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SCORE BOOSTER TEST SERIES

PHASE - I

TARGET NEET 5^{TH} MAY 2024

DATE : 13/12/2023

PHYSICS

01. Sol. (2) : [NCERT Exemplar]

Given, $A = \hat{i} + \hat{j}$

$B = \hat{i} - \hat{j}$

As we know that

$\vec{A} \cdot \vec{B} = |A||B|\cos\theta$

$(\hat{i} + \hat{j}) \cdot (\hat{i} - \hat{j}) = (\sqrt{1^2 + 1^2})(\sqrt{1^2 + 1^2})\cos\theta$

$(i + j)(i - j) = \sqrt{2} \times \sqrt{2}\cos\theta$

where θ is the angle between A and B

$$\cos\theta = \frac{1 - 0 + 0 - 1}{\sqrt{2}\sqrt{2}} = 0$$

$\therefore \quad \theta = 90°$

02. Sol. (2) : [Equation of trajectory]

Comparing the given equation with

$y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$, we get

$\tan\theta = \sqrt{3}$

03. Sol. (3) : [Basic of Projectile Motion]

Maximum horizontal range, $R = \frac{u^2 \sin 2\theta}{g} \quad \therefore \; R_{max}$

$= \frac{u^2}{g}$ when $\theta = 45°$ $\therefore$ $R_{max} \propto u^2$

Height $H = \frac{u^2 \sin^2\theta}{2g} \Rightarrow H_{max} = \frac{u^2}{2g}$ when $\theta = 90°$

It is clear that $H_{max} = \frac{R_{max}}{2}$

04. Sol. (2) : [Basic of Vector]

At point B the direction of velocity component of the projectile along Y-axis reverses.

Hence, $\vec{V}_B = 2\hat{i} - 3\hat{j}$

05. Sol. (3) : [Maximum Range]

If the angle of projection is $\frac{\pi}{4}$, then range $= \frac{v_0^2}{g}$ sin (π/2)

$\Rightarrow \quad (R)_{max} = \frac{v_0^2}{g} \qquad [\because \; \{\sin(\pi/2)\}_{max} = 1]$

06. Sol. (4) : [Range and time of flight]

$$\frac{R}{T^2} = \frac{u^2 \sin 2\theta}{g} \times \frac{g^2}{4u^2 \sin^2\theta}$$

$$\frac{R}{T^2} = \frac{g\cos\theta}{2\sin\theta} = 4.9$$

07. Sol. (3) : [Reference frame]

Relative horizontal displacement will be zero because horizontal component of velocity of coin is same for coil & observer/person. No angular projection has given to coin so no parabolic path.

08. Sol. (2) : [Range and maximum height]

According to the relation, $H = \frac{u^2}{2g}$

$R = \frac{u^2}{g} = 500 \Rightarrow u^2 = 500$ g

$H = \frac{500g}{2g} = 250$ m

09. Sol. (4) : [Maximum range]

Maximum horizontal distance (Range) $= \frac{u^2}{g}$

$180 \times 9.8 = u^2$

$\sqrt{1764} = u$

$u = 42$ m/s

10. Sol. (1) : [Motion in 2-D]

11. Sol. (1) : [Angular momentum]

Angular momentum = mvr

at starting point r = 0

12. Sol. (1) : [Range]

$\text{Range}(R) = \frac{u^2 \sin 2\theta}{g}$

Range $\propto u^2$

$\therefore \frac{R}{R'} = \frac{u^2}{4u^2} \Rightarrow R' = 4R$

13. Sol. (2) : [Range and maximum height]

$H_1 = \frac{u^2 \sin^2\theta_1}{2g}$, $H_2 = \frac{u^2 \sin^2\theta_2}{2g}$

$\frac{H_1}{H_2} = \frac{\sin^2\theta_1}{\sin^2\theta_2} \Rightarrow \frac{\sqrt{3}}{1} = \frac{\sin\theta_1}{\sin\theta_2} \Rightarrow \frac{\cos\theta_1}{\cos\theta_2} = \frac{1}{\sqrt{3}}$

We know that-

$\frac{R_1}{R_2} = \frac{(u^2)\sin 2\theta_1}{u^2 \sin 2\theta_2} = \frac{9\sin\theta_1\cos\theta_1}{\sin\theta_2\cos\theta_2} = \frac{9}{1}$

$\frac{R_1}{R_2} = \frac{9}{1}$ other parameters are same $(\theta_1 = \theta_2)$

14. Sol. (4) : [Basic of Projectile Motion]

Horizontal component of the velocity does not change in over all motion of projectile.

So, at highest point it will be.

$u\cos\theta = u\cos 30°$

$= \dfrac{u\sqrt{3}}{2}$

15. Sol. (2) : [Range and maximum height]

According to the relations $R = \dfrac{u^2 \sin 2\theta}{g}$, $H = \dfrac{u^2 \sin^2\theta}{2g}$

$$H_{max} = \frac{u^2 \sin^2 30^0}{2g} = \frac{u^2}{8g}$$

$$R = \frac{u^2 \sin 60°}{g} = \frac{u^2\sqrt{3}}{2g}$$

$$\therefore \frac{H}{R} = \frac{u^2}{8g} \times \frac{2g}{u^2\sqrt{3}} \Rightarrow R = 4\sqrt{3}H$$

16. Sol. (3) : [Horizontal Projectile Motion]

As the stone thrown vertically up will come back to the point of projection with same speed, both the stones will move downward with same initial velocity, so both will hit the ground with velocity

$$v^2 = u^2 + 2gh \quad \text{i.e., } v = \sqrt{(u^2 + 2gh)}$$

So, the ratio of speeds attained when they hit the ground is 1 :1

17. Sol. (4) : [Energy of Projectile Motion]

Kinetic energy at the highest point is $K = K_0 \cos^2\theta$

$$K = E\cos^2 30° = \frac{3E}{4}$$

18. Sol. (3) : [Maximum height]

$$H = \frac{u^2 \sin^2\theta}{2g} \Rightarrow H \propto \sin^2\theta$$

$$\frac{H_1}{H_2} = \frac{\sin^2 60°}{\sin^2 30°} = \frac{3}{4} \times \frac{4}{1}$$

$$\frac{H_1}{H_2} = 3$$

19. Sol. (4) : [Basic of Projectile Motion]

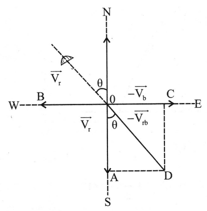
Time of flight, $T = \dfrac{2v_0 \sin\theta}{g}$

20. Sol. (1) : [Relative in 1-D]

Velocity of object A relative to that of object B is

$\vec{V}_{AB} = \vec{V}_A - \vec{V}_B$

21. Sol. (1) : [Rain-man Problem]



$\vec{V}_r = 35\,m/s$

$\vec{V}_b = 15\,m/s$

$\tan\theta = \dfrac{AD}{OA} \Rightarrow \tan\theta = \dfrac{\vec{V}_b}{\vec{V}_r} = \dfrac{15}{35} = \dfrac{3}{7} = 0.4285$

$\theta = \tan^{-1}(0.4285) = 23.19^0$

22. Sol. (1) : [River Boat Problem]

When a boat tends to cross a river of width along a shortest path, relative velocity of boat is-

$V_R = \sqrt{V_B^2 - V_r^2}$

Resultant velocity of the boat and river $= \dfrac{2\,km}{\frac{7}{60}hr}$

$= \dfrac{2 \times 60}{7} = 17.14$

$V_R^2 = V_B^2 - V_r^2 \Rightarrow V_r^2 = V_B^2 - V_R^2$

$V_r^2 = \sqrt{V_B^2 - V_R^2} = \sqrt{(18)^2 - (17.14)^2}$

$= \sqrt{324 - 293.7}$

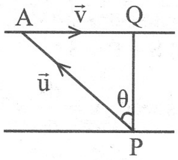
$= \sqrt{30.3} = 5.5\,km/h$

23. Sol. (2) : [River Boat Problem]

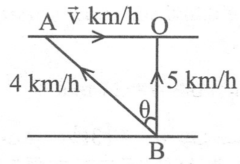
He should row his boat at an angle θ such that

$\sin\theta = \dfrac{v}{u} = \dfrac{4}{10} = \dfrac{2}{5}$

$\therefore \ \theta = \sin^{-1}\left(\dfrac{2}{5}\right)$



24. Sol. (2) : [River Boat Problem]



Velocity of the river is along AO

By applying triangle law of vector addition, value of AB comes to be 3 km/hr.

25. Sol. (1) : [Equation of trajectory]

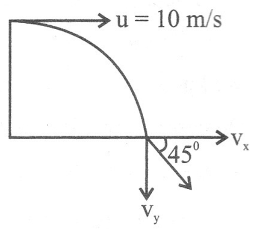
Since relative acceleration is zero, therefore relative velocity will be constant.

26. Sol. (4) : [Horizontal Projectile Motion]

$\tan 45° = \dfrac{V_y}{V_x}$

$1 = \dfrac{V_y}{V_x}$

$V_y = V_x = 10\ m/s$



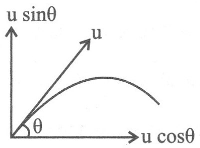
27. Sol. (2) : [Basic of Projectile Motion]

The projectile is shown below

$t = \dfrac{2u\sin\theta}{g} \Rightarrow 4 = \dfrac{2u\sin\theta}{g}$ ...(i)

Also, $v^2 = u^2 + 2as \Rightarrow 0^2 = u^2\sin^2\theta - 2gh$

$\dfrac{u^2\sin^2\theta}{2g} = h$



From equation (ii)

$\dfrac{u^2\sin\theta}{g} = 2$

$\Rightarrow \dfrac{4g^2}{2g} = h$

$h = 2g$

$h = 20\ m$

28. Sol. (3) : [Equation of trajectory]

Equation of projectile,

$$y = 10x - \left(\frac{5}{9}\right)x^2$$

Equation of trajectory is give by

$$y = x\tan\theta - \frac{g}{2u^2\cos^2\theta}.x^2$$

On comparing,

$\tan\theta = 10$ and $\frac{g}{2u^2\cos^2\theta} = \frac{5}{9}$

or $10u^2\cos^2\theta = 9g$

$\therefore \quad u^2\cos^2\theta = 9$

Range of projectile,

$$R = \frac{2u^2\sin\theta\cos\theta}{g} = \frac{2u^2\tan\theta\cos^2\theta}{g} \quad (\because \sin\theta = \tan\theta\cos\theta)$$

$$= \frac{2(u^2\cos^2\theta).\tan\theta}{g}$$

$$= \frac{2\times9\times10}{10} = 18\text{m}$$

29. Sol. (1) : [Maximum height]

Given, $R = 2H$

We know that, $R = 4H\cot\theta$

$$2H = 4H\cot\theta$$

$$\cot\theta = \frac{1}{2}$$

$\Rightarrow \sin\theta = \frac{2}{\sqrt{5}}$ and $\cos\theta = \frac{1}{\sqrt{5}}$

$\therefore$ Range of projectile,

$$R = \frac{2v^2\sin\theta\cos\theta}{g}$$

$$= \frac{2v^2}{g}\times\frac{2}{\sqrt{5}}\times\frac{1}{\sqrt{5}} = \frac{4v^2}{5g}$$

30. Sol. (1) : [Formula]

Range of projectile is given by,

$$R = \frac{2u^2\sin\theta\cos\theta}{g} \quad ...(i)$$

$$\text{Height } H = \frac{u^2\sin^2\theta}{2g} \quad ...(ii)$$

$$\text{And, } H_1 = \frac{u^2\sin^2(90^\circ-\theta)}{2g} \quad ...(iii)$$

$$= \frac{u^2\cos^2\theta}{2g}$$

$$\text{Then, } HH_1 = \frac{u^2\sin^2\theta u^2\cos^2\theta}{2g\times2g} \quad ...(iv)$$

From Eq. (i), we get

$$R^2 = \frac{4u^2\sin^2\theta u^2\cos^2\theta\times4}{2g\times2g}$$

$R = \sqrt{16HH_1}$ [from Eq. (iv)]

$= 4\sqrt{HH_1}$

31. Sol. (2) : [Basic of Projectile Motion]

We know that maximum height is given by,

$$H = \frac{u^2\sin^2\theta}{2g} \quad ...(i)$$

and time of flight, $T = \frac{2u\sin\theta}{g}$

Or $u\sin\theta = \frac{Tg}{2}$ ...(ii)

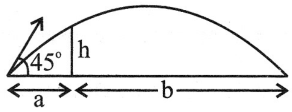
From Eqs. (i) and (ii), we get

$$H = \frac{1}{2g}\left(\frac{Tg}{2}\right)^2 \Rightarrow H = \frac{T^2g^2}{8g}$$

$$\Rightarrow \quad T^2 = \frac{8H}{g} \Rightarrow T = 2\sqrt{\left(\frac{2H}{g}\right)}$$

32. Sol. (4) : [Equation of trajectory]

$\tan\alpha + \tan\beta = \tan\theta$



$$\frac{h}{a} + \frac{h}{b} = \tan 45^\circ$$

$$h = \frac{ab}{a+b}$$

33. Sol. (4) : [Basic of Projectile Motion]

Along same straight line, velocity & acceleration can be in the same direction, opposite to each other or perpendicular as in circular motion with uniform speed. Thus θ can be anywhere between 0 & 180°.

34. Sol. (4) : [Equation of trajectory]

35. Sol. (4) : [Equation of trajectory]

The equation of motion for projectile is

$$x = x_0 + U_xt + \frac{1}{2}a_xt^2$$

$\therefore$ The shape of the trajectory depends on the initial position, initial velocity and acceleration.

36. Sol. (1) : [Relative Motion in 1-D]

$\vec{u} = 3\hat{i} + 4\hat{j} \quad \Rightarrow ux = 3$ and $uy = 4$

$\vec{a} = 0.4\hat{i} + 0.3\hat{j} \Rightarrow ax = 0.4$ and $ay = 0.3$

So, $V_x = ux + a_xt = 3 + 0.4 \times 10 = 3 + 4 = 7$

$V_y = uy + a_yt = 4 + 0.3 \times 10 = 4 + 3 = 7$

$\vec{V} = 7\hat{i} + 7\hat{j} \Rightarrow |\vec{V}| = \sqrt{7^2 + 7^2} = 7\sqrt{2}$ units

37. Sol. (3) : [Relative Motion in 1-D]

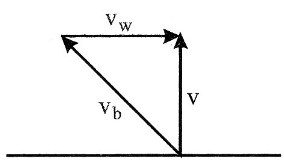
$\vec{v}_{BA} = \vec{v}_B - \vec{v}_A = 80 - 65 = 15$ km/hr

[$\because$ both are moving in the same direction]

38. Sol. (4) : [River boat Problem]

39. Sol. (2) : [River boat Problem]

$$v = \frac{1\text{km}}{\frac{1}{4}\text{h}} = 4\,\text{km h}^{-1}, \quad v_b = 5\,\text{km h}^{-1}$$



$$v_w = \sqrt{v_b^2 - v^2} = \sqrt{25-16} = \sqrt{9} = 3\,\text{km h}^{-1}$$

40. Sol. (3) : [Time of flight]

$V_y = u\sin\theta - gt_m = 0$

$\therefore t_m = \dfrac{u_y \sin\theta}{g}$ (time to reach the maximum height)

Total time of flight $T_f = \dfrac{2(u\sin\theta)}{g}$

$\therefore T_f = 2t_m$

41. Sol. (2) : [Equation of trajectory]

Comparing the given equation with the equation of trajectory of a projectile,

$$y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$$

we get, $\tan\theta = \dfrac{1}{\sqrt{3}} \Rightarrow \theta = 30°$

and $2u^2\cos^2\theta = 20 \Rightarrow u^2 = \dfrac{20}{2\cos^2\theta} = \dfrac{40}{3}$

Now, $R_{max} = \dfrac{u^2}{g} = \dfrac{40}{3\times10} = \dfrac{4}{3}$ m

42. Sol. (2) : [NCERT Exempler]

From the diagram, $u = a\hat{i} + b\hat{j}$

As u is in the first quadrant, so both components a and b will be positive.

For $v = p\hat{i} + q\hat{j}$, as it is in positive x-direction and located downward so x-component p will be positive and y-component q will be negative.

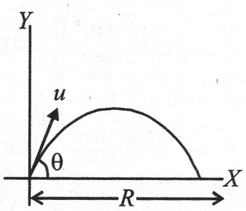
Hence, a, b and p are positive but q is negative.

43. Sol. (3) : [NCERT Exempler]

Consider, projectile is fired at an angle θ.

According to question,

$\theta = 15°$ and $R = 50$ m



Range, $R = \dfrac{u^2\sin 2\theta}{g}$

$R = 50\,\text{m} = \dfrac{u^2\sin(2\times15°)}{g}$

$50\times g = u^2\sin 30° = u^2\times\dfrac{1}{2} \Rightarrow 50\times g\times 2 = u^2$

$u^2 = 50\times9.8\times2 = 100\times9.8 = 980$

$u = \sqrt{980} = 31.304$ m/s $= 14\sqrt{5}$ $(\because g = 9.8\ \text{m/s}^2)$

Now, $\theta = 45°$; $R = \dfrac{u^2\sin 2\times45°}{g} = \dfrac{u^2}{g} = 100$ m

44. Sol. (4) : [NCERT Exempler]

As speed is a scalar quantity, hence it will be related with path length (scalar quantity) only.

Hence, Speed $v_0 = \dfrac{\text{total distance travelled}}{\text{time taken}}$

So, total distance travelled = Path length

= (speed) × time taken

Hence, path length which is scalar and traversed in equal intervals.

45. Sol. (3) : [NCERT Exempler]

As given that in two dimensional motion the instanteous speed v_0 is positive constant and we know that acceleration is rate of change of velocity or instantaneous speed and hence it will also be in the plane of motion.

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46. Sol. (2) : [NCERT Exempler]

Given:

$x = 5t - 2t^2$ $\qquad$ $y = 10t$

$v_x = \dfrac{dx}{dt} = 5 - 4t$ $\qquad$ $v_y = \dfrac{dy}{dt} = 10$

$a_x = \dfrac{dv_x}{dt} = -4$ $\qquad$ $a_y = \dfrac{dv_y}{dt} = 0$

$\bar{a} = a_x i + a_y j$ $\qquad$ $\bar{a} = -4i\ \text{m/s}^2$

Hence, acceleration of particle at (t = 2 s) $= -4\text{m/s}^2$

47. Sol. (3) : [Motion in 2-D]

$U_x = \dfrac{dx}{dt} = 1$ and $U_y = \dfrac{dx}{dt} = 1 - 2t$

$\therefore U_{t=0} = \sqrt{u_x^2 + y_y^2} = \sqrt{1^2+1^2} = \sqrt{2}$ m/s.

$a_x = \dfrac{d^2x}{dt^2} = 0;\ d_y = \dfrac{d^2y}{dt^2} = -2$

For time of flight,

$y = 0$ or $0 = t - t^2 \therefore t = 1s$.

For maximum height, $t = \dfrac{1}{2}\ s$.

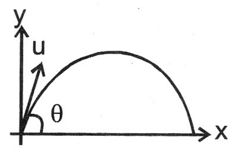
$\therefore H = t - t^2 = \dfrac{1}{2} - \left(\dfrac{1}{2}\right)^2 = \dfrac{1}{4}$ m.

48. Sol. (4) : [Motion in 2-D]

Assertion-1 is false because angles of projection θ and (90° – θ) give same range but time of flight will be different.

49. Sol. (1) : [Basic of Projectile Motion]

If we neglect air resistance, horizontal component of velocity is always same.



To find vertical component use equation,

$v_f^2 = v_i^2 - 2g\times h$, $\quad v_i = u\sin\theta, h = 0$,

$v_f^2 = u^2\sin^2\theta - 0$, $v_f = u\sin\theta$

hence $\vec{v} = u\cos\theta\hat{i} - u\sin\theta\hat{j}$

$\therefore$ Speed is same, so K.E. is same.

50. Sol. (1) : [Equation of trajectory]

$V = \hat{i} + 2\hat{j}$

$x = t$ .....(i)

$y = 2t - \dfrac{1}{2}(10t^2)$ .....(ii)

From eq. (i) and (ii)

$y = 2x - 5x^2$.

CHEMISTRY

51. (3)

In $(NH_4)_3PO_4$ 12 moles of 'H' are present with 4 moles of oxygen atom.

$\therefore$ 3.18 moles of 'H' are present with = $\frac{4}{12} \times 3.18$ = 1.06 moles of oxygen atom.

52. (1)

Maximum number of moles have maximum number of molecules

$\therefore$ calculate number of moles.

8 g H_2 moles = $\frac{8}{2}$ = 4 moles

44 g of CO_2 = $\frac{44}{44}$ = 1 mol CO_2

64 g SO_2 moles = $\frac{64}{44}$ = 1 moles

48 g of O_3 = $\frac{48}{48}$ = 1 mol of O_3

53. (2)

[Total number of e^- in CH_4]

Number of e^- in 1.6 g of CH_4 = $\frac{1.6}{16} \times 10 \times N_0 = N_0$

[Total number of e^- in H_2O]

Number of e^- in 1.8 g of H_2O = $\frac{1.8}{18} \times 10 \times N_0 = N_0$

54. (2)

Maximum number of moles have maximum Number of molecules.

Moles of N_2O = $\frac{7}{44}$; moles of H_2 = $\frac{20}{2}$; moles of NO_2 = $\frac{16}{46}$

Moles of SO_2 = $\frac{16}{64}$

55. (3)

Total number of atom = 0.1 × 4 × 6.022 × 10^{23} = 2.4 × 10^{23} atom

[4 atom are present as gas is tetra-atomic]

56. (4)

As water is liquid its density = 1 g/mL

i.e., 1 g of H_2O have volume = 1 mL

Mass of one molecule = $\frac{18}{6.023 \times 10^{23}}$ g

$\therefore$ $\frac{18}{6.023 \times 10^{23}}$ g of H_2O have volume = $\frac{18}{6.022 \times 10^{23}}$ mL = 3.0 × 10^{-23} mL

57. (1)

Weight of Fe in heamoglobin = $\frac{0.334}{100} \times 67200$ = 224.48 u

Mass of one Fe atom = 56 u

$\therefore$ $\boxed{\text{Total number of Fe atom} = \frac{224.48}{56} \approx 4}$

58. (2)

$2SO_2 + O_2 \longrightarrow 2SO_3$

2 moles of SO_2 reacts with 1 mole of O_2 as 1 mol of SO_2 is present

$\therefore$ SO_2 will be limiting reagent will formed $\therefore$ $\boxed{1 \text{ mol of } SO_3}$

59. (3)

1 mole S_8 = $8SO_3$ = 8 × 80 g = 640 g

60. (4)

$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

For 1 mol propane 5 mol O_2 gas is needed.

22.4 L propane = 5 × 22.4 L of O_2 gas needed

$\therefore$ $\boxed{\text{1 L propane = 5 L of } O_2 \text{ gas is required}}$

61. (3)

$2H_2 + O_2 \longrightarrow 2H_2O$

4 g   32 g   36 g

When 4 g of H_2 reacts with 32 g of O_2 gives 36 g of H_2O.

Now present oxygen is 20 g

$\therefore$ O_2 will be the limiting reagent and H_2O will be calculated from O_2

$\therefore$ 32 g of O_2 given = 36 g of H_2O

20 g of O_2 given = $\frac{36}{32} \times 20$ = 22.5 g H_2O

62. (2)

$$\text{Molality} = \frac{\text{moles of solute}}{\text{wt of solvent (kg)}} = \frac{n_B}{w_A(\text{kg})} \qquad w_B = 3\text{ g},\ w_A = 30\text{ g}$$

$$\text{Molality (m)} = \frac{\frac{3}{180}}{30} \times 1000 = \frac{1}{1800} \times 1000 = 0.56\text{ m.}$$

63. (3)

$$\text{Moles of NaOH} = \frac{M \times V(\text{mL})}{1000} = \frac{2 \times 250}{1000} = 0.5 \text{ moles of NaOH}$$

$$\text{Moles} = \frac{\text{given mass}}{\text{mol.mass}} \quad \therefore 0.5 \text{ mole} = \frac{x}{40} \quad \boxed{\text{given mass} = 40 \times 0.5 = 20\text{ g}}$$

64. (3)

$$\text{Total number of moles} = \frac{4.2}{14} = 0.3 \text{ mol}$$

1 mol of N^{3-} have electrons = 10 × N_0.

$\therefore$ $\boxed{\text{Number of } e^- \text{ in 0.3 mol} = 0.3 \times 10 \times N_0 = 3 \times N_0}$

65 (1)

$$\text{Mass of Fe} = 100 \times \frac{0.33}{100} = 0.33\text{ g}$$

$$\therefore \text{Moles of Fe} = \frac{0.33}{56} = 5.89 \times 10^{-3} \text{ mole}$$

$\therefore$ Number of atom of Fe = $5.89 \times 10^{-3} \times 6.022 \times 10^{23} = 0.035 \times 10^{23}$ atom

66. (1)

$2KClO_3 \longrightarrow 2KCl + 3O_2$

2 moles   3 moles

2 mol of $KClO_3$ gives = 3 mol O_2

1 mol of $KClO_3$ gives = $\frac{3}{2}$ mol O_2

For Al burning

$$2\text{ Al} + \frac{3}{2}O_2 \longrightarrow \underbrace{Al_2O_3}_{\text{1 mole}}$$

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As $\frac{3}{2}$ mole of O_2 gives 1 mole Al_2O_3

$\therefore$ 1 mole Al_2O_3 formed.

67. (3)

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2\ (g)$$
1 moL 22.4 L = 22400 ml

22400 ml of H_2 gas is produced from Zn = 65 g

1.12 ml of H_2 gas is produced from Zn = $\frac{65}{22400} \times 1.12$ g = 3.25×10^{-3} g

i.e., 32.5×10^{-4} g

68. (2)

	% age	Atomic mass	Moles	Simple ratio
C	40%	12	$\frac{40}{12} = 3.33$	1
H	6.7%	1	$\frac{6.7}{1} = 6.7$	2
O	53.3%	16	$\frac{53.3}{16} = 3.33$	1

$\therefore$ $\boxed{EF = CH_2O}$

69. (4)

$$H_2(g) + Cl_2(g) \longrightarrow 2HCl\ (g)$$
1 mol 1 mol 36.5 g × 2

22.4 L 22.4 L 36.5 g × 2

1.12 L 1.12 L 3.65 g

For (36.5 × 2) g of HCl volume of H_2 and Cl_2 required will be 22.4 L H_2 and 22.4 L of CL_2

$\therefore$ For 3.65 g and $\left.\begin{matrix}1.12\ L \text{ of } H_2 \\ 1.12\ L \text{ of } Cl_2\end{matrix}\right\}$

70. (4)

$$m = \frac{1000 \, . \, x_B}{x_A \, . \, m_A} \quad \left\{\begin{matrix} m = \text{molality} \\ x_B = \text{molality fraction of solute} \\ x_A = \text{molality fraction fo solvent}\end{matrix}\right\}$$

$\boxed{x_A + x_B = 1}$

$\therefore$ $x_A = (1 - x_B)$

$$m = \frac{1000 \, . \, x_B}{(1 - x_B)M_A}$$

Putting m = 3

M_A = 18 because aqueous solution is present

$$3 = \frac{1000 \, . \, x_B}{(1 - x_B)18} \Rightarrow 54\ (1 - x_B) = 1000\ x_B$$

$= 54 - 54\ x_B = 1000\ x_B$

$$x_B = \frac{54}{1054} \Rightarrow x_B = 0.05.$$

$\therefore$ $\boxed{x_A = (1 - x_B) = (1 - 0.05) = 0.95}$

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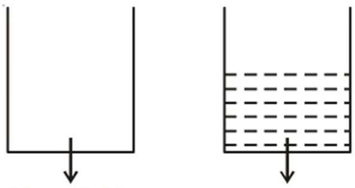
71. (3)

Molarity of 98% H_2SO_4 by mass having density 1.80 g/ml will be

$$M = \frac{\% \text{ w/w} \times d \times 10}{\text{M. mass}} = \frac{98 \times 1.80 \times 10}{98} = 18 \text{ M.}$$



$M_1 = 18$ M $\quad$ $M_2 = 0.1$ m

$V_1 = ?$ $\quad$ $V_2 = 1000$ ml

Applying $M_1V_1 = M_2V_2$

$18 \times V_1 = 1000 \times 0.1$

$$V_1 = \frac{100}{18} = 5.55 \text{ ml}$$

72. (1)

$$\text{Moles of oxalic acid} = \frac{6.022 \times 10^{20}}{6.022 \times 10^{23}} = 10^{-3} \text{ moles}$$

$$\text{Molarity} = \frac{10^{-3}}{500} \times 1000$$

$$= \boxed{2 \times 10^{-3} M} = \boxed{0.002 \text{ M}}$$

73 (2)

$$MgCO_3 \xrightarrow{\Delta} MgO + CO_2$$

84 g $\quad$ 40 g

x g $\quad$ 8 g

$$\therefore \quad x = \frac{84 \times 8}{40} = 16.8 \text{ g}$$

$$\therefore \quad \% \text{ purity of } MgCO_3 = \frac{16.8}{20} \times 100$$

$$= 84\%$$

74. (3)

$$\frac{n_{H_2}}{n_{O_2}} = \frac{1/2}{4/32} = \frac{32}{2 \times 4} = \frac{4}{1}$$

75. (3)

$$\text{Moles of } CH_3OH = \frac{M \times V \text{ mL}}{1000} = \frac{2 \times 150}{1000} = 0.3 \text{ mole}$$

$$\therefore \quad \text{weight of } CH_3OH = \text{moles} \times \text{mol. mass}$$

$$= \boxed{0.3 \times 32 = 9.6 \text{ g}}$$

76. (3)

$$Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$$

1 moL $\quad$ 22400 mL at STP

22400 mL of H_2 is produced by 1 mol Zn *i.e.*, = 65 g

224 mL of H_2 is produced by 1 mol Zn *i.e.*, $= \frac{65}{22400} \times 224 = 0.65$ g

77. (1)

$$4NH_3\,(g) + 5O_2\,(g) \longrightarrow 4NO\,(g) + 6H_2O\,(l)$$

4 mol NH_3 reacts with 5 mol O_2

1 mol NH_3 reacts with $\frac{5}{4}$ = 1.25 mol of O_2

as 1 mol of O_2 is taken therefore all the O_2 will be consumed.

78. (3)

$$\underset{1\,mol}{BaCO_3} \xrightarrow{\Delta} BaO + \underset{22.4\,L}{CO_2}$$

mol mass of $BaCO_3$ 197 + 12 + 48 = 257 g

moles of $BaCO_3$ = $\frac{9.85}{257}$ g = 0.038 mol

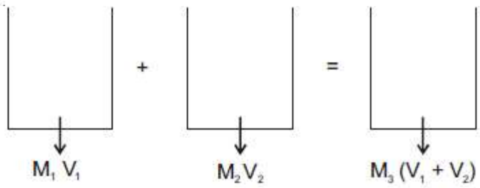
1 mol of $BaCO_3$ gives CO_2 = 22.4 L

0.038 moL of $BaCO_3$ gives CO_2 = 22.4 × 0.038 = 0.85 L

79. (3)

$$\boxed{\text{for same solution}}$$
$$\downarrow$$
$$\boxed{M_1V_1 + M_2V_2 = M_3(V_1 + V_2)}$$

(2.5 × 1) + (3 × 0.5) = M_3 (2.5 + 3)



2.5 + 1.5 = M_3 × 5.5

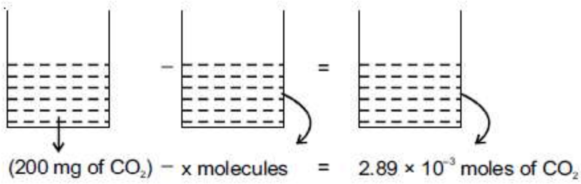
M_3 = $\frac{4}{5.5}$ = 0.727 ≈ 0.73 M

80. (1)

$$\frac{\sum \text{percentage} \times \text{atomic mass}}{100} = \frac{\sum \text{percentage abundance of each} \times \text{isotopic} \times \text{atomic mass}}{100}$$

$$= \frac{(56 \times 90) + (57 \times 8) + 59 \times 2}{100} = 56.14 \text{ amu}$$

81. (4)



From Equation

200 mg of CO_2 have molecule = $\frac{200}{44} \times 10^{-3} \times 6.022 \times 10^{23}$

= 2.7×10^{21}

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$\therefore$ 2.89×10^{-3} moles of CO_2 have molecule = $2.89 \times 10^{-3} \times 6.022 \times 10^{23}$

= 1.7×10^{21} molecule

$\therefore$ 200 mg of CO_2 – x molecule = 2.89×10^{-3} moles of CO_2

2.7×10^{21} – x molecule = 1.7×10^{21}

x = $(2.7 - 1.7) \times 10^{21}$ molecue

= 10^{21} molecule

$\therefore$ The value of x will be 10^{21}

82. (1)

30% NaOH means 30% by mass

i.e., $\frac{30 \text{ g of NaOH}}{100 \text{ g of solution}}$

Weight of NaOH = 30 g

Mol. mass NaOH = 40

Weight of H_2O = 100 – 30 = 70

Mol. mass = 18

$$\text{Mol. fraction of NaOH} = \frac{\text{moles of NaOH}}{\text{moles of } H_2O + \text{moles of NaOH}} = \frac{\frac{30}{40}}{\frac{70}{18}+\frac{30}{40}} = \boxed{0.16}$$

83. (2)

Both are correct but R is not explanation of A because 1 amu = 1.66×10^{-24} g

and mass of 1 atom of C = $1.99 \times 10^{-23} = \frac{12}{6.022 \times 10^{23}} = 1.99 \times 10^{-23}$ = g

Both A and R are correct.

84. (4)

Number of atoms in NH_3 = $2 \times 4 \times N_0$ = 8 N_0

Number of atoms in CH_4 = $4 \times 5 \times N_0$ = 20 N_0

Both are chemically different

Both A and R are incorrect.

85. (2)

mass of 1 g molecule means 1 mol of H_2SO_4 = 98 g

1 g atom = 1 mol atom = N_0

Both are correct but R is not explanation of A.

86. (1)

$$He = \frac{4}{4} \times N_A$$

$$O_2 = \frac{4}{32} \times N_A \times 2$$

$$O_3 = \frac{4}{48} \times N_A \times 3$$

$$H_2O_2 = \frac{4}{34} \times N_A \times 4$$

87. (3)

$$n = \frac{\text{Weight}}{\text{Molecular mass}} = \frac{16 \times 10^{-3} \text{ g}}{32 \text{ g}} = 5 \times 10^{-4} \text{ moles}$$

88. (4)

(a) $\frac{8}{32}\times N_A \times 2 = \frac{1}{2}N_A$ (b) $\frac{1}{2}\times N_A \times 2 = N_A$ (c) $\frac{7}{14}\times N_A \times 2 = N_A$ (d) $\frac{1.5}{4}\times N_A = \frac{3}{8}N_A$

$\therefore$ Correct answer (d).

89. (1)

(a) $\frac{5}{22.4}\times N_A \times 3 = \frac{15}{22.4}N_A$ (b) $\frac{5.6}{22.4}\times N_A \times 2 = \frac{11.2}{22.4}N_A$ (c) $\frac{6}{22.4}\times N_A \times 2 = \frac{12}{22.4}N_A$

$\therefore$ Correct answer (a).

90. (4) (1) and (3)

1 gram atom of nitrogen = 1 mole nitrogen atom

$= \frac{1}{2}$ mole N_2 Molecule $= \frac{1}{2}\times 22.4$ L = 11.2 L at NTP

91. (4)

1 g molecule of V_2O_5 = 1 mole V_2O_5 contain
2 moles V atom and 5 moles oxygen atom.

92. (4)

3 mole of $NH_3 = 3\times N_A \times 4 = 12\ N_A$ atom
Volume at STP $= n\times 22.4\ L = 3\times 22.4 = 67.2$ L
Number of molecules $= n\times N_A = 3\times 6.0\times 10^{23} = 1.8\times 10^{24}$
$\therefore$ Correct answer (d).

93. (4)

(a) $\frac{6.0}{18}\times N_A \times 3 = N_A$ atom in H_2O

(b) $\frac{4.0}{16}\times N_A \times 5 = \frac{5}{4}N_A$ atom in CH_4

(c) $\frac{7.5}{180}\times N_A \times 24 = N_A$ atom in glucose

94. (4)

All have same mass.
$0.6\times 12 = 0.3\times 24 = 0.05\times 12\times 12 = 7.2$ gram

95. (1)

$O_2 = \frac{16}{32} = \frac{1}{2}$ mol and $\frac{14}{28} = \frac{1}{2}$ mol $\rightarrow N_2$

96. (4)

$C_{\frac{24}{12}}H_{\frac{4}{1}}O_{\frac{32}{16}} \rightarrow C_2H_4O_2$
$2(CH_2O)$

97. (3)

8 mol of O atom present in 1 mol $Mg_3(PO_4)_2$

$\therefore$ 0.25 mol of 'O' atoms are in $\frac{1}{8}\times 0.25$

$= 3.125\times 10^{-2}$ mol

98 (3)

The number of moles is given by

$$\text{Number of moles} = \frac{\text{Weight (W)}}{\text{Molecular weight (M)}}$$

Thus, ratio of moles of O_2 and N_2 is given by

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$$\frac{n_{O_2}}{n_{N_2}} = \left(\frac{\frac{W_{O_2}}{M_{O_2}}}{\frac{W_{N_2}}{M_{N_2}}}\right) = \left(\frac{W_{O_2}}{W_{N_2}}\right)\left(\frac{M_{N_2}}{M_{O_2}}\right)$$

$$= \left(\frac{1}{4}\right) \times \left(\frac{28}{32}\right) = \frac{7}{32}$$

Hence, ratio of n_{O_2} and n_{N_2} is 7:32

99. (1)

Mass % of oxygen Present in

$$H_2O = \frac{16}{18} \times 100 = 88.88\%$$

100 (2)

$$Na_2SO_4 \rightarrow 2Na^+ + SO_4^{2-}$$

1 molecule gives 2 ions of Na^+

BIOLOGY

101. (2)	102. (2)	103. (2)	104. (1)	105. (2)
106. (2)	107. (1)	108. (4)	109. (1)	110. (1)
111. (2)	112. (1)	113. (3)	114. (4)	115. (3)
116. (3)	117. (4)	118. (2)	119. (3)	120. (1)
121. (4)	122. (3)	123. (4)	124. (2)	125. (1)
126. (4)	127. (4)	128. (2)	129. (3)	130. (1)
131. (3)	132. (2)	133. (1)	134. (1)	135. (3)
136. (3)	137. (4)	138. (1)	139. (3)	140. (4)
141. (3)	142. (3)	143. (1)	144. (4)	145. (4)
146. (2)	147. (3)	148. (1)	149. (1)	150. (2)
151. (3)	152. (3)	153. (4)	154. (2)	155. (1)
156. (4)	157. (3)	158. (2)	159. (1)	160. (1)
161. (2)	162. (1)	163. (4)	164. (1)	165. (4)
166. (1)	167. (2)	168. (1)	169. (3)	170. (4)
171. (4)	172. (4)	173. (3)	174. (2)	175. (3)
176. (3)	177. (2)	178. (2)	179. (1)	180. (1)
181. (3)	182. (4)	183. (3)	184. (2)	185. (3)
186. (3)	187. (4)	188. (3)	189. (4)	190. (1)
191. (4)	192. (4)	193. (1)	194. (1)	195. (2)
196. (2)	197. (4)	198. (2)	199. (1)	200. (3)