ISO 9001: 2015 Certified

CAREER INSTITUTE PVT.LTD.

NEET FRESH 2023-24

Mark 720	Group PCB	PCB EXAM - 58	Date : 21/12/2023 Time : 3:20 Hours

Answer Key Version - R (NEET FRESH All Batches)

Physics

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Biology

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PHYSICS

SECTION - A (35 Questions)

01. **(3)** Impulse = Force × time = (kg-m/s²) × s
= kg-m/s

02. **(4)** $R = 4H\cot\theta$ if $\theta = 45°$
then $R = 4H\cot(45°) = 4H$.

03. **(2)** Angular momentum = mvr
$= [MLT^{-1}][L]$
$= [ML^2T^{-1}]$.

04. **(1)** $\frac{dt}{dx} = 2\alpha x + \beta \Rightarrow v = \frac{1}{2\alpha x + \beta}$

$a = v\frac{dv}{dx} = \frac{-v.2\alpha}{(2\alpha x+\beta)^2} = -2\alpha.v.v^2 = -2\alpha v^3$

$\therefore$ Retardation = $2\alpha v^3$.

05. **(4)** $\frac{1}{2}CV^2$ = Stored energy in a capacitor
$= [M\ L^2\ T^{-2}]$.

06. **(4)** $\vec{A}\times\vec{B} = AB\sin\theta\hat{n}$

$\hat{n}$ is a unit vector indicating the direction of $\vec{A}\times\vec{B}$. Vector product or cross product is anticommutative i.e., $\vec{A}\times\vec{B} = -\vec{B}\times\vec{A}$.

07. **(1)** This graph shows uniform motion because line having a constant slope.

08. **(2)** If a quantity depends upon more than three factors, each having dimensions, then the method of dimensional analysis cannot be applied. It is because applying the principle of homogeneity will give only three equations.

09. **(1)** $S_n = u + \frac{a}{2}[2n-1]$

$S_{5th} = 7 + \frac{4}{2}[2\times5-1]$

$= 7 + 18$

$= 25m$.

10. **(4)** [Planck constant] = $[ML^2T^{-1}]$ and [Energy] = $[ML^2T^{-2}]$.

11. **(4)** The two vectors which are perpendicular to each other will have their dot product equal to zero.

12. **(3)** $F = -\eta.A\frac{dv}{dx} \Rightarrow [\eta] = [M^1L^{-1}T^{-1}]$.

13. **(1)** The distance covered by the ball during the last t seconds of its upward motion = Distance covered by it in first t seconds of its downward motion.

From $h = ut + \frac{1}{2}gt^2$

$h = \frac{1}{2}gt^2$ [As $u = 0$ for it downward motion]

14. **(1)** Couple of force = $|\vec{r}\times\vec{F}| = [ML^2T^{-2}]$

Work = $[\vec{F}.\vec{d}] = [ML^2T^{-2}]$.

15. **(3)** $\vec{A}.\vec{B} = AB\cos\theta$

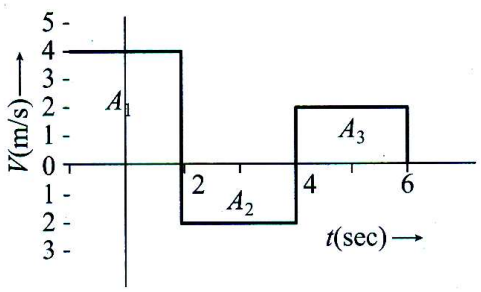
In the problem $\vec{A}.\vec{B} = -AB$ i.e. $\cos\theta = -1$

$\therefore \theta = 180^0$

i.e. $\vec{A}$ and $\vec{B}$ acts in the opposite direction.

16. **(1)** Quantities having different dimensions can only be divided or multiplied but they cannot be added or subtracted.

17. **(1)** Displacement = Summation of all the area with sign
$= (A_1) + (-A_2) + (A_3) = (2\times4) + (-2\times2) + (2\times2)$



$\therefore$ Displacement = 8m

Distance = Summation of all the areas without sign
$= |A_1| + |-A_2| + |A_3| = |8| + |-4| + |2| + |4| = 8 + 4 + 4$

$\therefore$ Displacement = 16m.

18. **(4)** The formula can be written as

$\frac{\text{Velocity of light in vacuum}}{\text{Velocity of light in medium}} = 1$

This formula is dimensionally correct as both the sides are dimensionless. Numerically, this ratio is equal to refractive index which is greater than 1. Hence, the equation is numerically incorrect.

19. **(2)** $\sqrt{(0.4)^2 + (0.8)^2 + c^2} = 1$

$\Rightarrow 0.16 + 0.64 + c^2 = 1 \Rightarrow c = \sqrt{0.2}$

20. **(4)** Up to time t_1 slope of the graph is constant and after t_1 slope is zero i.e. the body travel with constant speed up to time 1 and then stops.

21. **(3)** $\rho = \frac{M}{L^3}$

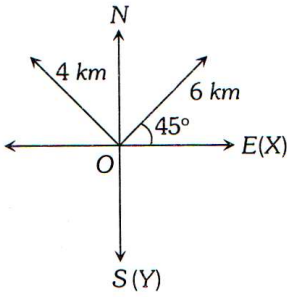
$n_1u_1 = n_2u_2$

$\therefore 128[M_1L_1^{-3}] = n_2[M_2L_2^{-3}]$

$$\therefore n_1 = 128 \times \left[\frac{M_1}{M_2}\right]\left[\frac{L_2}{L_1}\right]^3$$

$$= 128 \times \left[\frac{1000}{50}\right] \times \left[\frac{25}{100}\right]^3 = 128 \times 20 \times \frac{1}{64} = 40$$

22. **(3)**



Net movement along x-direction $S_x = (6-4)\cos 45°\,\hat{i}$

$$= 2 \times \frac{1}{\sqrt{2}} = \sqrt{2} \text{ km}$$

Net movement along y-direction $S_y = (6+4)\sin 45°\,\hat{j}$

$$= 10 \times \frac{1}{\sqrt{2}} = 5\sqrt{2}\text{km}$$

Net movement from starting point

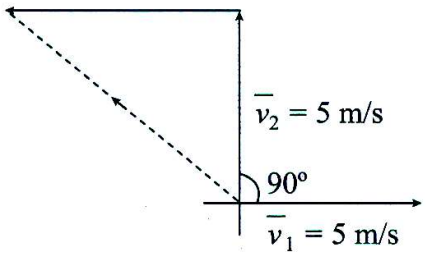
$$|\vec{S}| = \sqrt{S_x^2 + S_y^2} = \sqrt{(\sqrt{2})^2 + (5\sqrt{2})^2} = \sqrt{52} \text{ km}$$

Angle which makes with the east direction

$$\tan\theta = \frac{Y-component}{X-component} = \frac{5\sqrt{2}}{\sqrt{2}} \therefore \theta = \tan^{-1}(5)$$

23. **(3)**

24. **(2)**



$$\Delta\vec{v} = \vec{v}_2 - \vec{v}_1 = \sqrt{v_1^2 - v_2^2 - 2v_1v_2\cos 90°}$$

$$= \sqrt{5^2 + 5^2} = 5\sqrt{2}$$

Average acceleration $= \frac{\Delta\vec{v}}{\Delta t} = \frac{5\sqrt{2}}{10}$

$$= \frac{1}{\sqrt{2}} \text{m/s}^2$$

Directed toward north-west (As clear from the figure).

25. **(1)**

26. **(4)** Watt = joule / second = ampere × volt
= (ampere)^2 × ohm.

27. **(3)** $R = 4H\cot\theta$

When $R = H$ then $\cot\theta = 1/4 \Rightarrow \theta = \tan^{-1}(4)$.

28. **(2)** $\vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4 = 0\hat{i} + 4\hat{j} + 2\hat{k} \Rightarrow$ yz-plane.

29. **(3)** When a particle returns to its starting point, its displacement is zero.

30. **(1)** Quantities of similar dimensions can be added or subtracted so unit of a will be same as that of velocity.

31. **(3)** $\vec{v}_w = 20\hat{i}, \vec{v}_c = 20\hat{i}$

Here we have to look for velocity of wind w.r.t. car.

So, $\vec{v}_{w/c} = \vec{v}_w - \vec{v}_c = 20\hat{i} - 20\hat{j}$.

32. **(2)** 1 dyne = 10^{-5} newton, 1 cm = 10^{-2} m

$$70\frac{dyne}{cm} = \frac{70\times10^{-5}}{10^{-2}}\frac{N}{m} = 7\times10^{-2}\,N/m.$$

33. **(1)** Direction of velocity is always tangent to the path so at the top of trajectory it is in horizontal direction and acceleration due to gravity is always in vertically downward direction. It means angle between $\vec{v}$ and $\vec{g}$ are perpendicular to each other.

34. **(4)** Modulus of rigidity $= \frac{\text{Shear stress}}{\text{Shear strain}}$
$= M L^{-1} T^{-2}$.

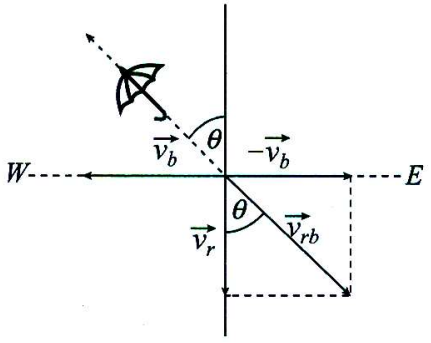
35. **(3)** Displacement vector $\vec{r} = \Delta x\hat{i} + \Delta y\hat{j} + \Delta z\hat{k}$

$$= (3-2)\hat{i} + (4-3)\hat{j} + (5-5)\hat{k} = \hat{i} + \hat{j}.$$

Section - B (Attempt Any 10 Questions)

36. **(2)**

In figure $\vec{v}_r$ represents the velocity of rain and $\vec{v}_b$, the velocity of the bicycle, the woman is riding. To protect herself from rain, the woman should hold her umbrella in the direction of relative velocity of rain with respect to the bicycle $\vec{v}_{rb}$.



From figure,

$$\tan\theta = \frac{v_b}{v_r} = \frac{12}{30} = \frac{2}{5} \Rightarrow \theta = \tan^{-1}\left(\frac{2}{5}\right)$$

Therefore, the woman should hold her umbrella at an angle of $\tan^{-1}\left(\frac{2}{5}\right)$ with the vertical towards the west.

37. **(2)**

$U = \frac{q^2}{2C}$, unit of C : coul^2 (joule)$^{-1}$

$F = Bil$, unit of B : newton (amp)$^{-1}$ (m)$^{-1}$

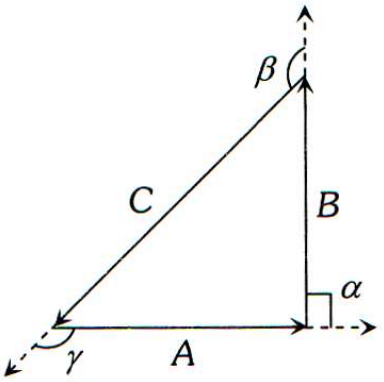
$e = \frac{-Ldi}{dt}$, unit of L : volt sec (amp)$^{-1}$

$V = iR$, unit of R : volt (amp)$^{-1}$.

38. **(1)**

When the body is projected vertically upward than at the highest point its velocity is zero but acceleration is not equal to zero.

39. **(4)**



From polygon law, three vectors having summation zero should form a closed polygon (Triangle). Since the two vectors are having same magnitude and the third vector is $\sqrt{2}$ times that of either of two having equal magnitude i.e. the triangle should be right angled triangle.

Angle between A and B, $\alpha = 90°$

Angle between B and C, $\beta = 135°$

Angle between A and C, $\gamma = 135°$

40. **(4)**

Here $(\omega t + \phi_0)$ is dimensionless because it is an argument of a trigonometric function.

41. **(1)** By substituting the dimension of each quantity, we get

$T = [ML^{-1}T^{-2}]^a\ [L^{-3}M]^b\ [MT^{-2}]^c$

By solving, we get $a = -3/2$, $b = 1/2$, $c = 1$.

42. **(2)** Net force $\vec{F}_N = (4\hat{i} + \hat{j} - 3\hat{k}) + (3\hat{i} + \hat{j} - \hat{k})$

$= 7\hat{i} + 2\hat{j} - 4\hat{k}$N

Displacement $\vec{S} = (5\hat{i} + 4\hat{j} - \hat{k}) - (\hat{i} + 2\hat{j} - 3\hat{k})$

$= 4\hat{i} + 2\hat{j} + 2\hat{k}$

Work W = $\vec{F} \cdot \vec{S} = 28 + 4 - 8 = 24$ J.

43. **(4)**

$\vec{v}_A = 40\hat{j}, \vec{v}_B = 30\hat{i}$

$\vec{v}_{B/A} = \vec{v}_B - \vec{v}_A = 30\hat{i} - 40\hat{j}$

$|\vec{v}_{B/A}| = \sqrt{(30)^2 + (40)^2}$

$= 50$km/hr.

$\tan\theta = \frac{v_B}{v_A} = \frac{30}{40} \Rightarrow \theta = \tan^{-1}\left(\frac{3}{4}\right)$.

44. **(1)**

We know that the velocity of body is given by the slope of displacement - time graph. So it is clear that initially slope of the graph is positive and after some time it becomes zero (corresponding to the peak of graph) and then it will become negative.

45. **(2)**

Let $\vec{A}$ be vector in xy plane. Its x and y component are $A_x = 12\ m$, $A_y = 8m$

The magnitude of vector $\vec{A}$ is

$A = \sqrt{A_x^2 + A_y^2}$

$= \sqrt{(12)^2 + (8)^2} = \sqrt{208}m$

Squaring both sides, we get

$208 = (6)^2 + A_y'^2$

$A_y'^2 = 208 - 36$

$= 172$

$A_y'^2 = \sqrt{172}$

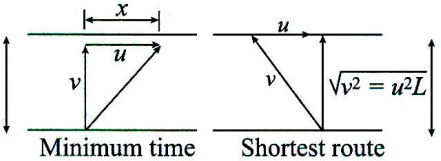
$= 13.11\,m$

46. **(1)** Dimensions of $\alpha t = [M^0L^0T^0]$

$\therefore [\alpha] = [T^{-1}]$

Again $\left[\frac{v_0}{\alpha}\right] = [L]$, so $[v_0] = [LT^{-1}]$

47. **(1)**



$10 = \frac{L}{v}$ .....(i)

Drift, $x = ut_1 \Rightarrow 120 = u \times 10$

$\Rightarrow u = 12$ m/min

$12.5 = \frac{L}{\sqrt{v^2 - u^2}} = \frac{L}{v\sqrt{1-(u^2/v^2)}}$ .....(ii)

From (i) and (ii),

$\frac{10}{12.5} = \frac{L}{v} \times \frac{v\sqrt{1-(u^2/v^2)}}{L}$

$\Rightarrow \frac{4}{5} = \sqrt{1-\frac{12^2}{v^2}}$

$\Rightarrow \frac{16}{25} = 1 - \frac{12^2}{v^2}$

$\Rightarrow \frac{12^2}{v^2} = 1 - \frac{16}{25} = \frac{9}{25}$

$\Rightarrow \frac{12}{v} = \frac{3}{5}$

$\Rightarrow v = \frac{12 \times 5}{3} = 20$m/min.

48. **(2)** Slope is increasing continuously from 0 to t_1.

49. **(4)** As $\theta = 90°$

$\vec{A} \times \vec{B} = 5 \times 9 \times \sin 90° = 45.$

50. **(4)** $\therefore$ $\frac{C}{L}$ does not represent the dimension of frequency.

CHEMISTRY

SECTION - A (35 Questions)

51. **(3)**
+5 and 0

52. **(3)**
$N_3H > NH_2OH > NH_3$

53. **(2)**
2 mole

54. **(1)**
4

55. **(4)**
All of these

56. **(2)**

$$\underset{-1\quad +1\quad -1}{H - \overset{+}{N} = \overset{-}{N} = N} \longleftrightarrow \underset{-2\ +1\quad 0}{H - \overset{\ominus}{N} - \overset{\oplus}{N} \equiv N}$$

57. **(4)**
$SO_2 \rightarrow$ Contain 3 atom

$n = \frac{wt.}{M.wt.} = \frac{64}{64} \times 3N_A$

$= 3 \times 6.02 \times 10^{23}$

58. **(2)**

$\frac{2}{44} : \frac{5}{44}$

59. **(4)**

$3CN^- + 7NO_3^- + 10H^+ \rightarrow 10NO + 3CO_2 + 5H_2O$

60. **(1)**

$N_2H_4 + OH^- \longrightarrow N_2 + H_2O + e^-$

$E_{N_2H_4} = \frac{\text{molecular wt.}}{\text{V.F.}} = \frac{32}{4} = 8.$

61. **(2)**

$\frac{2 \times 15}{0.08 \times 300} = \frac{80}{32 + 16x}$

$\Rightarrow x = 2$

62. **(3)**

$n_{H_2} = n_{H_e} = n_{O_2} = n_{O_3}$ at same T and P

$\therefore$ No. of atoms $\rightarrow 2 : 1 : 2 : 3$

63. **(1)**
$1 \times 5 = n \times 2$

64. **(1)**
Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for statement -1

65. **(1)**

$\frac{3 \times 10^{-10}}{12} \times 6 \times 10^{23}$

66. **(1)**

(1) $\frac{34}{18}$ (2) $\frac{28}{44}$ (3) $\frac{46}{32}$ (4) $\frac{54}{108}$

67. **(3)**
Statement-1 is true, statement-2 is false

68. **(4)**
Since the oxidation number of Ni increases from 0 to 2, therefore it acts as a reducting agent.

69. **(4)**

$m_{gas} = \frac{14}{11.2} \times 22.4$

70. **(3)**
Atoms of A in A_3O_4 = Atoms of A

$3 \times$ number of moles of $A_3O_4 = 1$

Number of moles of $A_3O_4 = \frac{1}{3}$

71. **(2)**
Redox reactions are those chemical reactions which involve transfer of electrons from one chemical species to another.

72. **(2)**
In $A_3(BC_4)_2$, $(+2) \times 3 + 2[+5 + 4(-2)]$
$\Rightarrow \quad +6 + 10 - 16 = 0$

73. **(2)**
$1 \times 8 \times 80$

74. **(2)**
$\frac{50}{10} : \frac{50}{20}$
$2 : 1$
$X_2 \quad Y$

75. **(2)**
a-(ii); b-(i); c-(iv); d-(iii)

76. **(3)**
CH_4 and CO_2

77. **(2)**
SO_2

78. **(4)**
All of these

79. **(3)**
Metal displacement reaction

80. **(3)**
$\frac{2}{3}$

81. **(2)**
2 mol carbon burns with 48 g of dioxygen

82. **(3)**
1 : 3

83. **(3)**
$+\frac{8}{3}$

84. **(1)**
1u

85. **(1)**
14.6 g

Section - B (Attempt Any 10 Questions)

86. **(1)**
1 : 3

87. **(3)**
(a) and (c) only

88. **(2)**
3×10^{22}

89. **(1)**
$$n_{left} = \frac{392 \times 10^{-3}}{98} - \frac{1.204 \times 10^{21}}{6.023 \times 10^{23}} = 2 \times 10^{-3}$$

90. **(1)**
$$\frac{20-18}{20} \times 100 = 10\% \text{ less}$$

91. **(3)**
-1

92. **(3)**
Limiting reagent may have the largest number of moles.

93. **(1)**
(a-p); (b-s); (c-q); (d-r)

94. **(2)**
11 u

95. **(2)**
Zeros preceding to first non-zero digit are significant

96. **(1)**
$N_2 + 3H_2 \rightarrow 2NH_3$
0.5 0.5
(LR) $\frac{0.25}{\frac{0.5}{3} \times 2} \times 100 = 75\%$

97. **(4)**
$C_3H_6O + 4O_2 \rightarrow 3CO_2 + 3H_2O$
40 – – –
– – 120

98. **(3)**
30 mL

99. **(1)**
$NH_3 \rightarrow \frac{1}{2}N_2 + \frac{3}{2}H_2$
0.2 mol – –
– – 0.3 mol

100. **(2)**
Weight of gas = 0.24 g, Volume of gas = 45 mL = 0.045 litre and density of H_2 = 0.089.
We know that weight of 45 mL of H_2 = Density × Volume = $0.089 \times 0.045 = 4.005 \times 10^{-3}$ g
Therefore vapour density
$$= \frac{\text{Weight of certain volume of substance}}{\text{Weight of same volume of hydrogen}}$$
$$= \frac{0.24}{4.005 \times 10^{-3}} = 59.93$$