DR.HOMI BHABHA BALVAIDNYANIK COMPETITION

HINTS & SOLUTIONS

01. (D)

02. (B)

03. (C)

04. (C)

05. (D)

06. (A) Average temperature at night in the month of march in pune is about 15ºC so correct option is (A).

07. (C)

08. (B)

09. (A)$T = 2\pi\sqrt{\frac{\ell}{g}}$ that means $T \propto \sqrt{\ell}$

for $T_p \propto \sqrt{25}$ ...(i)

$T_q \propto \sqrt{20}$ ...(ii)

$\frac{T_P}{T_Q} = \sqrt{\frac{25}{20}}$

$\frac{T_P}{T_Q} > 1$

So $T_P > T_Q$

010. (D) area under velocity time graph represent distance travelled

So distance = 60 × (5–2)

= 60 × 3 = 180 km

011. (A) Electric energy consume perday = $\frac{4 \times 100}{1000}$ = 0.4 kwh.

So total electric energy consume in February 2010 = 0.4 × 29 = 11.6 kwh.

012. (D) According to image formation rules of mirror 'D' option is wrong.

013. (A)

014. (B) We know 1 KWh = 3.6×10^6 J

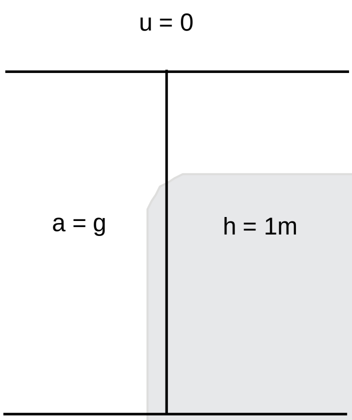
So 0.5 KWh = ½ × 3.6 × 10^6 = 1.8 × 10^6 J

015. (A)

016. (B)

017. Bonus According to Class-IX NCERT

018. (B)



From III equation of motion

$V^2 = u^2 + 2gh$

$V^2 = 0 + 2 \times g \times 1$

$V = \sqrt{2g}$

019. (A)

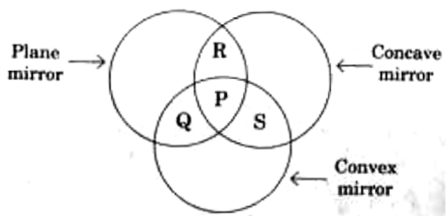
020. (C) We know

$E_K = \frac{1}{2} mv^2$

$E_k = \frac{1}{2} mv.v$

$= \frac{1}{2} pv \quad (p = mv)$

021. (A)



P →In all 3 mirrors virtual image can be formed but real image can not be formed in convex mirror.

Q →In both plane and convex mirror erect image can be formed.

R →In both plane and concave mirror similar sized image can be formed.

S →In both concave and convex mirror diminished image can be formed.

022. (B) X$\rightarrow$momentum = mass × velocity

Unit = kg ms^{-1}

It is vector quantity

Y $\rightarrow$Work = F×d unit = N – m

Scalar quantity

Z $\rightarrow$Pressure = $\frac{F}{A}$

Unit Nm^{-2} scalar

W $\rightarrow$ Power = $\frac{\text{work}}{\text{time}}$

Unit = $\frac{N-M}{Sec}$ Scalar

023. (D) We know R = $\frac{\rho\ell}{A}$

In A option R = $\frac{P\ell}{A}$ ……..(i)

In B option $R_1 = \frac{\rho \times 2\ell}{A/2} = \frac{4\rho\ell}{A}$ = 4 R

In C option $R_2 = \frac{\rho \times \ell/2}{2A} = \frac{\rho\ell}{4A}$ = R/4

In D option $R_3 = \frac{\rho \times 2\ell}{A/3} = \frac{6\ell\rho}{A}$ = 6R

024. (C) In P virtual image is diminished so mirror should be convex

In Q virtual image is enlarged so mirror should be concave

025. (A) $W_e = Mg_e$ = 29.4 N

M = $\frac{29.4}{9.8}$ = 3

Now from conservation of energy at moon

Change in K.E. = Change in P.E

$K_{\text{at surface}} - K_{\text{at 20M height}} = PE_{\text{at 20M}} - PE_{\text{at surface}}$

KE – 0 = 3 × $\frac{g}{6}$ × 20

$= 3 \times \frac{9.8}{6} \times 20$

$= 97.8 \approx 98J$

026. (C) $V = \frac{2d}{t}$

$T = \frac{2d}{V} = \frac{2 \times 3100}{1550} = 4$ sec.

027. (B) For one complete cycle displacement = 0

So Average velocity is '0'.

028. (B)

In parallel combination

•Potential difference each resistor is same

•If minimize resistor of circuit

•Resultant of resistance will be less than lowest resistance connected in parallel

029. (A)

$M_x : M_y = 1 : 2$

$P_x = P_y$ (given)

$M_x \times V_x = M_y \times V_y$

$\frac{V_x}{V_y} = \frac{M_y}{M_x} = \frac{2}{1}$

030. (C)

Given u = 7 m/s

s = 92 m.

t = 4 sec.

a = ?

$s = ut + \frac{1}{2}at^2$

$92 = 7 \times 4 + ½ a \times 4^2$

$92 - 28 = 8a \Rightarrow a = \frac{64}{8} = 8$ m/sec^2

031. When we move from left to right in a period the atomic size decreases.

∴ Atomic size of Na > Atomic size Al

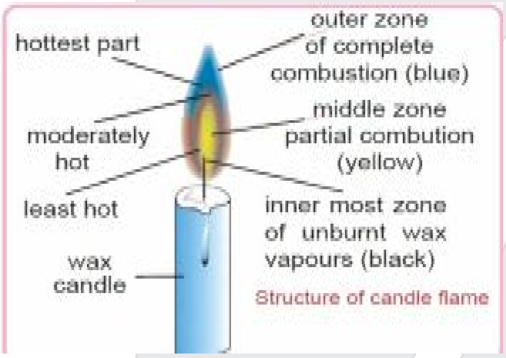
Na > Al

Ans. (A)

032. Graphite and diamond both are represented by carbon (C) while formula of marble is $CaCO_3$ and wool is protein (Organic compound).

Ans. (C)

033.



Outer most zone

Ans. (C)

034. Chemical equation are balance to follow the law of conservation of mass.

∴ Total number of atoms of each element on reactant side = total numbers of atoms of each element on product side.

$2KNO_3 \rightarrow 2KNO_2 + O_2$

Ans. (D)

035. Liquefied Petroleum Gas (LPG) is a colourless, odourless and inflammable gas. A strong smelling substance called **ethyl mercaptan** (C_2H_5SH) is added to LPG to detect the leakage of gas from the cylinder.

Ethyl mercaptane (C_2H_5SH)

Ans. (C)

036. (i) Salt of strong acid and strong base is neutral.

(ii) Salt of strong acid and weak base is acidic.

(iii) Salt of weak acid and strong base is basic.

Only statement (i) is correct.

Ans. (B)

037. Malleability is not a single reason for α particles experiment.

Ans. (D)

038. X + dil $H_2SO_4 \rightarrow$ Salt + H_2

X + NaOH $\rightarrow$ Salt + H_2

X is an amphoteric metals which shows the properties of acids as well as bases.

Ans. (A)

039. Number of proton in X = 8

Number of neutron in X = 8

Atomic mass = Number of neutron + Number of proton = 8 + 8

Atomic mass = 16 i.e. $^{16}_{8}X$

Number of neutron in Y = 10

Atomic mass = 10 + 8 = 18 i.e. $^{18}_{8}Y$

$\therefore$ X and Y are isotopes because same atomic number of elements i.e. X and Y have different physical properties but identical chemical properties.

Ans. (C)

040. Because blood (pH = 7.35 to 7.45) is basic in nature while others are acidic nature.

black coffee (pH = 5)

Urine (pH = 6.5 to 6.9)

Vinegar (pH = 3 to 4)

Ans. (C)

041. $2H_2O(\ell) \xrightarrow{\text{Electrolysis}} \underset{\substack{\text{at}\\\text{Cathode}}}{2H_2(g)} + \underset{\substack{\text{at}\\\text{Anode}}}{O_2(g)}$ or $H_2O(\ell) \longrightarrow H_2(g) + \frac{1}{2}O_2(g)$

i.e the volume of gas evolved at the anode is half the volume of gas evolved at the cathode.

Ans. (C)

042. $Na_2B_4O_7.10H_2O$ (Borax)

Ans. (D)

043. XCl_2 Valency of X is +2

Metal sulphate

$\underset{2}{X^{+2}} \quad \underset{2}{SO_4^{2-}} \Rightarrow XSO_4$

Metal Hydroxide

$\underset{2}{X^{+2}} \quad \underset{1}{OH^{-}} \Rightarrow X(OH)_2$

Ans. (C)

044. The neon sign bulbs and fluorescent tubes glow because of high applied voltage

Ans. (C)

045. Because LPG (liquefied petroleum gas) contain butane (C_4H_{10}).

Ans. (C)

046. In chemical reaction electrons are transferred from one atom to another and shared between two atoms. Both statement are true.

$Mg + 2HCl \rightarrow MgCl_2 + H_2$ (Transfer of electrons)

$C + O_2 \rightarrow CO_2$ (Sharing of electrons)

Ans. (C)

047. The composition of portland cement is CaO (60 to 67%), SiO_2 (17 to 25%), Al_2O_3 (3 to 8%) and Fe_2O_3(0.5 to 6%)

Ans. (B)

048. Decomposition of vegetable matter into compost is an example of exothermic reaction, aerobic and anerobic decomposition reaction.

Ans. (B)

049. $CuCl_2\ (aq) \xrightarrow{\text{electrolysis}} Cu^{2+}(aq) \quad + \quad 2Cl^{-}(aq)$

(P) anode (+) | (Q) cathode(–)

oxidation | reduction

$2Cl^{-} \rightarrow Cl_2 + 2e^{-}$ | $Cu^{2+} + 2e^{-} \rightarrow Cu$

P is a Cl_2 & Q is a Cu

Ans (B)

050. Low melting point and high boiling point are not the properties of covalent compounds.

Ans.(C)

051. Acetic acid CH_3COOH is a weak acid ammonium hydroxide is a weak base because both of them undergo partial ionisation in aqueous solution

Ans. (A)

052.

Reduction

$$\overset{0}{Mg} + \overset{+2}{CuO} \longrightarrow \overset{+2}{MgO} + \overset{0}{Cu}$$

Oxidation

Removal of electron $\Rightarrow$ oxidation

Addition of electron $\Rightarrow$ Reduction

$\therefore$ Mg is getting oxidised and act as an reducing agent while CuO is getting reduced and act as an oxidising agent.

$\therefore$ Its is a redox reaction because of both oxidation and reduction reaction takes place.

(i), (ii) (iv) are correct

Ans. (A)

053. Number of moles = $\dfrac{\text{Givenmass}}{\text{Molar mass}}$

$\therefore$ Number of moles of CO_2 = $\dfrac{77\text{g}}{44\,\text{g/mol}} = \dfrac{7}{4}$ mol

Number of molecule in 1 mole = N_A = 6.023×10^{23} molecule

$\therefore$ Number of molecules in $\dfrac{7}{4}$ mole of CO_2 = $\dfrac{7}{4} \times 6.023 \times 10^{23}$

= 10.54×10^{23}

Ans. (B)

054. Dalton use the symbol of elements in the form of sketches.

Dalton's symbol for hydrogen element is $\odot$

Ans. (B)

055. All sulphides are insoluble lead sulphide is particularly insoluble

$Pb^{+} + S^{2-} \rightarrow PbS\ (s) \downarrow$

This is the net ionic equation. The stoichiometric equation would be :

$(CH_3COO)_2Pb\ (aq) + H_2S(aq) \rightarrow PbS(s) \downarrow + 2CH_3COOH\ (aq)$

A black precipitate of lead sulphide would precipitate with clarity.

056. According to reactivity series of metal Li > K > Na > Ca and so on.

So K (potassium) is the second most reactive metal. It reacts violently with cold water thereby producing large amount of energy due to which the hydrogen gas produced in the reaction catches fire.

$$2K(s) + 2H_2O(\ell) \longrightarrow 2KOH(aq) + H_2(g) + \text{Energy}$$

(Potassium) (Cold water) (Potassium hydroxide) (Hydrogen gas)

Ans. (B)

057. Mass proportion of an element in a compound = $\dfrac{\text{Molar Mass of an element}}{\text{Total molar mass of compound}} \times 100$

Molar mass of CuO = 63.546 + 16 = 79.546 u

Weight proportion of Cu = $\dfrac{63.546}{79.546} \times 100$

Weight proportion of O = $\dfrac{16}{79.546} \times 100$

Ratio of weight proportion of Cu & O

Cu : O

$\dfrac{63.546}{79.546} \times 100 : \dfrac{16}{79.546} \times 100$

63.546 : 16

3.968 : 1

Ans. (A)

058. I - 131, Cs -137, Sr-90, Pu - 241

Ans. (B)

059. All positive radicals are basic radicals except hydrogen ion (H^+)

So option **(A)** is correct. Which contain all positive radical.

Ans. (A)

060. Water contains H^+ & OH^- ions is equal ratio, so on adding acid, H^+ ions concentration increases while OH^- ion concentration decreases.

Ans. (B)