

SOLUTIONS

PROGRESS TEST-6

PT-6-GSI-2101 & GSKI-2101

CBSE PATTERN

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PHYSICS

1. (A)

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

$$\begin{aligned} \therefore \text{Distance travelled by ball in } \frac{T}{3} \text{ seconds, } h' &= \frac{1}{2} g \left(\frac{T}{3}\right)^2 \\ &= \frac{1}{9} \cdot \frac{1}{2} g T^2 \\ &= \frac{h}{9} \end{aligned}$$

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)

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

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

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

$$\Rightarrow 8v = 480$$

$$\Rightarrow v = 60 \text{ kmph.}$$

4. (B)

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

5. (D)

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

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

$$\begin{aligned} \therefore \text{Force exerted by wooden block} &= m a \\ \Rightarrow F &= 30 \times 10^{-3} \times 600 \times 10^2 \text{ N} \\ &= 1800 \text{ N.} \end{aligned}$$

6. (D)

Area under force time graph = impulse = change in momentum

$$\begin{aligned} \Rightarrow \text{Area} &= \frac{1}{2} \times 10 \times 2 + 10 \times 2 + \frac{1}{2} \times (10 + 20) \times 2 + \frac{1}{2} \times 20 \times 4 \\ &= 10 + 20 + 30 + 40 = 100 \end{aligned}$$

Therefore, $mv - mu = 100$

$$\text{or } mv = 100$$

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

7. (C)

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

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

8. (B)

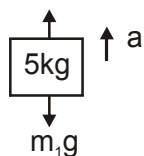
$$\text{acceleration, } a = \frac{F_{\text{net}}}{m} = \frac{6}{10} = 0.5 \text{ m/s.}$$

FBD of 5kg block :

$$R = m_2 \times a$$

$$\Rightarrow R = 5 \times 0.5 = 2.5 \text{ N}$$

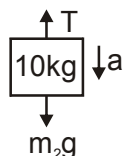
9. (C)

FBD of 5 kg block :

$$T - m_1 g = 5 a \text{ - (i)}$$

from (i) + (ii), we get

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

FBD of 10 kg block :

$$m_2 g - T = 10 a \text{ - (ii)}$$

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

10. (C)

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

$$\begin{aligned} \therefore a_c &= \omega^2 r = (4\pi)^2 \times 0.25 \text{ m / s}^2 \\ &= 16\pi^2 \times 0.25 = 4\pi^2 \text{ m / s}^2 \end{aligned}$$

11. (D)

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

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

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

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

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

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

$$\Rightarrow 4R = R+h$$

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

12. (C)

Conceptual

13. (C)

$$T^2 \propto R^3$$

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

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

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

$$T_2 = 8T$$

14. (B)

Conceptual

15. (D)

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

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

16. (B)

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

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

$$\Rightarrow 1.5 = 50 - W_2$$

$$\Rightarrow W_2 = 35\text{g}$$

17. (C)

For floation, $W = B$

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

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

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

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

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

18. (C)

$$F_{\max} = F_1 + F_2$$

$$= (12 + 8) \text{ N} = 20 \text{ N.}$$

19. (A)

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

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

$$\therefore \text{retardation} = 250 \text{ m/s}^2$$

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)

Atomic mass of C = 12

Atomic mass of O = 16

C : O mass ratio in CO = 12 : 16

C : O mass ratio in CO₂ = 12 : 32

22. (D)

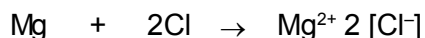
No. of protons in 20 carbon = 6 x 20 = 120

No. of protons in 30 hydrogen = 30 x 1 = 30

No. of protons in 1 oxygen = 8

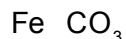
∴ Total no. of protons in one molecule of retinol
= 120 + 30 + 8 = 158

23. (A)



2, 8, 2 2, 7 2, 8, 2, 8

24. (D)



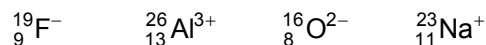
Charge 2+ 2-

Dividing by 1+ 1-

common factor

Formula = FeCO₃

25. (C)



No. of neutrons

10 13 8 12

No. of electrons

10 10 10 10

O²⁻ has more electrons than neutrons.

26. (A)

A will lose one electron so as to acquire the noble gas configuration.

27. (D)

$\frac{e}{m}$ for

(i) neutron = $\frac{0}{1} = 0$

(ii) α particle = $\frac{2}{4} = 0.5$

(iii) proton = $\frac{1}{1} = 1$

(iv) electron = $\frac{1}{1/1837} = 1837$

28. (C)

2 electrons in the valence shell of calcium ${}_{20}\text{Ca} = (2, 8, 8, 2)$

29. (C)

In the nth electronic level,

no. of electron = 2n²

30. (B)
Proton has a mass of 1 AMU and charge of + 1.
31. (C)
The number of hydrogen atoms which combine with one atom of an element is called its valency
32. (C)
While performing cathode ray experiment
At normal condition, under 1 atm pressure (760 mm) Air remains poor conductor of heat & electricity.
33. (D)
On the basis of scattering experiment, Rutherford put forward a model of atom known as 'Rutherford's nuclear model'.
34. (B)
Isobars have same mass number but different atomic numbers.
35. (C)
Electronic configuration of $\text{Ca}^{2+} = 2, 8, 8$ Electronic configuration of Ar = 2, 8, 8
36. (D)
We know that, Rutherford conducted the experiment with α -rays, whose composition is equal to ${}^4_2\text{He}$
 \Rightarrow Helium nucleus
37. (C)
No. of neutrons in C = $12 - 6 = 6$
No. of neutrons in Si = $28 - 14 = 14$

Therefore the ratio of no. of neutrons in C and Si = $\frac{6}{14} = 3 : 7$
38. (A)
In Na^+ , number of electrons are 10.
In Ne, number of electrons = 10
So Na^+ and Ne have same number of electrons,
so they are isoelectronic with one another.
39. (A)
The main drawback of Rutherford's model of the atom is that it does not explain the stability of atom.
40. (B)
Negatively charged particles.

MATHEMATICS

41. (A)

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

42. (B)

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

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)

$$5x + 2 \leq 12$$

$$5x \leq 10$$

$$x \leq 2$$

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

45. (A)

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

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

By option

46. (D)

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

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

$$0 \leq x \leq 4$$

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

$$1 - a = 0$$

$$\boxed{a = 1}$$

50. (D)

$$2x + y + 1 + kx - ky + k = 0$$

$$x(k + 2) + y(1 - k) + 1 + k = 0$$

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

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

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

$$\text{slope} = -3$$

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

$$3k + 6 = -1 + k$$

$$2k = -7$$

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

51. (A)

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

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

$$\Rightarrow \frac{-8x + 15y}{20} = 1$$

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

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

52. (C)

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

53. (C)

$$A(x_1, y_1) \quad B(x_2, y_2) \quad C(x_3, y_3)$$

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

$$0 = -b + 2a$$

$$\boxed{b = 2a}$$

54. (A)

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

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

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

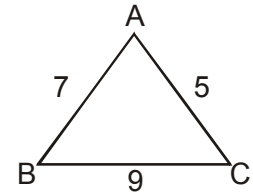
$$\Rightarrow 6 \times 7 \times 2 \times 4 = 42 \times 8 = 336 \text{ cm}^2$$

$$336 = \frac{1}{2} \times A \times \text{alti}$$

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

55. (A)

$$\begin{aligned} \text{Area} &= \sqrt{\frac{21}{2} \left(\frac{21}{2} - 5 \right) \left(\frac{x}{2} - 9 \right) \left(\frac{x}{2} - 7 \right)} \\ &= \sqrt{\frac{21}{2} \times \frac{11}{2} \times \frac{3}{2} \times \frac{7}{2}} \\ &= \frac{1}{4} \sqrt{7 \times 3 \times 3 \times 11 \times 7} \\ &= \frac{21}{4} \sqrt{11} \text{ cm}^2 \end{aligned}$$



56. (C)

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

$$54x = 540$$

$$\boxed{x = 10}$$

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

$$A = 9000 \text{ cm}^2$$

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

57. (A)

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

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

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

$$= 60 \text{ cm}$$

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

$$\text{Area of shaded portion} = 480 - 96 = 384 \text{ cm}^2$$

58. (A)

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

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

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

59. (B)

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

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

$$\begin{aligned} \text{Area} &= \frac{\sqrt{3}}{4} a^2 = \frac{\sqrt{3}}{4} \times \left(\frac{2h}{\sqrt{3}}\right)^2 \\ &= \frac{\sqrt{3}}{4} \times \frac{2 \times 9}{\sqrt{3}} \times \frac{2 \times 9}{\sqrt{3}} \\ &= \frac{81}{\sqrt{3}} = 46.76 \text{ cm}^2 \end{aligned}$$

60. (A)

$$S = 15$$

Area of ΔABD

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

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

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

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

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

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

BIOLOGY

61. (B)

62. (B)

63. (D)

64. (B)

65. (A)

Skin is covered by compound epithelium.

66. (D)

Pollen grains lands on the surface of stigma of flower following which next event called fertilisation takes place.

67. (B)

68. (C)

69. (D)

70. (D)

71. (C)

72. (D)

73. (C)

74. (B)

Diaphragm contracts during inhalation and becomes flat shaped thus increases the volume of thoracic cavity.

75. (B)

76. (B)

77. (C)

78. (B)

79. (A)

80. (B)

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)