \times 1 \times 5 \times 9} \text{ cm}^2 = \frac{4}{3} \times 5 \times 3 \times \sqrt{3} \text{ cm}^2 = 20\sqrt{3} \text{ cm}^2$

64. Ⓓ



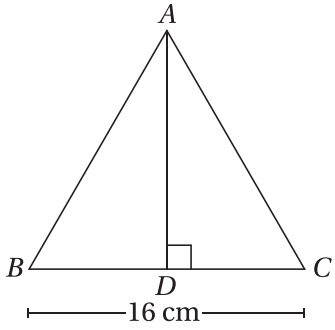
$AB = \sqrt{144 + 25} \text{ cm} = 13 \text{ cm}$

Area of $\Delta AOB = \frac{1}{2} \times 12 \times 5 \text{ cm}^2 = 30 \text{ cm}^2$

Area of $\Delta ABC = \sqrt{21 \times 6 \times 7 \times 8} \text{ cm}^2 = 7 \times 3 \times 4 \text{ cm}^2 = 84 \text{ cm}^2$

$\therefore$ Area of shaded part = (84 – 30) cm^2 = 54 cm^2

65. Ⓑ



$\frac{1}{2} \times 16 \times AD = 48 \quad \Rightarrow AD = 6 \text{ cm}$

$\therefore AB = \sqrt{8^2 + 6^2} \text{ cm} = 10 \text{ cm}$

$\therefore$ $AC = AB = 10$ cm

$\therefore$ Perimeter = 36 cm

66. Ⓓ

In ΔAPM and ΔBQM,

$AM = BM$ ($\because$ M is mid point of AB)

$\angle AMP = \angle BMQ$ (vertically opposite angles)

$\angle PAM = \angle QBM$ (90° each)

$\therefore \Delta APM \cong \Delta BQM \quad (\text{A} - \text{S} - \text{A})$

$\therefore PM = QM \quad (\text{c.p.c.t})$

Now, in ΔCPM and ΔCQM,

$PM = QM$

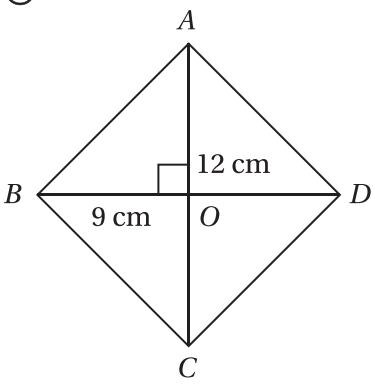
$\angle CMP = \angle CMQ$

$CM = CM$

$\therefore \Delta CPM \cong \Delta CQM \quad (\text{S} - \text{A} - \text{S})$

$\therefore$ $PC = QC$ (c.p.c.t)

67. Ⓑ



$AB = \sqrt{144+81}\ \text{cm} = 15\ \text{cm}$

68. Ⓐ

$\angle ABD = 180° - 110° = 70°$

$\angle ADB = 70°$

$x° = 110°$

$\therefore\ z° = 180° - (110° + 50°) = 180° - 160° = 20°$

$\therefore\ z = 20$

69. Ⓓ

$$\frac{3}{1} = \frac{-4}{c} \Rightarrow c = \frac{-4}{3}$$

70. Ⓓ

$(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab+bc+ca)$

$\Rightarrow (12)^2 = 50 + 2(ab+bc+ca)$

$$\Rightarrow \frac{144-50}{2} = ab+bc+ca$$

$\Rightarrow 47 = ab+bc+ca$

71. Ⓑ

Perimeter = 540 m

Ratio of sides = 25 : 17 : 12

$\therefore$ Sides are = 250 m, 170 m, 120 m

$\therefore$ Area of triangle $= \sqrt{270\times20\times100\times150}\ \text{m}^2 = \sqrt{9\times10\times3\times2\times10\times100\times3\times2\times25}\ \text{m}^2$

$= 3\times3\times2\times10\times10\times5\ \text{m}^2 = 9000\ \text{m}^2$

72. Ⓒ

Diameter of spherical basket ball = 20 cm

$\therefore$ Radius = 10 cm

Surface area = $4\pi r^2 = 4\pi \times (10)^2 \text{ cm}^2 = 400\ \pi \text{ cm}^2$

73. Ⓐ

Radius = r cm; Height = h cm

$\therefore$ Volume $= \frac{1}{3}\pi r^2 h \text{ cm}^3$

Height decreased by x cm

$\therefore$ Height = $(h - x)$ cm

$\therefore$ Volume $= \frac{1}{3}\pi r^2 (h-x) \text{ cm}^3$

$\therefore$ Change in volume $= \frac{\pi}{3} r^2 x \text{ cm}^3$

Radius decreased by x cm

$\therefore$ Radius = $(r - x)$ cm

$\therefore$ Volume $= \frac{\pi}{3}\pi (r-x)^2 h \text{ cm}^3$

Change in volume $= \left(\frac{\pi}{3} 2rxh - \frac{\pi}{3} x^2 h\right) \text{cm}^3$

$\therefore \frac{\pi}{3} r^2 x = \frac{\pi}{3} 2rxh - \frac{\pi}{3} x^2 h$

$\Rightarrow r^2 = 2rh - xh \quad \Rightarrow xh = 2rh - r^2 \quad \Rightarrow x = \frac{2rh - r^2}{h}$

74. Ⓐ

For greatest sphere radius = 1 cm

$\therefore$ Volume $= \frac{4}{3}\pi (1)^3 \text{ cm}^3 = \frac{4}{3}\pi \text{ cm}^3$

75. Ⓑ

Total outcomes = 90

Perfect square numbers are 1, 4, 9, 16, 25, 36, 49, 64, 81

$\therefore$ Fabourable outcomes = 9

$\therefore$ Required probability $= \frac{9}{90} = \frac{1}{10}$

Biology

76. Ⓓ

All

All are non living factors affecting crop production.

77. Ⓐ

Soil

13 out of 16 nutrients come from soil

78. Ⓓ

Both Ⓑ & Ⓒ

B is cow and C is buffalo. Females of both animals are used for milk production.

79. Ⓐ

Honey

Bee keeping is done mainly for the commercial production of honey.

80. Ⓓ

Feeding

81. Ⓐ

Microbial decomposition

Microbial decomposition of organic matter

82. Ⓓ

None

A, B and C are chemicals , hence cannot be used in organic farmimg.

83. Ⓑ

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

In both, pests are controlled in different ways.

84. Ⓐ

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

85. Ⓒ

Composite fish culture

86. Ⓐ

Do not compete with each other for food.

As they find their food from different levels of the pond.

87. Ⓒ

Lack of availability of good quality seeds.

88. ©

Virus

89. Ⓐ

England

90. Ⓐ

Fertile males

91. ©

Dead permanent simple tissue

92. ©

Centrosome

Its a cell organelle

93. Ⓐ

Amitosis

94. Ⓐ

Lysosomes

95. Ⓐ

Axon of neuron

Myelin sheath allows quick transmission of impulse along the neuron.

96. Ⓑ

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

Scarcity or irregularity in rainfall adversely affects crop production.

97. ©

A is true but R is false

Nitrogen is an essential element of almost all biomolecules, (like proteins), hence is required in larger amounts.

98. Ⓑ

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

99. Ⓓ

All of these

100. ⓓ

None

Apiaries are sites of apiculture, or rearing of honey bees.