

SOLUTIONS

PROGRESS TEST-5

GSI-2101, GSKI-2101

ICSE PATTERN

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PHYSICS

1. (B)

$$d_p = 2 \cdot d_e$$

$$R_p = \frac{3}{2} R_e$$

$$\frac{g_p}{g_e} = \frac{\frac{4}{3} \times G \cdot R_p \cdot d_p}{\frac{4}{3} \times G \cdot R_e \cdot d_e} = \frac{R_p \cdot d_p}{R_e \cdot d_e} = \frac{\frac{3}{2} R_e \cdot 2 \cdot d_e}{R_e \cdot d_e} = 3$$

$$\Rightarrow g_p = 3 \times g_e$$

Hence option (B) is correct.

2. (A)

$$g = \frac{GM}{R^2}$$

$$\Rightarrow M' = M + \frac{M}{100} = \frac{101}{100} M$$

$$\Rightarrow g' = \frac{GM'}{R'^2} = \frac{101}{100} \frac{GM}{R'} = \frac{101}{100} g$$

$$\therefore \% \text{ change} = \frac{g' - g}{g} \times 100\% = 1\% \text{ increase}$$

Hence, option (A) is correct.

3. (B)

$$r' = r + \frac{2}{100} \times r = \frac{51}{50} r$$

$$F' = \frac{G \cdot m_1 \cdot m_2}{(r')^2} = \left(\frac{50}{51}\right)^2 \cdot \frac{G \cdot m_1 m_2}{r^2} = \left(\frac{50}{51}\right)^2 \cdot F = 0.96 F$$

$$\therefore \% \text{ change} = \frac{F' - F}{F} \times 100\% = 4\% \text{ decrease}$$

Hence option (B) is correct.

4. (D)

$$W' = W - \frac{36}{100} \times W = \frac{64W}{100}$$

$$\Rightarrow \frac{W'}{W} = \frac{64}{100}$$

$$\Rightarrow \frac{g'}{g} = \frac{64}{100}$$

$$\Rightarrow \left(\frac{R}{R+h} \right)^2 = \frac{64}{100}$$

$$\Rightarrow \frac{R}{R+h} = \frac{8}{10}$$

$$\Rightarrow 8h = 2R$$

$$\therefore h = \frac{R}{4}$$

Hence, option (D) is correct.

5. (D)

$$\frac{T_1}{T_2} = \left(\frac{R_1}{R_2} \right)^{3/2} = \left(\frac{r}{2r} \right)^{3/2} = \left(\frac{1}{2} \right)^{3/2} = \frac{1}{2\sqrt{2}}$$

Hence, option (D) is correct.

6. (C)

Given, $P = 27500 \text{ Pa}$

$A = 200 \text{ cm}^2$

$F = P.A = 27500 \text{ Pa} \times 200 \times 10^{-4} \text{ m}^2$

$= 5500000 \times 10^{-4} \text{ N} = 550 \text{ N}$

Hence option (C) is correct.

7. (B)

$$\Delta P = P_2 - P_1 = \rho g(h_2 - h_1)$$

$$\Rightarrow (120000 - 30000) \text{ Pa} = 1000 \text{ kg/m}^3 \times 10 \text{ m/s}^2 \times (h_2 - h_1)$$

$$\Rightarrow h_2 - h_1 = 9 \text{ m.}$$

\therefore Option (B) is correct.

8. (D)

$$P = \rho gh$$

$$\therefore h = \frac{P}{\rho g} = \frac{600 \text{ Pa}}{12 \text{ kg/m}^3 \times 10 \text{ m/s}^2} = 5 \text{ m}$$

Hence, option (D) is correct

9. (D)

$$\text{M.A.} = \frac{(\text{Radius of larger piston})^2}{(\text{Radius of smaller piston})^2}$$

$$\Rightarrow 9 = \frac{(30 \text{ cm})^2}{(r)^2}$$

$r = 10 \text{ cm}$. Hence option (D) is correct.

10. (A)

For floatation

$$\Rightarrow mg = B$$

$$\Rightarrow \rho_{\text{ice}} \cdot V \cdot g = \rho_w \cdot V_{\text{in}} \cdot g$$

$$\Rightarrow V_{\text{in}} = \frac{\rho_{\text{ice}}}{\rho_w} \times V$$

$$\Rightarrow V_{\text{in}} = \frac{0.9}{1.1} V = \frac{9}{11} V$$

11. (A)

Given weight of solid in air = 200 gf = W_A

wt. of solid in liquid = 170 gf = W_l

wt. of solid in water = 160 gf = W_w

$$\text{R.D. of solid} = \frac{W_A}{W_A - W_w} = \frac{200 \text{ gf}}{200 \text{ gf} - 160 \text{ gf}} = \frac{200}{40} = 5$$

$$\text{R.D. of liquid} = \frac{W_A - W_l}{W_A - W_w} = \frac{30 \text{ gf}}{40 \text{ gf}} = 0.75$$

12. (A)

$$\text{Given } v_o = \sqrt{\frac{GM}{R+h}}, \quad v_e = \sqrt{\frac{2GM}{R}} \quad \text{and } v_o = \frac{v_e}{2}$$

$$\text{hence, } \sqrt{\frac{GM}{R+h}} = \frac{1}{2} \sqrt{\frac{2GM}{R}}$$

$$\Rightarrow 4R - 2(R+h) = 0$$

$$\Rightarrow h = R = 6400 \text{ km}$$

13. (B)

Conceptual.

14. (A)

$$\text{Given } P_o = 10^5 \text{ Pa}$$

$$\rho_w = 10^3 \text{ kg/m}^3$$

$$h = 5.1 \text{ m}$$

$$\therefore \text{ Total pressure, } P_T = P_o + \rho gh = 10^5 + (10^3 \times 5.1 \times 10) = 15.1 \times 10^4 \text{ pa}$$

Hence, option (A) is correct.

15. (C)

$$F = m \cdot a$$

$$\therefore a = \frac{F}{m} = \frac{5 \times 10^7}{3 \times 10^7} = \frac{5}{3} \times 10^{-3} \text{ m/s}^2$$

$$\therefore v = \sqrt{2 \cdot a \cdot s} = \sqrt{2 \times \frac{5}{3} \times 3 \times 10^{-3}} = 0.1 \text{ m/s}$$

Hence, option (C) is correct.

16. (C)

$$\text{Thrust} = \text{Force} = \frac{\Delta m}{\Delta t} \times v = 40 \text{ kg/s} \times 5 \times 10^4 \text{ m/s} = 2 \times 10^6 \text{ N}$$

Hence, option (C) is correct.

17. (A)

$$\frac{\text{Volume of cube submerged}}{\text{Total volume}} = \frac{\text{Density of cube material}}{\text{Density of water}}$$

$$\Rightarrow \frac{10-4}{10} = \frac{d}{1} \Rightarrow d = \frac{6}{10} = 0.6 \text{ g cm}^{-3}$$

18. (C)

Change in momentum = Area under the F versus t graph in that interval.

$$= \frac{1}{2} \left(\frac{1}{2} \times 2 \times 6 \right) - (2 \times 3) + (4 \times 3) = 6 - 6 + 12 = 12 \text{ Ns}$$

19. (B)

Here, mass of bullet $m = 10\text{g} = \frac{10}{1000} \text{ kg}$

Mass of ice, $M = 5 \text{ kg}$

According to the conservation of linear momentum, we get

$$m \times 300 + M \times 0 = m \times 0 + Mv$$

$$\Rightarrow \frac{10}{1000} \times 300 + M \times 0 = 5v$$

$$\therefore v = \frac{3}{5} = 0.6 \text{ m/s} = 60 \text{ cm/s}$$

20. (A)

Inside the earth $g = \frac{4}{3} \pi \rho Gr$
 $\therefore g \propto r$

CHEMISTRY

21. (B)

Ar and Ca^{2+} are isoelectronic species as they have same number of electrons, i.e., 18.

22. (A)

Isobars have same atomic mass but different atomic number. Thus, the isobar of ${}_{20}\text{Ca}^{40}$ is ${}_{18}\text{Ar}^{40}$.

23. (C)

Number of electrons is $M^{2+} = 24$

\therefore Number of electron in $M = 26$

i.e., atomic number (Z) = 26

Mass number (A) = 26 \therefore Number of neutrons = $A - Z = 56 - 26 = 30$

24. (C)

Nucleus of an atom is small in size but carries the entire mass i.e., contains all the neutrons and protons.

25. (C)

Isoelectronic species have same number of electron. Mg^{2+} and Na^+ both have 10 electrons hence, they are isoelectronic species.

26. (C)

${}^{14}_6\text{C}, {}^{16}_8\text{O}, {}^{15}_7\text{N}$ = isotonic triad

Isotonic = same number of neutron.

All species contain 8 neutrons.

27. (D)

The mass number = atomic number + number of neutron

Atomic number = no. of proton

= no. of electron (for an atom)

So, mass number = $18 + 20 = 38$

28. (A)

${}^8\text{O}^{2-}$ has 10 electrons ${}_{81}\text{Ti}^+$ has 80 electrons.

29. (A)

Isoelectronic means having same number of electrons K^+ , Cl^- , Ca^{2+} , Sc^{3+} (all are having 18 electrons).

30. (A)

Tritium is the isotope of hydrogen. Its composition is as follows :

1 electron, 1 proton and 2 neutrons.

31. (C)

Al (13) – 2, 8, 3

32. (C)

Mg forms divalent ions, rest all the elements form monovalent ions.

$\text{Li} - e \rightarrow \text{Li}^+$

$\text{Na} - e \rightarrow \text{Na}^+$

$\text{Mg} - 2e \rightarrow \text{Mg}^{2+}$

$\text{K} - e \rightarrow \text{K}^+$

33. (C)

34. (C)

37 (Rb) – 2, 8, 18, 8, 1

35. (D)

Ca and Zn have different outer electronic configuration and they belong to different blocks (s and d respectively).

36. (A)

Valency of noble gases is zero since they are not reactive.

37. (A)

C – 6 2, 4

Si – 14 2, 8, 4

Sn – 50 2, 8, 18, 18, 4

38. (C)

Atomic number = 13 2, 8, 3

Atomic number = 31 2, 8, 18, 3

39. (B)

Atomic number 37 = 2, 8, 18, 8, 1

Atomic number 19 = 2, 8, 8, 1

Atomic number 3 = 2, 1

Atomic number 55 = 2, 8, 18, 18, 8, 1.

40. (A)

Li is the lightest metal.

MATHEMATICS

41. (D)

A = Area of Rectangle = xy

Changed Area = 4xy

$$\% \text{ change in Area} = \frac{4xy - xy}{xy} \times 100 = 300\%$$

42. (A)

Perimeter of square = $4a$ (a is side of square)Perimeter of equilateral $\Delta = 3b$ (b is side of equilateral Δ)

$$4a = 3b \text{ (Given)} \Rightarrow a = \frac{3b}{4}$$

Diagonal of square = $\sqrt{2}a$

$$\sqrt{2} \times \frac{3b}{4} = 6\sqrt{2}$$

$$b = \frac{24}{3} = 8$$

$$\boxed{b = 8}$$

$$\text{Area of } \Delta = \frac{\sqrt{3}}{4}b^2 = \frac{\sqrt{3}}{4} \times 64 = 16\sqrt{3} \text{ cm}^2$$

43. (C)

$$\text{Area of } \Delta ECB = \frac{1}{2} \times 3.5 \times 2 = 3.5 \text{ m}^2$$

44. (B)

$$\text{Area of } \square ABCD = 50 \times 7 = 350 \text{ cm}^2$$

$$\text{Area of } \square ABCD = 25 \times BE$$

$$350 = 25 \times BE$$

$$BE = \frac{350}{25} = 14 \text{ cm}$$

45. (D)

$$\text{Area of equilateral } \Delta = \frac{\sqrt{3}}{4}a^2$$

$$64\sqrt{3} = \frac{\sqrt{3}}{4}a^2$$

$$a = 16 \text{ cm}$$

$$\text{Perimeter of equilateral } \Delta = 48 \text{ cm}$$

46. (A)

$$42 = 18 + 10 + C$$

$$C = 14$$

$$S = 21$$

$$A = \sqrt{21 \times 3 \times 11 \times 7} = \sqrt{7 \times 3 \times 3 \times 11 \times 7} = 21\sqrt{11} \text{ cm}^2$$

47. (B)

$$12x + 17x + 25x = 540$$

$$54x = 540$$

$$\boxed{x = 10}$$

side

$$a = 120, b = 170, c = 250$$

$$s = 270$$

$$A = \sqrt{270 \times 150 \times 100 \times 20}$$

$$\Rightarrow 10\sqrt{270 \times 150 \times 20}$$

$$\Rightarrow 100\sqrt{8100} = 9000 \text{ cm}^2$$

48. (C)

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\text{New semiperimeter } s_1 = \frac{3(a+b+c)}{2}$$

$$s_1 = 3s$$

$$A' = \sqrt{s_1(s_1-3a)(s_1-3b)(s_1-3c)} = \sqrt{3s(3s-3a)(3s-3b)(3s-3c)} = 9\sqrt{s(s-a)(s-b)(s-c)}$$

$$A' = 9A \quad \% \text{ Change} = \frac{9A - A}{A} \times 100 = 800\%$$

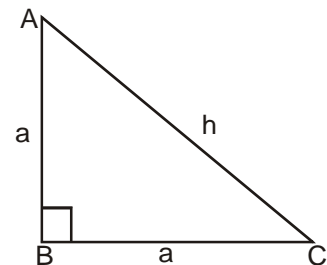
49. (A)

$$\text{Area of } \triangle ABC = \frac{1}{2}a^2$$

$$200 = \frac{1}{2}a^2$$

$$a = 20 \text{ cm}$$

$$h = \sqrt{a^2 + a^2} = \sqrt{400 + 400} = \sqrt{800} = 20\sqrt{2} \text{ cm}$$



50. (D)

$$3x + 4x + 5x = 144$$

$$12x = 144$$

$$\boxed{x = 12}$$

$$36, 48, 60$$

$$s = \frac{36 + 48 + 60}{2} = \frac{144}{2} = 72$$

$$A = \sqrt{72 \times 36 \times 24 \times 12}$$

$$= \sqrt{12 \times 6 \times 6 \times 6 \times 6 \times 4 \times 6 \times 2} = 12 \times 6 \times 6 \times 2 = 144 \times 6 = 864$$

51. (C)

$$x - y = 0.9$$

$$2x + 2y = 11$$

$$x + y = \frac{11}{2} = 5.5$$

$$x - y = 0.9$$

$$\underline{x + y = 5.5}$$

$$2x = 6.4$$

$$x = 3.2$$

$$y = 5.5 - 3.2 = 2.3$$

52. (C)

Let 50 notes is x and 100 notes is y

$$x + y = 25 \quad \text{(I)}$$

$$50x + 100y = 2000 \quad \text{(II)}$$

$$50x + 50y = 1250$$

$$\underline{50x + 100y = 2000}$$

$$\hline -50y = -750$$

$$\boxed{y = 15}$$

$$\boxed{x = 10}$$

53. (C)

Let number of cows is x and Number of hens is y

$$\therefore x + y = 48 \quad (I)$$

$$4x + 2y = 140$$

$$\Rightarrow 2x + y = 70 \quad (II)$$

$$\begin{array}{r} _x _ + y = _48 \\ \underline{\hspace{1.5cm}} \\ x = 22 \end{array}$$

$$y = 26$$

54. (C)

Let Number be x and y

$$x + y = 40$$

$$\underline{x - y = 6}$$

$$2x = 46$$

$$x = 23$$

$$y = 17$$

55. (D)

Let the speed of the boat is x km/h speed of the stream is y km/h

\therefore Now

$$\frac{30}{x-y} + \frac{44}{x+y} = 10 \quad (I)$$

$$\frac{40}{x-y} + \frac{55}{x+y} = 13 \quad (II)$$

$$\text{Let } \frac{1}{x-y} = P \text{ and } \frac{1}{x+y} = Q$$

after solving (I) and (II)

$$x = 8 \text{ km/h } y = 3 \text{ km/hr}$$

56. (D)

$$\frac{x}{y} = \frac{2}{3} \Rightarrow x = \frac{2y}{3}$$

$$\Rightarrow \frac{x-2}{y-8} = \frac{3}{2}$$

$$\Rightarrow 2x - 4 = 3y - 24$$

$$\Rightarrow 2 \times \frac{2y}{3} - 4 = 3y - 24$$

$$\Rightarrow 4y - 12 = 9y - 72$$

$$\Rightarrow -12 + 72 = 5y$$

$$\Rightarrow \frac{60}{5} = y$$

$$\Rightarrow \boxed{12 = y} \quad \boxed{x = 8}$$

57. (A)

$$x - 2y - 3 = 0$$

$$3x - ky - 1 = 0$$

Unique solution

$$\frac{1}{3} \neq \frac{2}{k}$$

$$\boxed{k \neq 6}$$

58. (C)

$$2x + 3y - 5 = 0$$

$$6x + ky - 15 = 0$$

Infinitely many solution

$$\frac{2}{6} = \frac{3}{k} = \frac{5}{15}$$

$$\boxed{k = 9}$$

59. (C)

$$kx - 5y = 2$$

$$6x + 2y = 7$$

No solution

$$\frac{k}{6} = \frac{-5}{2} \neq \frac{2}{7}$$

$$\boxed{k = -15}$$

60. (C)

$$2x - (a - 4)y - (2b + 1) = 0$$

$$4x - (a - 1)y - (5b - 1) = 0$$

Infinitely many solution

$$\frac{2}{4} = \frac{a - 4}{a - 1} = \frac{2b + 1}{5b - 1}$$

$$2a - 2 = 4a - 16$$

$$2a = 14$$

$$a = 7$$

$$10b - 2 = 8b + 4$$

$$2b = 6$$

$$\boxed{b = 3}$$

BIOLOGY

61. (C)

Anther produce male gamete pollen grain, while ovary produce female gamete ova.

62. (C)

63. (B)

64. (D)

65. (D)

66. (C)

67. (A)

68. (C)

69. (B)

70. (A)

Alveoli increase the surface area of lungs.

71. (D)

Oxidation of glucose takes place in presence of oxygen.

72. (B)

73. (A)

Pyruvate converts into lactic acid in absence of oxygen.

74. (C)

75. (B)

76. (B)

77. (D)

78. (B)

79. (C)

80. (A)

Kreb's cycle takes place in matrix of mitochondria.

MENTAL ABILITY

81. (D)

82. (A)

83. (C)

84. (B)

85. (D)

86. (C)

87. (C)

88. (C)

89. (C)

90. (A)

91. (B)

92. (A)

93. (C)

94. (B)

95. (A)

96. (A)

97. (C)

98. (D)

99. (D)

100.(B)