SOLUTIONS

PROGRESS TEST-6

GSA-2101, GS-2101 & 2102

GSSK-2101, GSK-2101 & 2102

CBSE PATTERN

Test Date: 30-10-2017

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PHYSICS

1. (A)

Distance travelled by ball in 'T' seconds; $h = \frac{1}{2} g T^2$

$\therefore$ Distance travelled by ball in $\frac{'T'}{3}$ seconds, $h' = \frac{1}{2} g \left(\frac{T}{3}\right)^2$

$= \frac{1}{9} \cdot \frac{1}{2} g T^2$

$= \frac{h}{9}$

hence, $h' = \frac{h}{9}$

$\therefore$ Position of ball from ground = $h - \frac{h}{9} = \frac{8h}{9}$ m.

2. (C)

Total distance travelled = (850 + 150) m = 1000 m

$\therefore$ $\text{time} = \frac{\text{distance}}{\text{speed}} = \frac{1000}{45 \times \frac{5}{18}} = \frac{1000 \times 18}{5 \times 45} = 80 \text{ sec}$

3. (C)

$v_{avg} = \frac{2v_1v_2}{v_1 + v_2}$

$\Rightarrow \quad 48 = \frac{2 \times 40 \times v}{40 + v}$

$\Rightarrow \quad 480 + 12v = 20v$

$\Rightarrow \quad 8v = 480$

$\Rightarrow \quad v = 60$ kmph.

4. (B)

Time of flight, $t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 19.6}{9.8}} = 2 \text{ second}$

5. (D)

acceleration, $a = \frac{v^2 - u^2}{2s} = \frac{0 - 120 \times 120}{2 \times 12 \times 10^{-2}}$

$\Rightarrow a = -600 \times 10^2 \text{ m/s}^2$

$\therefore$ Force exerted by wooden block = m a

$\Rightarrow$ F = 30 x 10^{-3} x 600 x 10^{2} N

= 1800 N.

6. (D)

Area under force time graph = impuse = change in momentum

$\Rightarrow$ Area = $\frac{1}{2}\times 10\times 2+10\times 2+\frac{1}{2}\times(10+20)\times 2+\frac{1}{2}\times 20\times 4$

= 10 + 20 + 30 + 40 = 100

Therefore, mv – mu = 100

or mv = 100

or $v=\frac{100}{2}=50\ m/s.$

7. (C)

Velocity of recoil, $v_r=\frac{-mv}{M}$

or $v_r=\frac{-20\times 10^{-3}\times 50}{1}=-1\ m/s$

8. (B)

acceleration, $a=\frac{F_{net}}{m}=\frac{6}{10}=0.5\ m/s.$

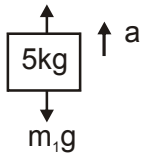
FBD of 5kg block :

$R = m_2 \times a$

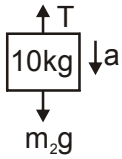
$\Rightarrow R = 5\times 0.5 = 2.5N$

9. (C)

FBD of 5 kg block :



FBD of 10 kg block :



$T - m_1 g = 5a$ – (i)

$m_2 g - T = 10a$ – (ii)

from (i) + (ii), we get

$(m_2 - m_1) g = (m_1 + m_2) a$

or $a = \dfrac{(10-5)g}{15} = \dfrac{g}{3}$

10. (C)

$\omega = 2 \text{ rev / s} = 2 \text{x} 2\pi \text{ rad / s.} = 4\pi \text{ rad / s}$

$\therefore\ a_c = \omega^2 r = (4\pi)^2 \times 0.25 \text{ m / s}^2$

$= 16\pi^2 \times 0.25 = 4\pi^2 \text{ m / s}^2$

11. (D)

$W_h = \dfrac{W}{16}$

$\Rightarrow \dfrac{W_h}{W} = \dfrac{1}{16}$

$\Rightarrow \dfrac{mg_h}{mg} = \dfrac{1}{16}$

$\Rightarrow \dfrac{g_h}{g} = \dfrac{1}{16}$

$\Rightarrow \left(\dfrac{R}{R+h}\right)^2 = \dfrac{1}{16}$

$\Rightarrow \dfrac{R}{R+h} = \dfrac{1}{4}$

$\Rightarrow 4R = R + h$

$\Rightarrow$ 3 R = h $\Rightarrow$ h= 3 R.

12. (C)

Conceptual

13. (C)

$T^2 \propto R^3$

$\Rightarrow \dfrac{T_1}{T_2} = \left(\dfrac{R_1}{R_2}\right)^{3/2}$

$\Rightarrow \dfrac{T}{T_2} = \left(\dfrac{R}{4R}\right)^{3/2}$

$\Rightarrow \dfrac{T}{T_2} = \dfrac{1}{8}$

T_2 = 8T

14. (B)

Conceputual

15. (D)

$P = P_0 + \rho gh = 1.013 \times 10^5 + 1000 \times 9.8 \times 20$

$= 2.97 \times 10^5$ Pa $\simeq$ 3 atm

16. (B)

$$\text{R.D. of liquid} = \frac{W_1 - W_2}{W_1 - W_3}$$

$$\Rightarrow \quad 1.5 = \frac{50 - W_2}{50 - 40}$$

$$\Rightarrow \quad 1.5 = 50 - W_2$$

$$\Rightarrow \quad W_2 = 35g$$

17. (C)

For floation, W = B

$\Rightarrow$ $\rho vg = \sigma\ v_{in}\ g$

$\Rightarrow$ 900 x V = 1000 x V_{in}

$$\Rightarrow \quad V_{in} = \frac{3V}{10}$$

$$\Rightarrow \quad V_{out} = \frac{V}{10}$$

$$\text{\% of ice cube outside water} = \frac{\frac{V}{10}}{V} \times 100\% = 10\%$$

18. (C)

$F_{max} = F_1 + F_2$

$= (12 + 8)$ N = 20 N.

19. (A)

$$a = \frac{v^2 - u^2}{2s} = \frac{0 - 10 \times 10}{2 \times 20 \times 10^{-2}} = \frac{-100 \times 10^2}{40}$$

$$= \frac{-100 \times 100}{40} = -250 \text{ m/s}^2$$

$\therefore$ retardation = 250 m/s^2

20. (B)

Area under a - t graph = change in velocity

$$\Rightarrow v - u = \frac{1}{2} \times 10 \times 11 = 55$$

$$\Rightarrow v = 55 \text{ m/s.}$$

CHEMISTRY

21. (D)

Number of moles of oxygen = $\frac{80}{16}$

Number of atoms of oxygen = $\frac{80}{16} \times N_0 \times 2$

$= 5 \times N_0 \times 2$

Number of moles in 5 g of hydrogen = $\frac{5}{1}$

Number of atoms in 5 g of hydrogen = $5 \times N_0 \times 2$

Hence, the number of atoms in 80 g of oxygen is equal to the number of atoms in 5 g of hydrogen.

22. (B)

Mole of sucrose = $\frac{\text{mass of sucrose (in gram)}}{\text{molecular weight of sucrose}}$

$= \frac{25.6}{342.3} = 0.0747882$

Formula of sucrose = $C_{12}H_{22}O_{11}$

Number of H atoms in 1 mole of sucrose = $22 \times 6.023 \times 10^{23}$

Number of H atoms in 0.0747882 mole of sucrose

$= 22 \times 6.023 \times 10^{23} \times 0.074788$

$= 9.9 \times 10^{23}$

23. (A)

In 15 L of H_2 gas at STP, the number of molecules

$= \frac{6.023 \times 10^{23}}{22.4} \times 15$

$= 4.033 \times 10^{23}$

In 5 L of N_2 gas at STP, the number of molecules

$= \frac{6.023 \times 10^{23} \times 5}{22.4} = 1.344 \times 10^{23}$

In 0.5 g of H_2 gas, the number of molecules

$= \frac{6.023 \times 10^{23} \times 0.5}{2}$

$= 1.882 \times 10^{23}$

Hence, maximum molecules are present in 15 L of H_2 at STP.

24. (D)

Number of oxygen atom in 2 g of CO

$= \frac{2}{28} \times 6.022 \times 10^{23} \times 1$

Number of oxygen atom in 2 g of CO_2

$$= \frac{2}{44} \times 6.022 \times 10^{23} \times 2$$

Number of oxygen atom in 2 g of SO_2

$$= \frac{2}{64} \times 6.022 \times 10^{23} \times 2$$

Number of oxygen atom in 2 g of H_2O

$$= \frac{2}{18} \times 6.022 \times 10^{23} \times 1$$

Hence, 2 g of H_2O has maximum number of atoms of oxygen.

25. (A)

Number of atoms in 24 g of C = $\frac{24}{22} \times 6.02 \times 10^{23}$

$$= 2 \times 6.02 \times 10^{23}$$

Number of atoms in 56 g of Fe = $\frac{56}{56} \times 6.02 \times 10^{23}$

Number of atoms in 26 g of Al = $\frac{26}{27} \times 6.02 \times 10^{23}$

$$\approx 6.02 \times 10^{23}$$

Number of atoms in 108 g of Ag = $\frac{108}{108} \times 6.02 \times 10^{23}$

$$= 6.02 \times 10^{23}$$

26. (A)

(a) 0.1 mole of CO_2

(b) $\frac{11.2}{22.4} = 0.5$ mole of CO_2

(c) $\frac{22}{44} = 0.5$ mole of CO_2

(c) $\frac{22.4 \times 10^3}{22400} = 1$ mole of CO_2

Equal number of moles have equal number of molecules. Hence, the smallest number of molecules of CO_2 is in 0.1 mole of CO_2.

27. (B)

4.6×10^{22} atoms weigh = 13.8 g

Hence, 6.02×10^{23} atoms will weigh

$$= \frac{13.8 \times 6.02 \times 10^{23}}{4.6 \times 10^{22}} = 180.6\,\text{g (molar mass)}$$

28. **(C)**

$\because$ Mass of 22400 cm^3 of CH_4 at STP = 16g

$\therefore$ Mass of 1 cm^3 of CH_4 at STP = $\frac{16}{22400}$ g

$\therefore$ Mass of 112 cm3 of CH4 at STP = $\frac{16}{22400} \times 112$

= 0.08 g

29. **(C)**

Mass of 1 mole of methane (CH_4) = 16 g

Mass of 0.1 mole of methane = 16 x 0.1g = 1.6g

30. **(A)**

We know that protons in 1 mole $CaCO_3$

= atomic number of calcium + atomic number of carbon
+ 3 (atomic number of oxygen)
= 20 + 6 + 3 (8) = 50 mol

$\therefore$ Proton in 10g $CaCO_3$ = $\frac{10 \times 50}{100} \times 6.02 \times 10^{23}$

= 3.01 x 10^{24}

31. **(D)**

Mol. wt. of C_2H_5OH = 12 x 2 + 1 x 5 + 16 + 1 = 46 g

$\because$ 46 g of C_2H_5OH has hydrogen atoms
= 6 x Avogadro number

$\therefore$ 0.046 g of C_2H_5OH has hydrogen atoms

$$= \frac{6 \times 6.023 \times 10^{23} \times 0.046}{46}$$

= 3.6 x 10^{21} atoms of hydrogen.

32. **(A)**

Weight of empirical formula

CH_2 = 12 + (1 x 2)
= 12 + 2
= 14

Mass of one mole of the compound = its molecular weight
= 42

$$n = \frac{\text{mol. wt.}}{\text{empirical formula wt.}} = \frac{42}{14} = 3$$

$\therefore$ Mol. formula = (empirical formula) x n
= (CH_2) x 3 = C_3H_6

33. (A)

no. of moles of CO_2= $\frac{4.4}{44} = 0 - 1$

no. of molecules of CO_2 = 0.1 N_A

no. of atoms of oxygen in CO_2 = 2 x 0.1 N_A

= 0.2 N_A

= 1.2 x 10^{23}

34. (A)

% wt of Zn in $ZnSO_4.7H_2O$ = $\frac{65}{287} \times 100$

= 22.65 %

35. (D)

no. of moles of unknown gas = $\frac{2.24}{22.4} = 0.1$

$$\frac{\text{mass}}{\text{molar mass}} = 0.1$$

$$\text{Molar mass} = \frac{\text{mass}}{0.1}$$

$$= \frac{4.4}{0.1}$$

molar mass = 44 gms

$\therefore$ gas may be CO_2.

36. (A)

$$\text{moles of } CO_2 = \frac{0.44}{44} = 0.01$$

$$\frac{\text{Volume}}{\text{molar volume}} = 0.01$$

volume of CO_2 = 0.01 x

37. (B)

1 AMU = $\frac{1}{12} \times$ mass of 1 atom of 12^C

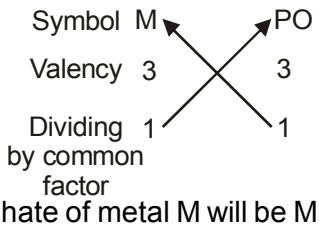
$$= \frac{1}{12} \times \frac{12}{N_A}$$

$$= \frac{1}{N_A} \text{gm}$$

$$= \frac{1}{6.022 \times 10^{23}} \text{gm}$$

38. (A)

Valency of M is 3 +



$\therefore$ The formula of phosphate of metal M will be MPO_4

39. (C)

Molecular mass of CO_2 = 12 + 2 + 16 = 44 u
Molar mass of CO_2 = 44 g

No. of CO_2 molecules = $\frac{6.6}{44} \times 6.022 \times 10^{23}$ = 0.9033 x 10^{23}

Molecular mass of SO_2 = 32 + 2 x 16 = 64 u
Molar mass of SO_2 = 64 g

No. of SO_2 molecule = $\frac{3.2}{64} \times 6.022 \times 10^{23}$ = 0.3011 x 10^{23}

Ratio of molecules present in CO_2 and SO_2= $\frac{0.9033 \times 10^{23}}{0.3011 \times 10^{23}} = 3$

40. (C)

Molecular mass of water (H_2O)
= 2 x 1 + 16 = 18 u
Molecular mass of water (H_2O) = 18 g
Now, 1 mole of water contains = 6.022 x 10^{23} molecules
Mass of one mole of water = 18g
Mass of 6.022 x 10^{23} molecules of water = 18 g

Mass of 1 molecule of water = $\frac{18}{6.022 \times 10^{23}}$ = 2.99 x 10^{-23} g $\approx$ 3 x 10^{-23} g

MATHEMATICS

41. (A)

$\frac{1}{2} + \frac{1}{5}$ unique solution.

42. (B)

$\frac{1}{2} = \frac{1}{2} = \frac{6}{12}$ infinitely many solution.

43. (B)

$3x + y = 1$

$(2k-1)x+(k-1)y=2k+1$

$\frac{3}{2k-1}=\frac{1}{k-1} \Rightarrow 3k-3=2k-1$

$\Rightarrow \boxed{k=2}$

44. (B)

$5x+2 \le 12$

$5x \le 10$

$x \le 2$

$\{-4,-3,-2,-1, 0, 1, 2\}$

45. (A)

$\frac{1}{2}(3x-2y)-30=\frac{1}{4}(2x-y)$

and $\frac{1}{2}(5x-4y)-3=\frac{1}{3}(4x-3y)$

By option

46. (D)

$A=\{2, 3, 4\}\ B=\{0, 1, 2, 3\}$

$A \cup B=\{0, 1, 2, 3, 4\}$

$0 \le x \le 4$

47. (A)

$A=\{2,\ 3,\ 4\}\quad A \cap B=\{3, 4\}$

$B=\{3,\ 4, 5\}$

48. (D)

Let the ratio is

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

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

$2x - 4 = 3y - 24$

$\Rightarrow 2x - 3y = -20$

$2x\frac{2y}{3} - 3y = -20$

$\frac{4y - 9y}{3} = -20$

y = 12

x = 8

49. (B)

2x + y + 1 + ax – ay + a=0

x (a + 2) + y(1 – a) + 1 +a = 0

$y = \frac{-(a+2)x}{(1-a)} - \frac{1-a}{(1-a)}$

line is parallel to y-axis

l– a = 0

$\boxed{a = 1}$

50. (D)

2x+ y + 1 + kx – ky+ k = 0

x (k + 2) + y(1 – k) +1 + k = 0

y (1 – k) = – (k + 2) x – 1 – k

$y = \frac{(k+2)}{(1-k)} x \frac{-(1+k)}{(1-k)}$

3x + y + 2 = 0

slope = – 3

$\frac{-(k+2)}{(1-k)} x - 3 = -1$

3k + 6 = – 1 + k

2k = – 7

$k = -\frac{7}{2}$

51. (A)

$\frac{x}{\frac{-5}{2}} + \frac{y}{\frac{4}{3}} = 1$

$\Rightarrow \quad \frac{2x}{5} + \frac{3y}{4} = 1$

$\Rightarrow \quad \frac{-8x + 154}{20} = 1$

$\Rightarrow \quad -8x+15y-20=0$

$\boxed{8x-15y+20=0}$

52. (C)

$PQ=\sqrt{x^2+y^2}$

53. (C)

$A\overset{x_1\ y_2}{(1,2)}\ \ B\overset{x_2\ y_2}{(0,0)}\ \ C\overset{x_3\ y_3}{(a,b)}$

$0=\{1(0-\theta)+0(b-2)+a\ (2-\theta)\}$

$0=-b+2a$

$\boxed{b=2a}$

54. (A)

$S=\dfrac{56+28}{2}=\dfrac{84}{2}=42$

$A=\sqrt{42(12)(16)(14)}$

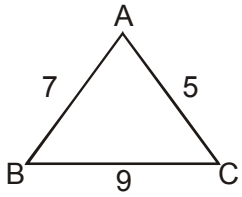
$\Rightarrow \sqrt{7\times 6\times 6\times 2\times 4\times 4\times 7\times 2}$

$\Rightarrow 6\times 7\times 2\times 4=42\times 8=336\ cm^2$

$336=\dfrac{1}{2}\times A\ C\times alti$

$\dfrac{336\times 2}{28}=alti=24\ cm$

55. (A)



$Area=\sqrt{\dfrac{21}{2}\left(\dfrac{21}{2}-5\right)\left(\dfrac{x}{2}-9\right)\left(\dfrac{x}{2}-7\right)}$

$=\sqrt{\dfrac{21}{2}\times\dfrac{11}{2}\times\dfrac{3}{2}\times\dfrac{7}{2}}$

$=\dfrac{1}{4}\sqrt{7\times 3\times 3\times 11\times 7}$

$=\dfrac{21}{4}\sqrt{11}\ cm^2$

56. (C)

$5 = 25x + 17x + 12x = 540$

$54x = 540$

$\boxed{x = 10}$

$A = \sqrt{540 \times (540-250)(540-170)(540-120)}$

A = 9000 cm^2

$\text{alti} = \frac{9000 \times 2}{250} = 72$ cm

57. (A)

$\sqrt{(12)^2 + (16)^2} = \sqrt{144 + 256} = \sqrt{400} = 20$ cm

Area of PQS = $\frac{1}{2} \times 16 \times 12 = 96$ cm^2

Semi perimeter of PQR = $\frac{20 + 52 + 48}{2} = \frac{120}{2}$

= 60 cm

$\text{Area} = \sqrt{60 \times 40 \times 8 \times 12} = \sqrt{12 \times 5 \times 8 \times 5 \times 12} = 5 \times 12 \times 8 \times 8$

Area of shaded portion = 480 – 96 = 384 cm^2

58. (A)

$\frac{1}{2} \times \text{Base} \times \text{height} = \text{Area of right angle}$

$\Rightarrow \frac{1}{2} \times 9 \times \text{height} = 36$

$\text{height} = \frac{36 \times 2}{9} = 8$ cm

59. (B)

Height of equilateral Δ = $\frac{\sqrt{3}}{2}$ a

$\frac{2h}{\sqrt{3}} = a$

Area = $\frac{\sqrt{3}}{4} a^2 = \frac{\sqrt{3}}{4} \times \left(\frac{2h}{\sqrt{3}}\right)^2$

$$= \frac{\sqrt{3}}{4} \times \frac{2 \times 9}{\sqrt{3}} \times \frac{2 \times 9}{\sqrt{3}}$$

$$= \frac{81}{\sqrt{3}} = 46.76 \text{ cm}^2$$

60. (A)

$S = 15$

Area of Δ ABD

$$= \sqrt{15 \times 7 \times 6 \times 2}$$

$$= \sqrt{3 \times 5 \times 7 \times 3 \times 2 \times 2} = 2 \times 3\sqrt{35} = 6\sqrt{35} = 35.496 \text{ m}^2$$

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

$$\text{Area of } \square \text{ABCD} = 30 + 35.49$$

$$= 65.49 \text{ m}^2$$

$$\simeq 65.50 \text{ m}^2$$

BIOLOGY

61. (D)

62. (A)

63. (B)

64. (C)

65. (C)

66. (C)

Euglenoids shows autotrophic mode of nutrition in the presence of sun-light where as heterotrophic mode of nutrition in the absence of sun-light.

67. (B)

68. (D)

69. (C)

70. (A)

71. (B)

72. (B)

73 (B)

Bryophytes are found in soil but they need water for sexual reproduction and therefore they are known as “Amphibians of plant kigdom”.

74. (A)

75. (C)

Yeast is unicellular in nature.

76. (D)

AIDS is a viral disease

77. (B)

Naked seeds are the characteristic of gymnospherms.

78. (C)

79. (A)

80. (A)

MENTAL ABILITY

81. (B)	**82. (B)**	**83. (C)**	**84. (D)**
85. (D)	**86. (C)**	**87. (B)**	**88. (B)**
89. (B)	**90. (C)**	**91. (D)**	**92. (C)**
93. (C)	**94. (C)**	**95. (A)**	**96. (D)**
97. (D)	**98. (B)**	**99. (C)**	**100. (A)**