

# **SOLUTIONS**

## **PROGRESS TEST-5**

**GSA-2101, GS-2101 & 2102**

**GSSK-2101, GSK-2101 & 2102**

**CBSE PATTERN**

**Test Date: 25-09-2017**



**Corporate Office: Paruslok, Boring Road Crossing, Patna-01**  
**Kankarbagh Office: A-10, 1st Floor, Patrakar Nagar, Patna-20**  
**Bazar Samiti Office : Rainbow Tower, Sai Complex, Rampur Rd.,**  
**Bazar Samiti Patna-06**  
**Call : 0612-3223681/2 | 7544015993/6/7 | 7070999604/5**

## 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)



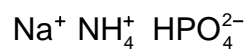
Sodium pyro silicat  $\rightarrow \text{Na}_6 \text{Si}_2\text{O}_7$

22. (B)



Calcium sulphite  $\rightarrow \text{CaSO}_3$

23. (C)

Sodium ammonium hydrogen phosphate  $\rightarrow \text{NaNH}_4\text{HPO}_4$ 

24. (A)

Cesium hydrogen carbonate  $\rightarrow \text{CsHCO}_3$ 

25. (D)

Barium nitrate  $\rightarrow \text{Ba}(\text{NO}_3)_2$ 

26. (D)

$$\text{No. of electrons} = \frac{1}{9.108 \times 10^{-31} \times 6.022 \times 10^{23}} = \frac{1 \times 10^8}{9.108 \times 6.022}$$

27. (D)

All have the same number of atoms.

28. (D)

As we know 2 mole of Hydrogen atom = 1 mole of  $\text{H}_2$ .So, volume occupied by 1 mole of  $\text{H}_2$  = 22.4 litres

29. (D)

$$\begin{aligned} \text{No. of oxygen atom} &= \frac{16}{32} \times 6.022 \times 10^{23} \times 2 \\ &= 6.022 \times 10^{23} \end{aligned}$$

30. (C)

$$\text{Mole} = \frac{5.6}{22.4} = \frac{1}{4} \text{ mole.}$$

31. (C)

We know that

1 gm - atom = 1 mole.

mass of 1 mole of Na = 23 g.

32. (A)

$$\frac{V}{22400} = \frac{W}{M} \text{ As we are equalising mole. } \quad M = \frac{W \times 22400}{V}$$

33. (C)

$$\text{Mole} = 0.1 \times 10^{-3}$$

$$\text{No. of ions} = 0.1 \times 10^{-3} \times 3 \times 6.022 \times 10^{23} = 6.02 \times 3 \times 10^{19}$$

34. (D)

$$\text{Molar mass} = 11.2 \times 2 = 22.4 \text{ g}$$

$$\text{mole} = \frac{2.4}{22.4} = 0.1$$

$$\text{Volume occupied} = 0.1 \times 22.4 = 2.4 \text{ L}$$

35. (A)

$$1 \text{ a.m.u} = \frac{1}{12} \text{ of C} = 12$$

36. (A)

C<sup>12</sup>

37. (A)

No. of atoms = n x Na x atomicity.

38. (C)

An element or a compound both are a pure substance.

39. (C)

No. of neutrons.

$$\frac{1.7}{17} \times \text{Na} \times 7 = \frac{\text{Na}}{10} \times 7$$

40. (B)

$$\text{No. of atom} = \frac{5.6}{22.4} \times \text{Na} \times 2 = \frac{1}{4} \times 6.022 \times 10^{23} \times 2$$



## 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  $\Delta$ )

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

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)

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

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

$$s_1 = 3s$$

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

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

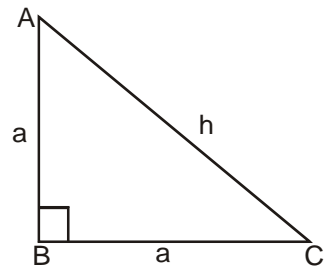
49. (A)

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

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

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

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



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

$$x + y = 25 \quad (I)$$

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

$$\begin{array}{r} 50x + 50y = 1250 \\ \underline{50x + 100y = 2000} \\ -50y = -750 \end{array}$$

$$y = 15$$

$$x = 10$$

**53. (C)**

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

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

$$4x + 2y = 140$$

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

$$\begin{array}{r} \underline{x + y = 48} \\ 2x + y = 70 \\ \hline x = 22 \end{array}$$

$$y = 26$$

**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. (D)

62. (D)

63. (B)

64. (A)

65. (D)

Members of kingdom plantae perform autotrophic mode of nutrition by the process of "Photosynthesis".

66. (B)

67. (B)

68. (B)

69. (B)

70. (B)

Euglena perform mixotrophic mode of nutrition (Both autotrophic as well as heterotrophic), hence considered as connecting link between plants & animal.

71. (A)

72. (B)

Mycoplasma is considered as smallest bacteria and placed under kingdom monera.

73. (C)

74. (C)

75. (A)

76. (C)

77. (C)

78. (B)

79. (B)

80. (C)

## 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)