DATE : 27-01-2018

HINTS & SOLUTIONS

1. (c)

1L mixture —— 800g H_2O (0.02 % D_2O)
200g D_2O

$\therefore \quad m_{H_2O} = 800 \times \frac{99.98}{100} = 799.84$ g

$m_{D_2O} = 200 + 800 \times \frac{0.02}{100} = 200.16$ g

Avg. molar mass = $\frac{1000}{\left(\frac{799.84}{18}\right)+\left(\frac{200.16}{20}\right)} = 18.38$ g mol^{-1}

$18.38 = \frac{[18 \times x] + [20 \times (100 - x)]}{100}$

X = 81% 100 – X = 19%

Neutron = 0.81 × 8 Neutrons From H_2O + 0.19 × 10 Neutrons From D_2O

Fraction mass of neutrons = $\frac{8.38}{18.38} = 0.455$

2. (d)

$Al + 2HCl \rightarrow AlCl_3 + \frac{3}{2}H_2$

$Zn + 2HCl \rightarrow ZnCl_2 + H_2$

Moles of $H_2 = \frac{3}{2}$ × moles of Al + 1 × moles of Zn (according to chemical reaction).

Let mass of Al = x

Then mass of Zn = 1.67 – x

Moles of $H_2 = \frac{1.69}{22.4} = 0.075$

$0.075 = \frac{3}{2} \times \frac{x}{27} + \frac{(1.67 - x)}{65.3}$

X = 1.228

%Al = 73.5%

3. (a)

4. (c)

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + energy$

180 gm glucose required = 192 gm of oxygen

for 40 gm glucose = $\frac{192}{180}$ × 40 gm of oxygen is required for one hour

Now for 30 days amount of O_2 required will be = $\frac{192}{180} \times 40 \times 24 \times 30$ gm

= 30720 gm = 30.720 kg

5. (d)

$V = 4 - 3t - t^2$

$\frac{dx}{dt} = 4 - 3t - t^2$

$x = 4t - \frac{3t^2}{2} - \frac{t^3}{3} + C$

at $t = 0$ $\quad x = C$

so (i) option is some time correct.

(ii) at $t = 0$

$V = 4 m/s^2$

So (ii) option is never correct.

(iii) $a = -3 - 2t$ $\quad [V = 4 - 3t - t^2$

$4 - 3t - t^2 = 0$

$T = 1, -4$

So $t = 1$]

That means particle deaccelerates till $t = 1$ sec.

And speed of particle goes on increasing after $t = 1$ sec

6. (a)

Suppose mole of $FeSO_4 = x$

Only Fe^{+2} undergoes reaction

$Fe^{+2} + e^- \longrightarrow Fe^{+3}$

Equivalence of $FeSO_4$ is equal to equivalence of $KMnO_4$ (i.e., is Oxidising agent) as $Fe_2(SO_4)_3$ cannot be oxidized by $KMnO_4$.

Eq. of $FeSO_4$ = Eq. of $KMnO_4$

n_f of $FeSO_4 = 1$ as it oxidize from + 2 to + 3 oxidation state by $KMnO_4$

n_f of $KMnO_4$ in acidic medium = 5.

$MnO_4^- \longrightarrow Mn^{+2} + 5e^-$

$x \times 1 = \frac{100 \times 2 \times 5}{1000} = 1$

$\therefore$ moles of $FeSO_4 = 1$

Mole fraction of $FeSO_4 = \frac{n_{FeSO_4}}{n_{FeSO_4} + n_{Fe_2(SO_4)_3}} = \frac{1}{3}$. **Ans.**

7. (c)

8. (b)

$\mu = \frac{\text{Real depth}}{\text{Apparent depth}}$

$= \frac{AC}{DC}$

$\mu = \frac{d}{DC}$ $\quad$ Here $AC = d$

it is for normal view so answer is b.

9. (c)

Let suppose mass of original sample = 100 gm
mass of water in original sample = 15 gm.
and mass of (impurity + silica) in original sample = 85 gm.
% water after drying = 8%.
Let x be the mass of water left and y be the mass of silica in original sample.

$$\% \text{ water after drying} = \frac{\text{mass of water left}}{\text{mass of sample after drying}} \times 100$$

$$8 = \frac{x}{85+x} \times 100$$

$$x = \frac{85 \times 8}{92} = 7.391 \text{ gm}$$

$$\% \text{ Silica after drying} = \frac{\text{Mass of silica}}{\text{Mass of sample after drying}} \times 100$$

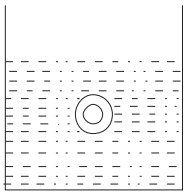
$$60 = \frac{y}{85+7.391} \times 100$$

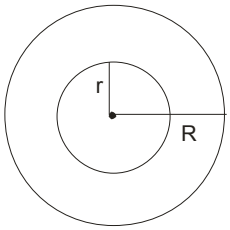
$$Y \simeq 55.5 \text{ gm}$$

$$\% \text{ Silica in original sample} = \frac{55.5}{100} \times 100 \simeq 55.5\%$$

10. (b)

11. (c)





Reading of weighing machine = 400 gm

Mass of water = 262 gm

Mass of beaker = 50 gm

In equilibrium.

400 g = (262 + 50) g + weight of sphere

400 g = 312 g + mg

m = 88 gm

volume of sphere = $36\pi = \frac{4}{3}\pi R^3$

R = 3 cm

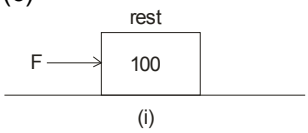
$$\frac{4}{3}\pi(R^3 - r^3) \times d = 88$$

$$R^3 - r^3 = \frac{88 \times 3}{4\pi 8}$$

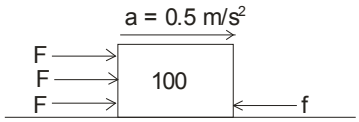
r = 2.899 cm

So thickness = R – r = 3 – 2.899 = 3 – 2.9 = 0.1 cm = 1 mm.

12. (c)



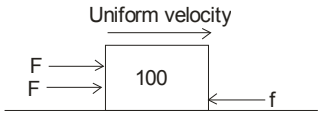
(i)



(ii)

$3F - f = 100 \times a$ ..... (i)

$3F - f = 100 \times 0.5 = 50$



(iii)

$f = 2F$ ..... (ii)

From (i) & (ii)

$3F - 2F = 50$

$F = 50$

Put the value in equation (ii)

$2 \times 50 = \mu \times N$

$100 = \mu \times 10 \times 100$

$\mu = \frac{1}{10}$

$\mu = 0.1$

13. (d)

Element	Group
A	1
B	2
C	14
D	17

Elements of group (14) & (17) are non-metals so they will react with each other to give covalent compound.

14. (c)

Given that

$C_2H_2O_4 . 2H_2O = 252$ mg

Now, moles of oxalic acid = $\frac{\text{Given mass}}{\text{GMM}}$

$= \frac{252 \times 10^{-3}}{126}$

$= 2 \times 10^{-3}$

One mole molecule of oxalic acid contains 2 mole of H_2O

So in 2×10^{-3} moles of oxalic acid amount of water will be = $2 \times 2 \times 10^{-3} = 4 \times 10^{-3}$ mole

So, No. of molecules of water of hydration = $4 \times 10^{-3} \times 6.023 \times 10^{23}$

$= 24.08 \times 10^{20} = 2.4 \times 10^{21}$

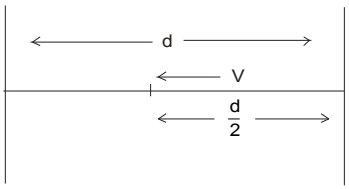
15. (c)

16. (d)

17. (b)

No change in flux.

18. (b)



For first echo

$$\frac{\left(\frac{d}{2}+\frac{d}{2}-2V\right)}{2} = V_s$$

$$\frac{d-2V}{2} = V_s \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

And for second echo

$$\frac{\frac{d}{2}+\frac{d}{2}+3V}{3} = V_s$$

Or $\frac{d+3V}{3} = V_s$ $\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$

From equation (1) and (2)

$$\frac{d-2V}{2} = \frac{d+3V}{3}$$

$3d - 6V = 2d + 6V$

$d = 12\ V$

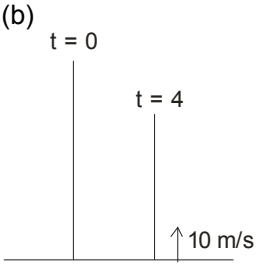
Using this value in equation (1)

$$\frac{12V-2V}{2} = V_s$$

$5V = V_s$

That means velocity of sound is five times of velocity of sound so option (b) is correct.

19. (b)



For upward journey

$V = U - gt$

$0 = 10 - 10\,t$

$t = 1$ s

& $V^2 - U^2 = 2gh$

$0 + 100 = 2 \times 10 \times h$

$h_1 = 5$ m

while for downfall

$h = \frac{1}{2} gt^2 = \frac{1}{2} \times 10 \times 3^2$

$h_2 = 45$

Difference in height = $h_2 - h_1 = 45 - 5 = 40$ m

20. (a)

In case P :

Al is more reactive than Zn, So reaction will occur

$2Al(s) + 3ZnSO_4(aq) \rightarrow Al_2(SO_4)_3\,(aq) + 3Zn\,(s)$

In case Q :

Pb is less reactive than Fe, So reaction will not occur.

$Pb(s) + FeSO_4(aq) \rightarrow$ No reaction

In case R :

Fe is more reactive than Pb, So reaction will occur

$Fe(s) + Pb(NO_3)_2(aq) \rightarrow Fe(NO_3)_2(aq) + Pb(s)$

In case S : Ag is less reactive than Cu, So reaction will not occur

$Ag(s) + CuSO_4(aq) \rightarrow$ No reaction

21. (a)

22. (c)

For Hydrogen gas

Given, Pressure = 0.8 bar, Volume = 0.7 ℓ

For Oxygen gas

Given Pressure = 0.6 bar, Volume = 1.5 ℓ

Now, given total volume of gaseous mixture is 1 ℓ at 25°C

Let total pressure = P_T

So by using ideal gas equation

$P_T \times 1 = (n_H + n_O) \times RT$

$\Rightarrow P_T = \left[\left(\frac{0.8 \times 0.7}{RT}\right) + \left(\frac{0.6 \times 1.5}{RT}\right)\right] \times RT$

$\Rightarrow P_T = 0.56 + 0.9$

$\Rightarrow P_T = 1.46$ bar

23. (b)

Red and green.

24. (d)

25. (b)

26. (a)

27. (a)

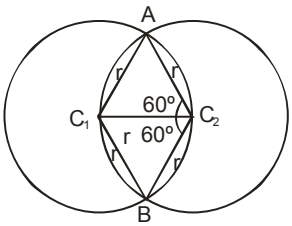
In presence of phenolphthalein indicator, equivalents of HCl = $\frac{1}{2}$ equivalents of Na_2O_3.

$\because$ x ml of HCl will be used for $\frac{1}{2}$ eq. of Na_2CO_3.

So 1 eq. of Na_2CO_3 required = 2x ml of HCl.

28. (d)

29. (c)



$\therefore$ Length of AC, B is $\frac{1}{3}$ of total circumference or its resistance is

$\frac{36}{3} = 12\ \Omega$

Rest part will have resistance = 24 Ω

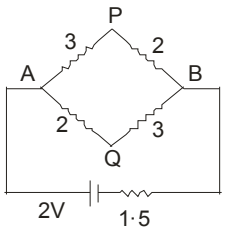
$$\frac{1}{R_{effAB}} = \frac{1}{12}+\frac{1}{12}+\frac{1}{24}+\frac{1}{24}$$

$$\frac{1}{R_{effAB}} = \frac{1}{4}$$

$\therefore$ $R_{effAB} = 4$

$\therefore$ Power = $\frac{V^2}{R} = \frac{4}{4} = 1$ W

30. (a)



$$i = \frac{V}{Reff} = \frac{20}{4} = 5A$$

$V_A - V_P = 3 \times 2{\cdot}5 = 7{\cdot}5$ V

$V_A - V_Q = 2 \times 2{\cdot}5 = 5$ V

$V_Q - V_P = 2{\cdot}5$ V

$V_P - V_Q = -2{\cdot}5$ V

31. (A) Energy = 2eV, Voltage = 1V

Charge present on X = $\frac{2}{1}$ = 2 × 1.6 × 10^{-19} C

So, Ion will be X^{2-}

Let no. of e^- in X^{2-} = y

Then number of neutrons will be

Neutron = y + $\frac{25}{100}$ y

Neutron = $\frac{125}{100}$ y

We know that

Number of proton + number of neutron = 79

y – 2 + $\frac{125}{100}$ y = 79 ($\therefore$ Ion contains two more e^- than number of proton)

$\frac{225}{100}$ y = 81

y = 36

then number of proton = y – 2

= 36 – 2 = 34

So, atomic number of X will be = 34 & Ion will be = Se^{-2}

(B) In Pure state calcium occurs in silvery white colour. So element 'A' should be calcium (Ca)

$2Ca + O_2 \xrightarrow{\Delta} 2CaO$

(white ash of calcium oxide)

(X)

$CaO + H_2O \rightarrow Ca(OH)_2$ (aq)

(Y) Basic solution

$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2$

(Y) (B) Bleaching powder

$Ca(OH)_2 + H_2SO_4 \rightarrow CaSO_4(s) + H_2O$

(Y) (Z)

So, A $\rightarrow$ calcium (Ca)

B $\rightarrow$ Bleaching powder ($CaOCl_2$)

Y $\rightarrow$ Calcium Hydroxide [$Ca(OH)_2$]

Z $\rightarrow$ Calcium sulphate [$CaSO_4$]

32. Dotted part m not be a part of answer

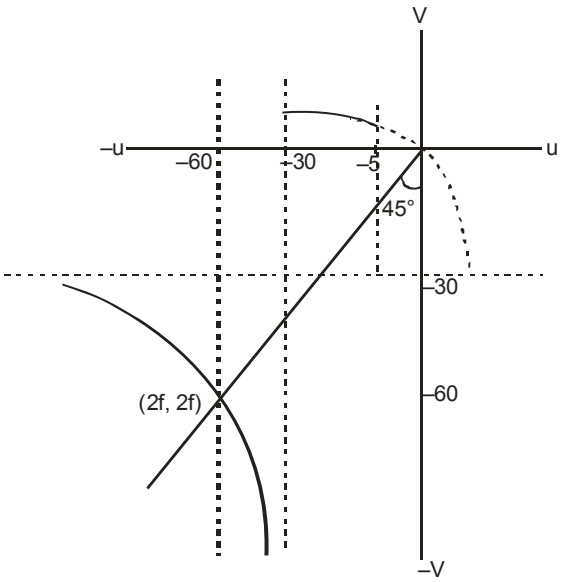


Figure not to scale and all dimensions are in centimeters

U	-5	-10	-20	-30	-40	-50	-60	-70	-80	-90
V	+6	+15	+60	∞	-120	-75	-60	-52.5	-48	-45

33. **(I)** Given 200 ml of 5% glucose solution

100 ml of glucose solution contain = 5 gm glucose

$\therefore$ 200 ml of glucose solution contain = 10 gm glucose

(M.W. of glucose = 180 gm)

Moles of glucose given to the sprinter = $\frac{\text{given mass}}{\text{molecular mass}} = \frac{10}{180}$ = 0.055 moles of glucose

(II) Given 100% glucose converted to pyruvic acid.

Thus, Glucose $\rightarrow$ 2 pyruvic acid

So, 0.055 glucose $\rightarrow$ 2 × 0.055 pyruvic acid = 0.11 pyruvic acid

(III) Moles of pyruvic acid present = $\frac{1}{9}$

25% of pyruvic acid = $\frac{25}{100} \times \frac{1}{9} = \frac{1}{36}$ mole

1 mole pyruvic acid produces 1 mole lactic acid

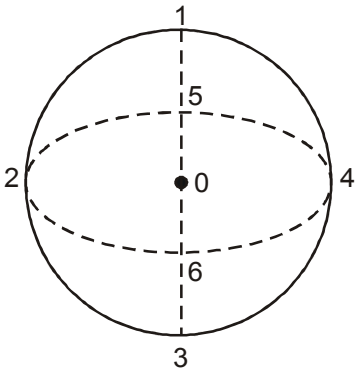
25% PA. $\left(\frac{1}{36}\right)$ will produce $\frac{1}{36}$ moles of lactic acid

(IV) Mole of P.A. $\longrightarrow$ produces 3 moles CO_2

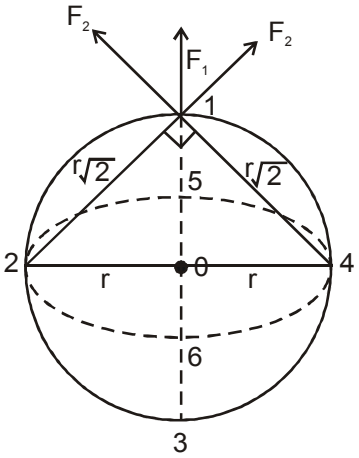
$\frac{1}{9}$ moles of PA $\longrightarrow \frac{1}{9} \times 3 = \frac{1}{3}$ moles of CO_2

(V) (i) Cytoplasm (ii) Cytoplasm (iii) Mitochondria

34. (i)



(ii)



(iii) Force on proton 1 do to proton 3

$F_1 = \frac{Kq^2}{4r^2}$ $\quad q = 1.6 \times 10^{-19}C$

$r = 2.7 \times 10^{-15}m$

Force on proton 1 do to proton 2 or 4

$F_2 = \frac{Kq^2}{\left(r\sqrt{2}\right)^2}$

Force on proton 1 do to proton 5 or 6

$F_3 = \frac{Kq^2}{\left(r\sqrt{2}\right)^2}$

Net electrostatic force on proton 1

$F_e = F_1 + F_2 \times \sqrt{2} + F_3 \times \sqrt{2}$

On putting the value we will get

$F_e = 52.46$ N

(iv) For gravitation force on proton 1

$F_g = F_1 + F_2 \times \sqrt{2} + F_3 \times \sqrt{2}$

Where $F_1 = \frac{Gm^2}{4r^2}$ $\quad F_2 = \frac{Gm^2}{\left(r\sqrt{2}\right)^2}$ $\quad F_3 = \frac{Gm^2}{\left(r\sqrt{2}\right)^2}$ Here $m = 1.67 \times 10^{-27}$ kg

$r = 2.7 \times 10^{-15}$ m

$F_g = 4.24 \times 10^{-35}$ N

(v) $\frac{F_e}{F_g}$ obtained in step (iii) & (iv)

$\frac{F_e}{F_g} = 12.37 \times 10^{35}$

(vi) Radially outward

35.

(A) $\rightarrow$ Given $KClO_3$ = 90 gm (60% purity)

Mass of pure $KClO_3$ in sample = $\frac{90 \times 60}{100}$ = 54 gm.

Moles of $KClO_3$ present = $\frac{54}{122.5}$ = 0.44 moles of $KClO_3$.

$2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$

Oxygen gas will be produced on decomposition of $KClO_3$.

2 moles of $KClO_3$ gives 3 moles O_2

$\therefore$ 0.44 moles of $KClO_3$ will give = $\frac{3}{2}$ × 0.44 moles of O_2 = 0.66 moles of O_2.

$\rightarrow$ When O_2 reacts with H_2 , it gives H_2O.

$O_2 + 2H_2 \rightarrow 2H_2O$

One mole of oxygen require 2 moles of H_2.

$\therefore$ 0.66 mole O_2 required = 0.66 × 2 = 1.32 mole of H_2 required

$\rightarrow$ For the production of H_2 gas steam is passed over hot Mg metal.

$Mg_{(s)} + H_2O_{(g)} \rightarrow MgO_{(s)} + H_{2(g)} \uparrow$.

1 mole of H_2 will be obtained from 24 gm Mg.

$\because$ 1.32 mole of H_2 will require = 24 × 1.32 gm = 31. 68 gm Mg.

Ans. 31.68 gm Mg metal is required.

(B) (I) A = Al

B = Fe_2O_3

C = Fe

D = Al_2O_3

(II) $2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$

(A) (B) (C) (D)

(III) $2Al + 3O_2 \rightarrow 2Al_2O_3$

When (A) reacts with air, it will give aluminium oxide which is amphoteric in nature.

(IV) $Al_2O_3 + 6HCl(aq) \rightarrow 2AlCl_3 + 3H_2O$

$Al_2O_3 + 2NaOH(aq) \rightarrow 2NaAlO_2 + H_2O$

36.

(I)

(i) Statements a and b are correct as the mother and father both need to be heterozygous for a recessive trait to appear in next generation. Daughters, however can be either AA/Aa homozygous / heterozygous.

(ii) Statements a & b are correct as mother has to be carrier X^6X if the male child is affected (Criss –Cross inheritance). Both daughters however can receive either X^C or X from mother, Therefore, can be homozygous / heterozygous.

(II) If both parents carry allele for disorder.

A<u>a</u>	×	A<u>a</u>
(male)		(female)
AA	–	1
A<u>a</u>	–	2
aa	–	1

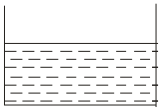
Probability that first daughter would carry same allele is 2/4 (b) option.

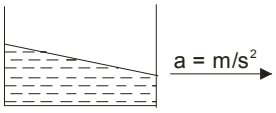
(III) If the affected son marries a woman, who does not carry the allele of the disorder, then child can be

X^C × XX

	X	X
X^C	X^CX	X^CX
Y	XY	XY

Son = O (Male unaffected)
Daughter = 1 (Allele present)

37. (i) Yes 

(ii) No. 

(iii) For maximum acceleration possible the liquid level can go up to a maximum of 0·4 m (Since it is already filled up to 80% of 2 m = 1·6 m)

$\therefore \quad \tan\theta = \frac{a}{g}$

$\frac{0\cdot4}{1\cdot5} = \frac{a}{g}$

$\therefore \quad a = \frac{4g}{15} = \frac{40}{15} = 2\cdot66 \text{ m/s}^2$

(iv) (d)

38. (A) Given that

10.7% NH_4Cl in 100 ml solution

So, NH_4Cl = 10.7 gm

moles of NH_4Cl = $\frac{10.7}{\text{Gmm of } NH_4Cl} = \frac{10.7}{53.5}$ = 0.2 moles

(i) $2NH_4Cl\,(aq) + Ca(OH)_2(aq) \rightarrow CaCl_2\,(aq) + 2NH_3\,(g) + 2H_2O$

Ammonium chloride — Slaked lime — calcium chloride — Ammonia gas

$2NH_3(g) + 3CuO(s) \rightarrow N_2\,(g) + 3Cu(s) + 3H_2O$

(ii) **3 moles of CuO** require **1 moles $Ca(OH)_2$**

3x79.5 gm CuO is required by **= 1 × 74 gm $Ca(OH)_2$**

So **25.85 gm** CuO is required by = $\frac{1\times74\times25.85}{3\times79.5}$ = **8.02 gm** $Ca(OH)_2$

(iii) $2NH_3(g) + 3\,CuO(s) \longrightarrow 3Cu(s) + N_2(g) + 3H_2O$
0.2 mole 23.85 gm.
=0.3 mole

2 moles of NH_3 gives $\longrightarrow$ 3 moles of Cu

$\therefore$ 0.2 mole gives $\longrightarrow$ 0.3 moles of Cu

Mass of Cu = 0.3 moles × 63.5 g/mol
= 19.05 gm of Cu

(B) As per the fourth period

a	b	c	d	e	f	g	h	i	j	k	L	m	n	o	p	q	r
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr

(i) According to above table covalency of **o** [As] is three and Covolency of **q** [Br] is one, so compound formed when **o** reacts with **q** will be $\mathbf{oq_3}$ or $\mathbf{AsBr_3}$

(ii) Element **g** [manganese (Mn)] will show maximum oxidation state (+7).

(iii) Salt of element **g** [manganese (Mn)] of purple colour will be $KMnO_4$.
$KMnO_4 \longrightarrow$ Contains two elements of fourth period K and Mn but It shows purple colour and act as a disinfectant and used in sterilizing water due to Mn as Mn is a good oxidising agent.

(iv) Element **k** [Copper (Cu)] is Coinage metal.)

(v) Element **n** [Germanium (Ge)] and **o** [Arsenic (As)] are metalloids)

(vi) Brass is an alloy made up of copper and zinc [70 : 30 ratio]. So Element **l** [Zinc (Zn)] has lower percentage ($\approx$ 30%).

39

1. (b) The starch free leaves can be obtained by keeping the plant in dark, so that already present starch is utilized in 48 hrs.

2. (c) Starch presence can be tested by adding iodine solution which gives bluish black colour of starch – iodine mixture.

3. (c) Purpose of illumination to specific wavelengths of light is the excitation of chlorophyll (light reaction).

4. (b) Wilting occurs due to wax blocks the transpiration so water transportation inhibits.

5. (c) The transport of glucose, occurs in the form of sucrose, in phloem therefore, when cell sap oozes out, liquid contains sucrose

6. (b) Photosynthesis will occur till the test tube is illuminated with white light & sodium bicarbonate is present which yields CO_2 in solution.

40.

(A) Since potenitial is a scalar quantity.

$\Delta W = \Delta KE$

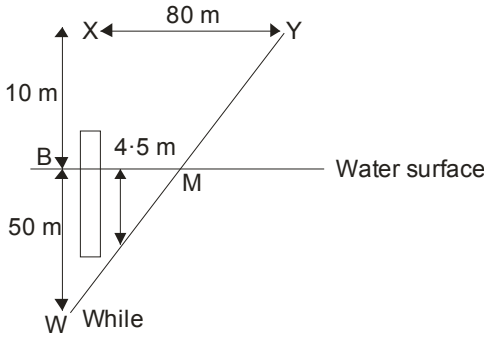
$qV = \frac{1}{2}mV_2^2 - \frac{1}{2}mV_1^2$

$q \times 10 = \frac{1}{2} \times 0.02 \times (1600 - 400)$

$= 600 \times 0.02$

$q = 1.2\ C$

(B)



height of ice block outside the water = 9 % of 50m = 4.5 m
Since density of ice = 910 kg/m^3
& density of water = 1000 kg/m^3

Distance = YW = $\sqrt{80^2 + 60^2} = 100$m

(i) 4.5m

(ii) By similar Δ s

$$\frac{50}{60} = \frac{BM}{80}$$

$$\therefore \quad BM = \frac{4000}{6} = \frac{200}{3m}$$

$$\therefore \quad WM = \sqrt{BM^2 + 50^2} = \sqrt{\frac{40000}{9} + 2500} = \frac{250}{3}m$$

$$\therefore \quad MY = 100 - \frac{250}{3} = \frac{50}{3}m$$

(iii) $t_{WY} = \frac{D_{WM}}{V_{water}} + \frac{D_{YM}}{V_{air}}$

$$= \frac{250}{3\times 1500} + \frac{50}{3\times 350} = 0.103s$$

(iv) $t_{WX} = t_{WY} - 0.07 = 0.103 - 0.07 = 0.033$ s

(v) $t_{WX} = \frac{4.5}{1500} + \frac{50}{V_{ice}} + \frac{5.5}{350}$

$t_{WY} = t_{WX} + 0.07$ (As per given condition)

$$0.103 = \frac{4.5}{1500} + \frac{50}{V_{ice}} + \frac{5.5}{350} + 0.07$$

$$0.033 = \frac{4.5}{1500} + \frac{50}{V_{ice}} + \frac{5.5}{350}$$

$$V_{ice} = \frac{50}{0.0143}$$

$V_{sound\ in\ ice}$ = 3496.5 m/s

41.

(A) Volume of NaOH = $\frac{6\times 2}{100}$ = 0.12 mL

(HCl) (NaOH)

$M_1V_1 = M_2V_2$

$M_1 = \frac{1\times 0.12}{5}$ = 0.024 M

Weight of HCl= $\frac{M1V1}{1000}$ x mol. wt. of HCl = $\frac{0.024\times 5}{1000}$ x 36.5 = 4.38 x10^{-3}g

(B) Eq. of NaOH = Eq. of dibasic acid.

$N_1V_1 = N_2V_2$

$N_1 \times 11.3 = 10 \text{ ml} \times 0.05 \times 2$

Normality of NaOH = 0.088 N

amount of NaOH present in 250 ml NaOH solution.

$Wt = \frac{ENV}{1000} = \frac{40 \times 0.088 \times 250}{1000}$ = 0.88 gm NaOH reacted.

(I) Amount of NaOH spilled on floor is = 1 gm – 0.88 gm = 0.12 gm NaOH spilled on floor.

(II) Molecules of NaOH present during titration = $\frac{M \times V}{1000} X\ N_A$

$= \frac{0.0885 \times 11.3}{1000} \text{ x } 6.023 \text{ x } 10^{23}$

$= 6.023 \text{ x } 10^{20}$ molecules

Molecules of Dibasic acid present during titration = $3.0115 \text{ x } 10^{20}$ molecules

42. (A) (i) 5 food chains are present in the food web

(ii) A = 1200 J
B = 1200 J
C = 1200 J
D = 120 J
E = 12 or 120 J
F = 120 J

(iii) Tertiary consumer here is Eagle, so for eagle the most energy efficient link is rabbit, as the rabbit is not being eaten in any other food chain.

(B) (i) Insects net secondary production is (a) 12 J.
Net secondary productivity(NSP) = Gross secondary productivity(GSP) – Respiratory loss(R).
= 100 – (52 + 36) = 12 J

(ii) Production efficiency = $\frac{\text{Net productivity}}{\text{assimilatory energy}} \times 100s$

$= \frac{12}{(100-52)} \times 100 = \frac{12}{48} \times 100 = 25\%$ (b) Ans.

(C) Answer is (d) because maximum production efficiency is of micro organisms.