SCIENCE – 086

Section-A

Q.1) (B) Calcium and Magnesium

Q.2) (A) $Mg \overset{\cdot\cdot}{:} \overset{\text{xx}}{\underset{\text{xx}}{O}} \overset{\cdot\cdot}{:} \rightarrow Mg^{2+}[:\overset{\text{xx}}{\underset{\text{xx}}{O}}:^{2-}]$
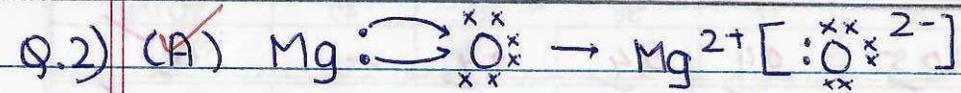
Q.3) (C) It has weak electrostatic forces of attraction between its oppositely charged ions

Q.4) (A) Salt and water is formed

Q.5) (B) 5

Q.6) (B) Al_2O_3 and MgO

Q.7) (D) 1:8

Q.8) (D) Cytoplasm and Oxygen deficient muscle cells

Q.9) (c) 100% round and yellow

Q.10) (c) (i) and (iii)

Q.11) (D) Auxins

Q.12) (c) Starch into simple sugars

Q.13) (D) 99%

Q.14) (D) (ii) and (iv)

Q.15) (A) scattering of light

Q.16) (A) (i) and (ii)

Q.17) (B) Both Assertion(A) and Reason(R) are true, but Reason (R) is not the correct explaination of (A)

Q.18) (A) Both Assertion (A) and Reason(R) are true and Reason(R) is the correct explaination of Assertion(A).

Q.19) (C) Assertion(A) is true, but Reason (R) is false.

Q.20) (B) Both Assertion(A) and Reason (R) are true, but Reason(R) is not the correct explaination of Assertion(A)

Section-B

Q.21) Given –

$u = -10\,cm$ (object distance)

$f = -15\,cm$ (Since it is a concave mirror)

To find → v (image distance)

⇒ Mirror formula $= \dfrac{1}{v} + \dfrac{1}{u} = \dfrac{1}{f}$

$\Rightarrow$ $\dfrac{1}{V} - \dfrac{1}{10} = \dfrac{-1}{15}$

$\Rightarrow$ $\dfrac{1}{V} = \dfrac{-1}{15} + \dfrac{1}{10}$ ✓

$\Rightarrow$ $\dfrac{1}{V} = \dfrac{-10 + 15}{10 \times 15}$

$\Rightarrow$ $\dfrac{1}{V} = \dfrac{\cancel{5}}{\dfrac{10 \times 15}{2}}$

$$\boxed{V = +30 \, cm}$$ ✓

Position of image formed by mirror = +30cm
on the other side of mirror.

Q22)

(a) Lamp A →
Power = 50ω
Volt = 220V ✓

we know,
$$P = \frac{V^2}{R}$$

$$R = \frac{V^2}{P}$$

$$R_A = \frac{\overset{44}{\cancel{220}} \times 220}{\cancel{50}}$$

$$= 44 \times 22$$

$$= 968\,\Omega \qquad \checkmark$$

Lamp B →
Power = 25ω
Volt = 220V

$$P = \frac{V^2}{R}$$

$$R_B = \frac{\overset{44}{\cancel{220}} \times \overset{44}{\cancel{220}}}{\cancel{25}\,5}$$

$$= 1936\,\Omega \qquad \checkmark$$

$$\therefore \frac{R_A}{R_B} = \frac{968}{1936}$$

$$R_A : R_B = \boxed{1 : 2}$$

Q.23) Hydra reproduces by the process of budding. With help of regenerative cells, there is outgrowth called bud which develops.

Parent Hydra → → Small outgrowth Cbud) → Tentacle fully grown bud detached.
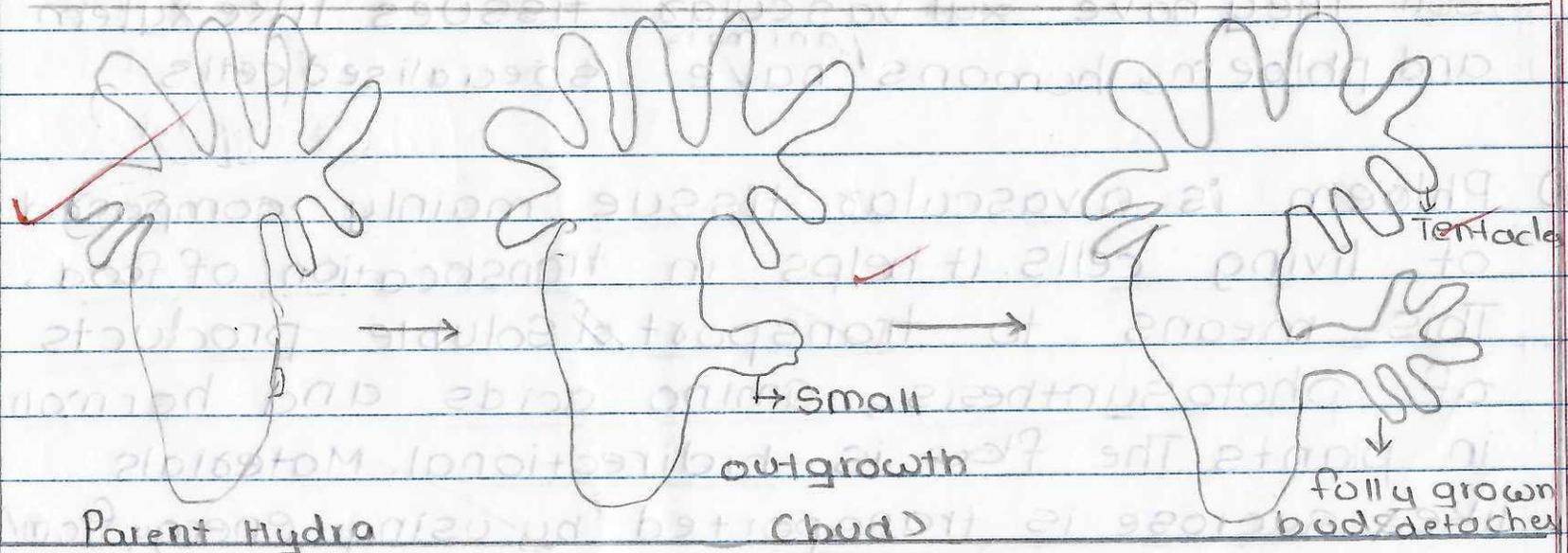
Diagᵐ - Budding in Hydra

Q.24)

(b)(i) The transport system in plants is relatively slower than in animals because plants are mainly composed of dead cells. Plants are stationary and don't require energy to perform activities when compared to humans. ^animals Moreover, simple processes like diffusion and osmosis help in transport of materials from soil. They have ~~xyl~~ vascular tissues like xylem and phloem, humans ^animals have specialised cells

(ii) Phloem is a vascular tissue mainly composed of living cells. It helps in translocation of food. This means to transport of soluble products of photosynthesis, amino acids and hormones in plants. The flow is bidirectional. Materials like sucrose is transported by using energy fromATP for eg. During spring, food stored in stem

and roots is transported to buds.

Q.25) For a chemical change to occur there has to be-

i) evolution of gas

II) change in temperature
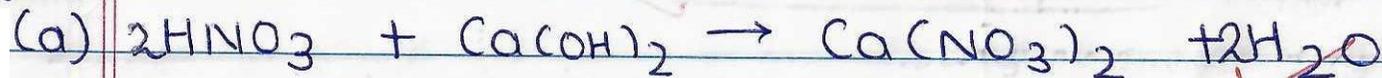
III) change in odour

IV) formation of precipitate

Here,

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

Here 2 observations are seen-

i) Evolution of gas (H_2) ✓

II) Change in temperature since this is an exothermic reaction. ✓

Q.26)

(a) $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

(b) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

Section-C

Q.27)

(a) When 1 Joule of work is done to move 1 Coloumb of charge from one point to another in an electric field, it is said to be 1 Volt
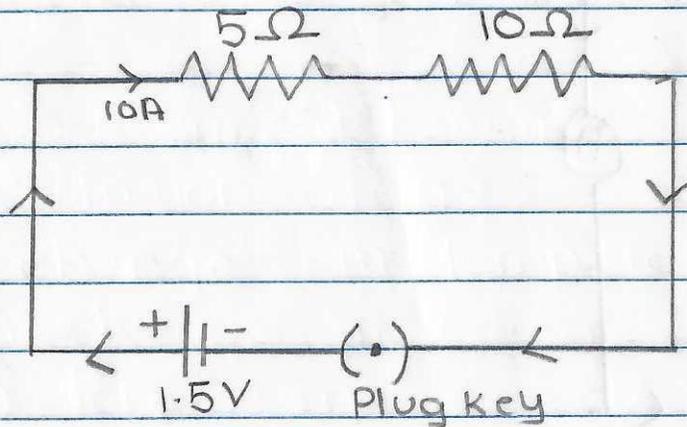
$$V = \frac{W}{Q}$$

$$1V = \frac{1J}{1C}$$

$$1V = 1JC^{-1}$$

Q.27)
(b)

Let $R_1 = 5\Omega$

$R_2 = 10\Omega$

To find $\rightarrow$ I (current)

Total resistance $(R_s) = R_1 + R_2$

$= 5 + 10$

$= 15\Omega$ ✓

$I = \dfrac{V}{R}$ (Ohm's law)

$= \dfrac{1.5}{15} = \cancel{10A}$ $\boxed{0.1A}$ ✓

Q.28)
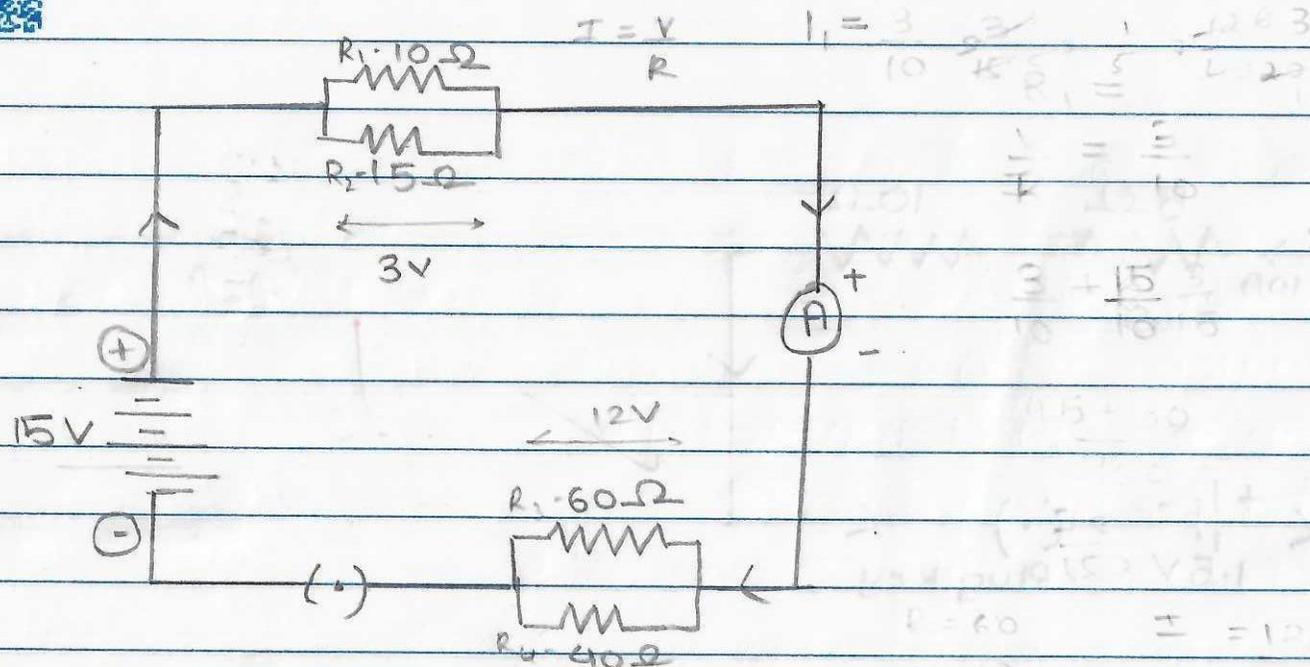
In the given circuit,
Let $R_1 = 10\Omega$

$R_2 = 15\Omega$

$R_3 = 60\Omega$

$R_4 = 40\Omega$

(a) Since R_1 and R_2 are in parallel,

$$\frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{R_5}$$

$\Rightarrow \quad \frac{1}{10} + \frac{1}{15} = \frac{1}{R_5}$

$\Rightarrow \quad \dfrac{15+10}{150} = \dfrac{1}{R_5}$

$\Rightarrow \quad \dfrac{\cancel{25}\ 5}{\underset{30}{\cancel{150}}} = \dfrac{1}{R_5}$

$$R_5 = 6\,\Omega \quad \checkmark$$

Now R_3 and R_4 are in parallel.

$\dfrac{1}{R_3} + \dfrac{1}{R_4} = \dfrac{1}{R_6}$

$\Rightarrow \quad \dfrac{1}{60} + \dfrac{1}{40} = \dfrac{1}{R_6}$

$\Rightarrow \quad \dfrac{100}{60 \times 40} = \dfrac{1}{R_6}$

$\Rightarrow \quad \therefore R_6 = 24\,\Omega \quad \checkmark$

Now total $R_S = R_5 + R_6$

$= \boxed{30\,\Omega} \longrightarrow$ Total resistance

(b) Total current →

$R = 30\,\Omega$

$V = 15\,V$

$I = \dfrac{V}{R}$ (Ohm's law)

$= \dfrac{1}{2}\,A$ ✓

(c) Total Resistance (R_5) of parallel combination of $10\,\Omega$ and $15\,\Omega = 6\,\Omega$

∀ $I = \dfrac{1}{2}\,A$

∴ $V = IR$ (Ohm's law)

$= 3\,V$ ✓
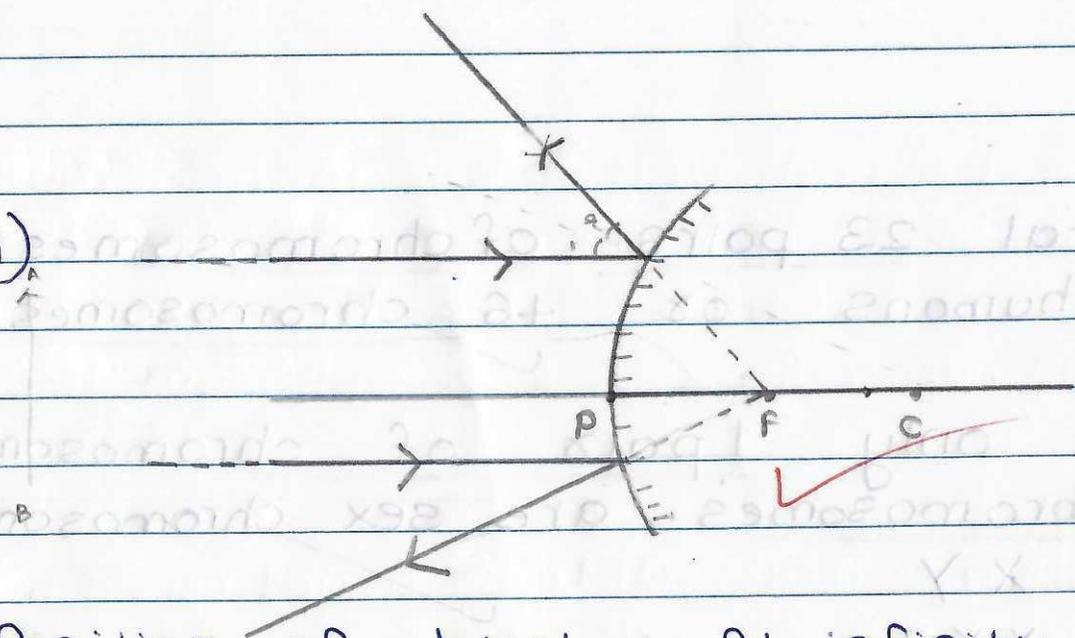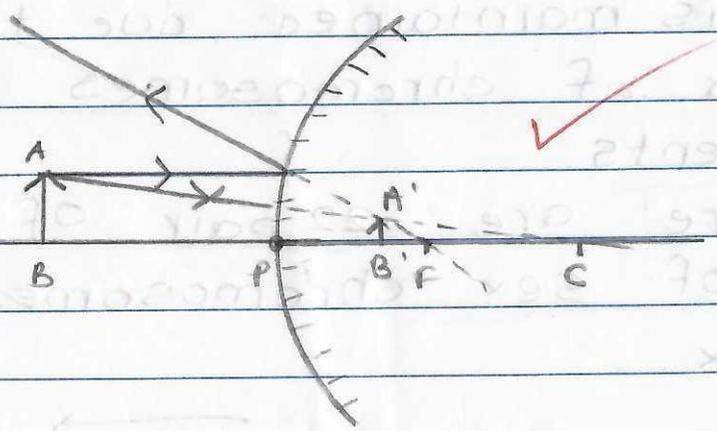
Voltage across them is $3\,V$

Q.29)

(i)

Position of object → At infinity
Nature of image → virtual, erect, diminished, At focus, on other side

(ii)

Position of object →
Between infinity
and Pole

Nature of image –
Virtual, erect,
diminished, between
F and P on other
side

Q.30)

(a) There are total 23 pairs of chromosomes
present in humans or 46 chromosomes
are present.
Out of them only 1 pair of chromosomes
or only 2 chromosomes are sex chromosomes.
In male → XY
In female → XX

(b)(i) In sexually reproducing organisms, the number
of chromosomes is maintained due to inheritance
of equal number of chromosomes from
both the parents.

(ii) In humans, there are 22 pair of autosomes
and 1 pair of sex chromosome. In male-XY
and female XX.

⟶

(iii) The gametes ~~half~~ only half the amount of (have) DNA ~~eh~~ and chromosomes present in them.

(iv) Hence, when ~~these too~~ the two/male and female gamete combine during fertilisation, Original number of chromosomes is attained

(v) A diploid zygote is formed (2n) from haploid gametes (n).

Q.31)

(a) The hormone 'x' is adrenaline and the gland that secretes them, is adrenal glands

(b) Adrenaline hormone prepares the body for fight or flight. There are 3 main process that take place →

i) It increases the heart rate

ii) It decreases blood supply to skin and digestive system due to contraction of

muscles around small arteries in these organs.
and diverts blood to skeletal muscles.
(III) It increases breathing rate due to
contraction of rib cage and diaphragm.

Q.32)
(a) Aim — To show iron articles get rusted
only under specific conditions of
moisture and air.

Materials — Iron nails, three testube,
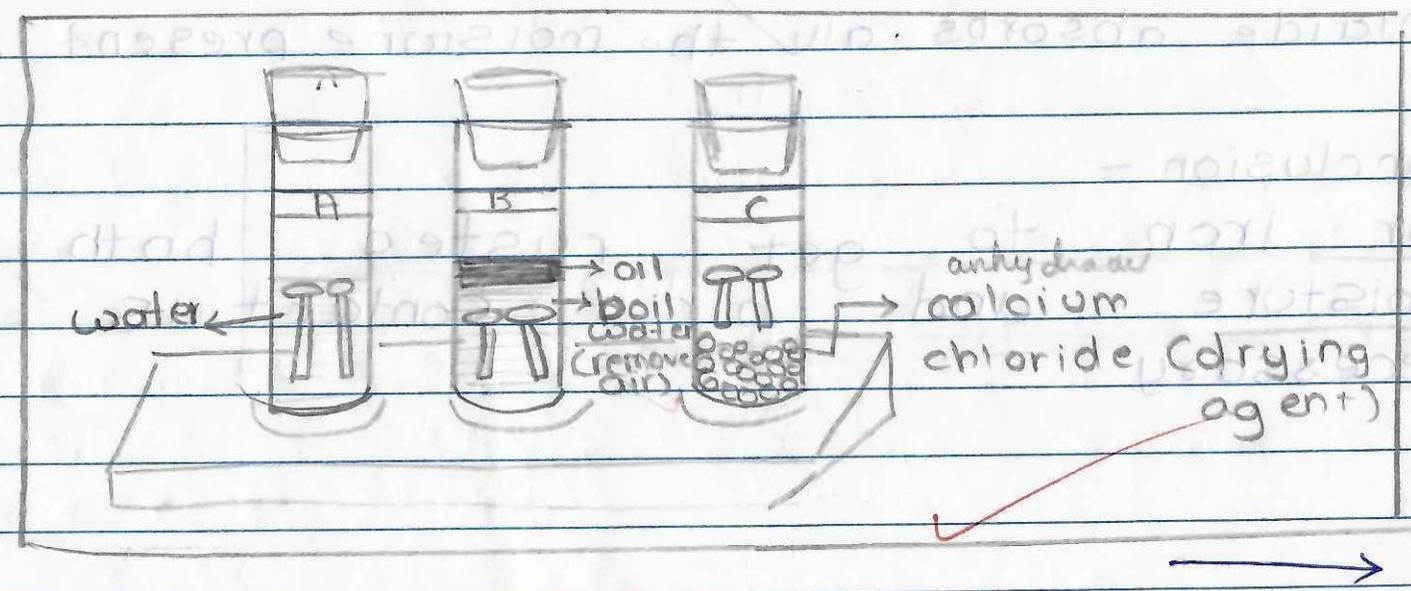required   calcium chlorid, water soil

Procedure —
(a) Take three test tubes A, B and C
(b) In test tube A, pour some water
and put iron nails in it and cork it.

(c) In test tube B, put iron nails in boiled distilled water and on top a layer of oil. and cork it

(d) In test tube C, put calcium chloride along with iron nails and cork it

(e) Do the experimental set up as shown below →

Observation –

i) In test tube A, iron nails develop red-brown flaky substance (rust)

ii) In test tube B and C no rust is observed as in test tube B boiled distilled water and layer of oil prevent air to interact with iron nail. In test tube C, calcium chloride absorbs all the moisture present.

Conclusion –

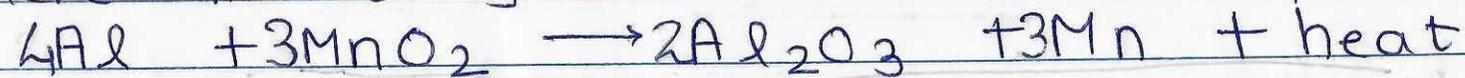For iron to get rusted both moisture and air contact is necessary.

Q.33)

(a) ~~(a)~~ Displacement reactions in which a high reactive metal displaces less reactive metal from its salt $soln$ can be used to obtain two metals from middle of reactivity series $\rightarrow$ Manganese and Iron

(I) $Reac^n$ of Aluminium with manganese oxide—
Here Al being more reactive displaces Mn.
$$4Al + 3MnO_2 \longrightarrow 2Al_2O_3 + 3Mn + heat$$
The heat evolved is so large that Mn is obtained in molten form

(II) $Reac^n$ of ~~Fe_2~~ ferric oxide with aluminium to obtain Iron $\rightarrow$
Here Al replaces iron from its oxide.
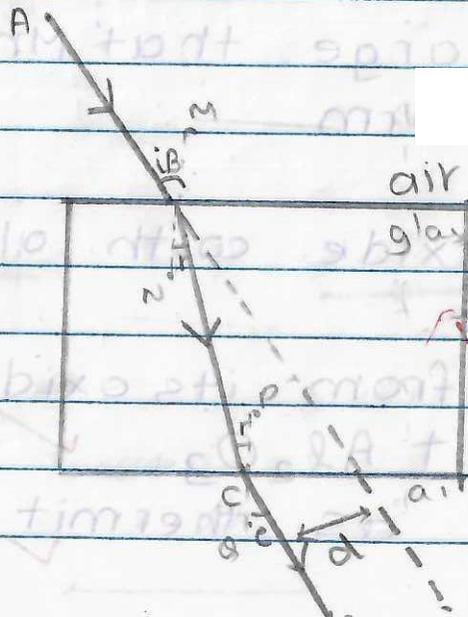$$Fe_2O_3 + Al \longrightarrow Fe + Al_2O_3 + heat$$
$\rightarrow$ This is also known as thermit $reac^n$.
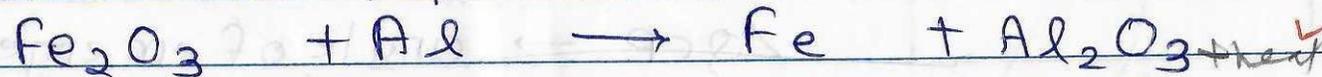
(b) Metals high up in the reactivity series cannot be obtained by reduction of ~~more~~ oxides by carbon as —

(i) These metals (K, Na, Ca) are highly reactive

(ii) They have more affinity for oxygen rather than carbon.

Section - D

Q.34)
(b) (i)

Here,

AB — ~~re~~ incident ray

∠ABM → angle of incidence

∠NBC → angle of refraction

BC → refracted ray

∠QCP → angle of emergence

∠CP → emergent ray

d → lateral displacement

(II) Snell's law of refraction of light →
The ratio of sine of angle of incidence to the sine of angle of refraction is constant for a given colour and given pair of media. ($i < \theta < 90°$)

$$\frac{\sin i}{\sin r} = \text{constant} \quad \checkmark$$

This constant is known as refractive index of medium 2 with respect to medium 1.

(III)

Aspect	Virtual image by convex lens	Virtual image by concave lens
(I) Object distance	Between focus and Optical centre of lens ~~pole of mirror~~	Anywhere from infinity to Optical centre ~~pole~~
(II) Magnification	Greater than 1 Image is enlarged	Less than 1 Image is diminished

Q.35)

(i) (I) Ovary →

Produces female gametes, eggs which take part in the the process of fertilisation.

(II) Fallopian tube →

It is the site of fertilisation of female gamete (egg) and male gamete (sperm).

(III) Uterus →

Provides nutrients for nourishment of foetus. It has thick and spongy lining which provides necessary conditions if egg is fertilised. During pregnancy, Placenta develops which helps to provide nutrients from mother's body and removal of waste from body of foetus.

(ii) Two contraceptive methods used by males→

(a) Mechanical barriers - condoms

→ These help to prevent sperm transfer to female body and prevents transmission of STD's (sexually transmitted ~~des~~ diseases ~~devices~~)

~~(b) Intra-uter~~

(b) Surgical method → Vasectomy

→ In this the vas deferens of male is blocked, which prevents sperm transfer.

Q.36

(b)

(i) Carbon forms compounds mainly by covalent bonding because —

Carbon is tetravalent (2,4)
It either has to gain or lose e⁻.
Hence it forms covalent bonding by sharing of e⁻

(a) If ~~carbon~~ carbon loses $4e^-$ to form
C^{4+} cation, then it will be difficult
for nucleus to hold on to $2e^-$ with
$6p^+$.   A lot of energy will be lost

(b) If carbon gains $4e^-$ to form C^4- anion,
then the nucleus will have $10e^-$ with
just $6p^+$ which is unstable. This
process also requires a lot of energy.
Hence carbon forms compounds by
covalent bonding as there are
also other properties which allow it to
do so — like catenation, tetravalency
and small size.

(11) Covalent compounds have low melting and boiling point as they have weak intermolecular forces of attraction which can easily be overcome due to heat

(III)

(I) Covalent compounds don't have any free electrons, they only constitute of shared pair of electrons. Hence they are bad conductors of electricity.

(II) Carbon shows self-linkage of property of forming long chain of carbon atoms. It forms saturated, unsatured compounds. It can even form branched, cyclic chains. Due to its tetravellency, it forms bonds with other carbon atoms.

Section-E

Q.37)

(a)

Wire	Insulation cover
Live wire	Red ✓
Neutral wire	Black ✓
Earth wire	Green

(b) Given →

$P = 1000 \text{ W}$

$V = 220 \text{ V}$

To find → I

$\Rightarrow P = V I$

$\Rightarrow I = \dfrac{P}{V}$

$\Rightarrow I = \dfrac{1000}{220}$

$I = 4.5 A$

Hence current rating should be atleast $5A$.

(c)

(i) Earth wire is connected to the metallic body of appliances to prevent overflow of current in a circuit and to prevent fatal accidents and damaging of appliance. The earth wire is connected to a metal plate buried inside earth. Whenever there is an excess of current flowing through circuit, it offers low resistance path for current to flow in earth therefore saving appliances such as electric iron from damage and prevent overloading /breaking of circuit.

Q.38

(a) $2NaCl + 2H_2O \xrightarrow{electrolysis} 2NaOH + H_2 + Cl_2$

(caustic   (Hydrogen) (Chlorine)
soda)
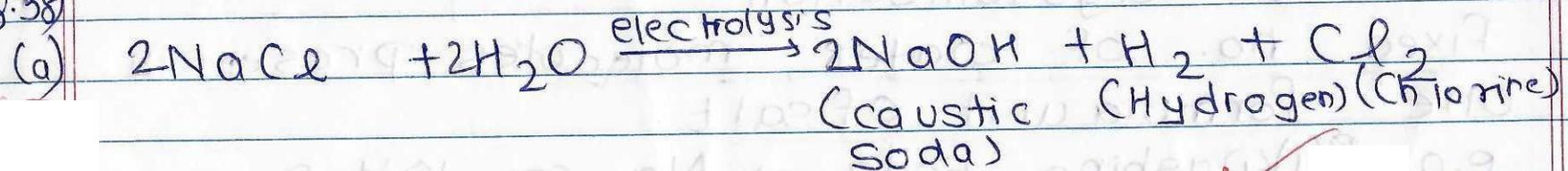
(b)

Products obtained	uses
i) H_2 (hydrogen)	fuels, ammonia for fertilisers, margarine
ii) NaOH (caustic soda)	De-greasing metal, soap and detergent, artificial paper making
iii) Cl_2 (Chlorine)	PVCs, disinfectant, swimming Pool

(c)(ii) Water of crystallisation -
Fixed no. of water molecules present in one formula unit of salt.
e.g. (i) Washing soda → $Na_2CO_3.10H_2O$
Sodium carbonate decahydrate

(II) $CuSO_4 . 5H_2O$
   (copper sulphate) ✓

(III) $FeSO_4 . 7H_2O$
   (ferrous sulphate)

Q.39)

(a) → Photosynthesis is the process by which green plants prepare their own food.

→ Photosynthesis is the the process by which some green plants and bacteria prepare their own food by using inorganic substances like carbondioxide and water in presence of sunlight and chlorophyll to form glucose.

(b) $6CO_2 + 12H_2O \xrightarrow[chlorophyll]{sunlight} C_6H_{12}O_6 + 6O_2 + 6H_2O$
                                       glucose.
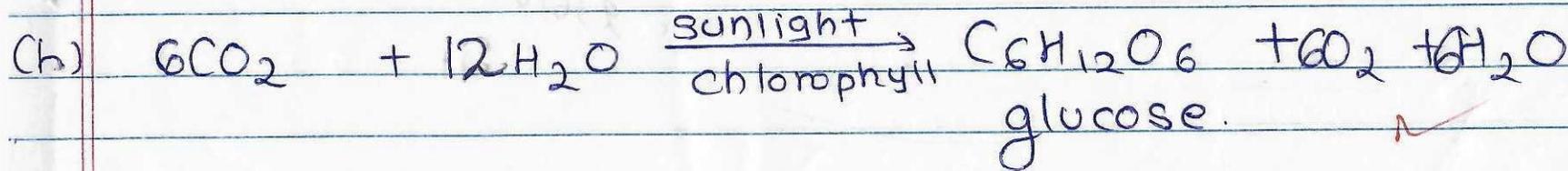
(c)

(i) In desert plants →

(a) Take up Carbon dioxide at night

(b) Prepare an intermediate product

(c) This product is acted upon by energy absorbed by chlorophyll during the day time.

(d) After this they split water to form hydrogen and oxygen and Reduction of carbon dioxide to carbohydrates.