SCIENCE

SECTION A

1. The S.I. unit of potential difference is 'volts' in honour of Alessandro Volta.

Voltmeter is a device that is always connected in parallel in a circuit to measure the voltage.

2. A good fuel is the one that -

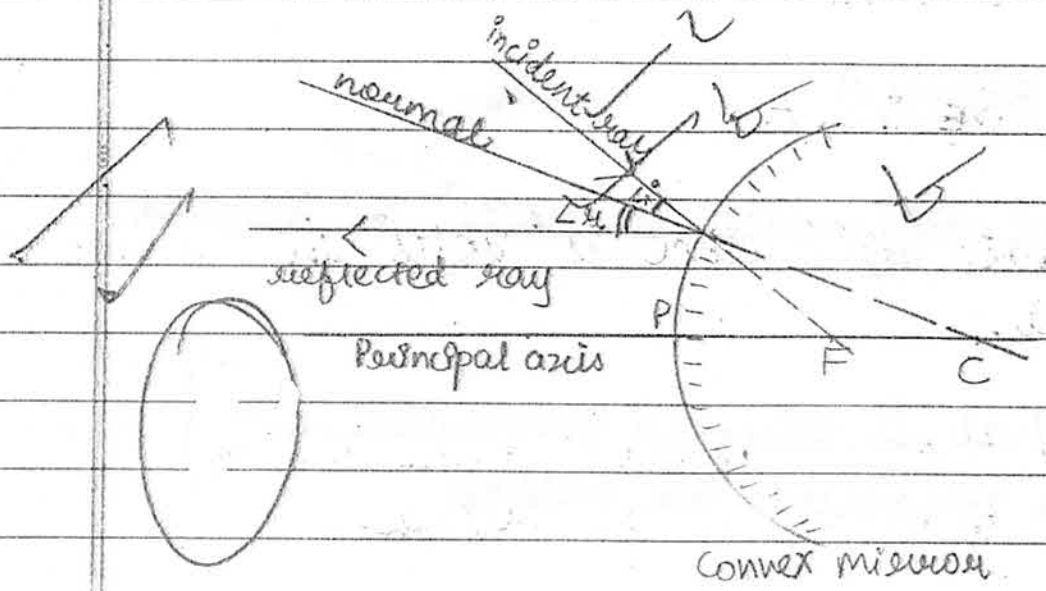
1) does a large amount of work per unit volume or mass i.e. it has high calorific value.

2) has a moderate ignition temperature.

3) is easy to store and transport.

SECTION B

2.



$\angle i$ = angle of incidence

$\angle r$ = angle of reflection

The ray of light directed towards focus will bounce back and move <u>parallel</u> to the <u>Principal axis</u> after reflection.

4. The lines representing the magnetic field are called magnetic field lines.
They have the following characteristics —

1) Two magnetic field lines never intersect at a point.

2) They are always arranged in the form of closed concentric circles outside the magnet and move from North to South.

3) They are uniform, straight and parallel inside the magnet and move from South to North.

4) They are denser and stronger near the poles and weaken when wider apart.

5. Brine is the cold and concentrated solution of Sodium chloride.

1) When electricity is passed through it, ~~the~~ NaCl breaks to give ions in the solution.

$$NaCl \xrightarrow{\text{electricity}} Na^+ + Cl^-$$

Sodium Chloride → Sodium ions + Chloride ions

(2) Then water also splits to give ions.

$$H_2O \xrightarrow[\text{Decomposition}]{\text{electricity}} H^+ + OH^-$$

water — hydrogen ions. — Hydroxide ions

(3) Cl^- ions being negatively charged moves towards anode and H^+ being positively charged moves towards cathode and are collected there.

At anode

$$Cl^- - 1\bar{e} \longrightarrow Cl$$

$$Cl + Cl \longrightarrow Cl_2$$

Chlorine gas

At cathode

$$H^+ + 1\bar{e} \longrightarrow H$$

$$H + H \longrightarrow H_2$$

Hydrogen gas

The Na^+ & OH^- ions are left in solution which combine to give NaOH (Sodium Hydroxide)

$$2NaCl + 2H_2O \xrightarrow{\text{electricity}} 2NaOH + H_2\uparrow + Cl_2\uparrow$$

Sodium Chloride + water (Brine) → Sodium Hydroxide + Hydrogen gas + Chlorine gas

SECTION C

6. Concave mirror

$f = -20\,cm$

$h = +4\,cm$

$v = -30\,cm$

$u = -?$

$h' = -?$

According to mirror formula,

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\frac{-1}{20} = \frac{-1}{30} + \frac{1}{u}$$

$$\frac{-1}{20} + \frac{1}{30} = \frac{1}{u}$$

$$\frac{1}{u} = \frac{1}{30} - \frac{1}{20}$$

$$\frac{1}{u} = \frac{2-3}{60}$$

$$\frac{1}{u} = \frac{-1}{60}$$

$$\boxed{u = (-60)\,cm}$$

According to linear magnification,

$$\frac{-v}{u} = \frac{h'}{h}$$

$$\frac{+(-30)}{+60} = \frac{h'}{+2}$$

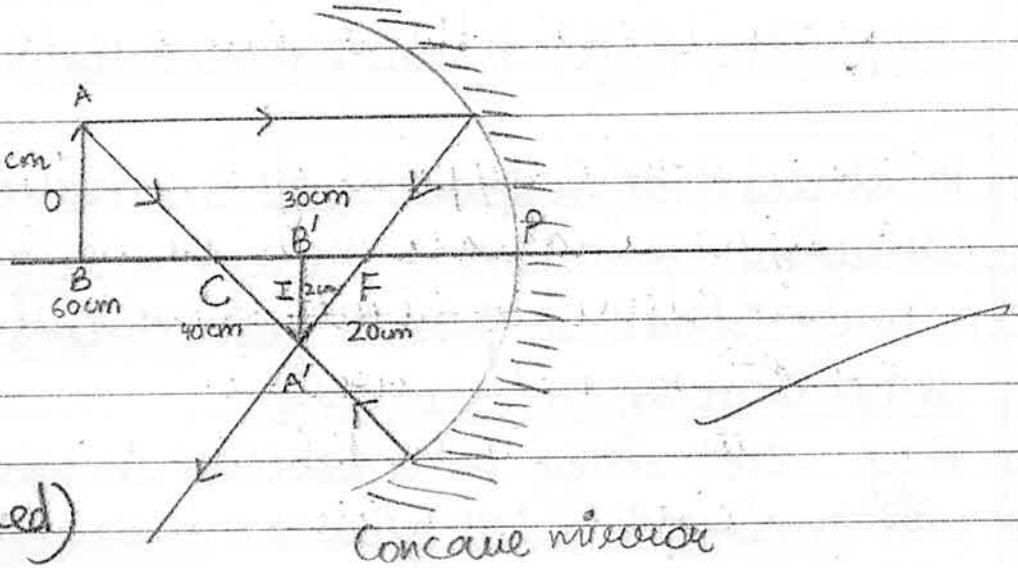
$$\boxed{h' = (-2)\,cm}$$

Image

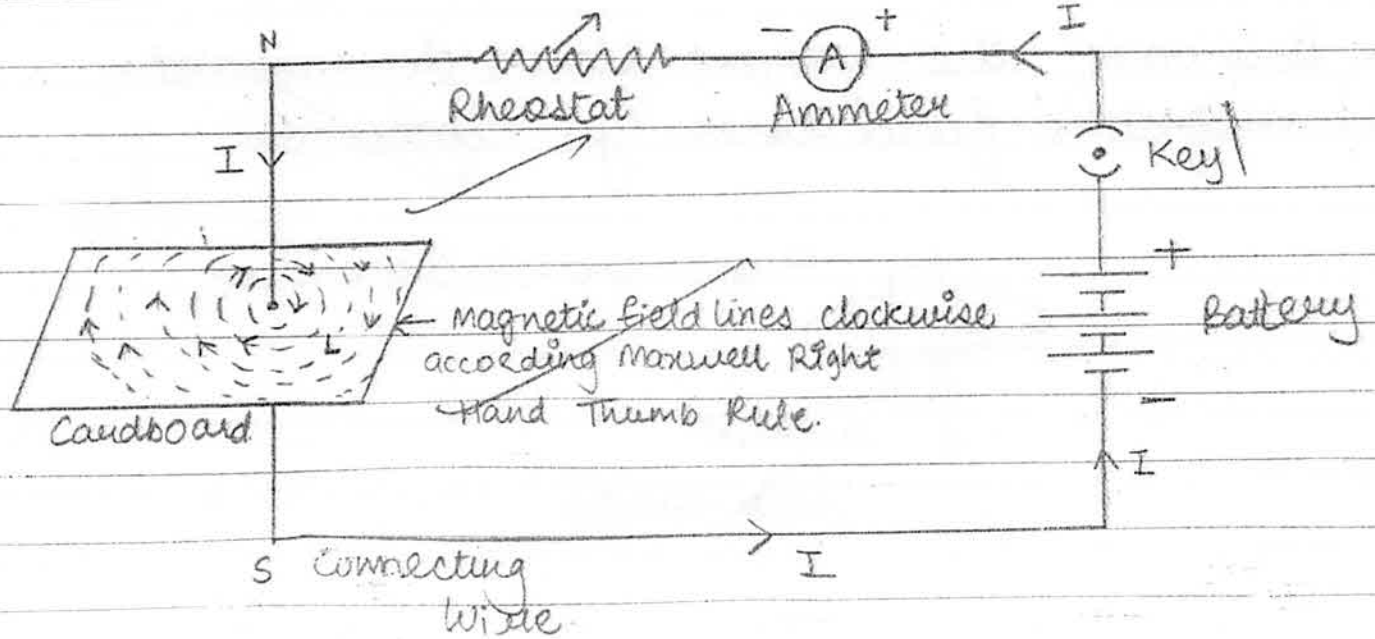
Natures - Real and Inverted

Position - Between C & F at 30cm

Size - Smaller than Object (Diminished)



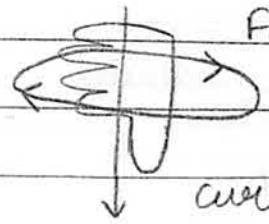
7.



Maxwell Right Hand Thumb Rule is used

It States that Suppose you are holding a current carrying conductor in your right hand in such a way that it points your thumb points in the direction of the current.
They the way or direction in which your fingers will encircle will give the direction of magnetic field lines.

As in this case, the current flows downwards, so the magnetic field lines go clockwise.



Fingers encircle clockwise

current downwards

8. Smell of rotten eggs is usually produced by Sulphur.

∴ It must be a sulphide ore.

Let us suppose that the ore is Zinc Blende (ZnS).

Concentration of ore

First of all, the ore is concentrated by the method of froth floatation.

Conversion into metal oxide

Then it is ~~roasted~~ converted into its metal oxide via Roasting in supply of excess air.

For eg.

$$\underset{\text{Zinc Sulphide ore}}{ZnS} + \underset{(\text{excess air})}{O_2} \xrightarrow[\Delta]{\text{Roasting}} \underset{\text{zinc Oxide}}{ZnO} + \underset{\text{Sulphur dioxide (pungent smell)}}{SO_2}\uparrow$$

Conversion into metal

It is then converted into its metal form by using a reducing agent like Carbon, Aluminium etc.

for eg. $ZnO + C \xrightarrow{\text{reduction}} Zn + CO$

zinc oxide — (reducing agent) Carbon — zinc metal (contaminated) — Carbon monoxide

It is further refined to get it in its pure form.

9.

a) This black substance has been formed due to the oxidation of copper powder.

b) This black substance is ~~copp~~ Copper Oxide (CuO).

c) $2Cu_{(s)} + O_{2(g)} \xrightarrow{\text{Heat}} 2CuO_{(s)}$

Copper (reddish brown) — (O_2 from air) — Copper oxide (black)

d) This black coating can be removed by treating the black compound with hydrogen.

$CuO(s) + H_2(g) \longrightarrow Cu(s) + H_2O(l)$

Copper oxide (Black), Hydrogen → Copper metal (shiny brown), water

10. The white powder added to cakes is baking powder.

Baking powder is prepared with Baking Soda i.e. Sodium Hydrogen carbonate along with a mild acid like Tartaric acid.

(1) Baking soda being a base is bitter and tartaric acid is sour.

(2) When their mixture is added, neutralisation takes place nullifying the bitter and sour effects.

Baking Soda + Tartaric acid → Baking Powder.

~~Baking Soda is used~~

Baking Soda is mainly for producing effervescence and tartaric acid is used for nullifying the bitter effect of Sodium bicarbonate.

$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + CO_2\uparrow + H_2O(g)$

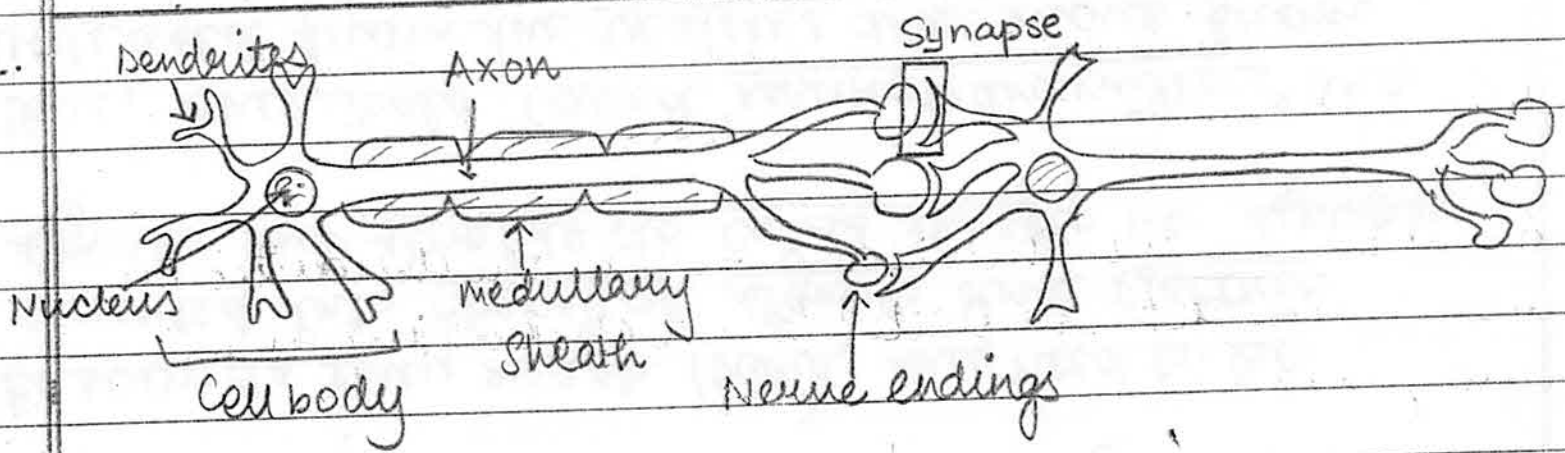
Baking Soda in form of Baking powder. — Sodium Carbonate — Carbon dioxide — Water (vapours)

The carbon dioxide released gets trapped in the cake layers and makes it soft and spongy.

11.	Blood	Lymph
1.	It is a fluid connective tissue consisting of plasma, red blood cells, white blood cells, platelets etc.	1. It is an extra cellular fluid consisting of plasma, proteins, white blood cells etc.
2.	It contains red blood cells and is red in colour due to	2. It lacks ~~colour~~ red blood cells and is

presence of haemoglobin.	therefore colourless.
3. It contains more proteins.	3. It has lesser proteins.
4. It has many functions like transport of O_2, CO_2, food, nitrogenous wastes etc.	4. It carries absorbed fats from small intestine and drains extra fluid back into the blood vessels.

12.



① The nerve impulses are transmitted from one neuron to the other in the form of electric impulses.

(2) They enter through the dendrites, move through axon and reach the neuve ending.

(3) As soon as they reach there, they need to be converted into chemical signals and electric signals are unable to cross the gap i.e. synapse.

(4) Thus, chemicals called 'neurotransmitters' are released from the vesicles that move from neuve ending of one neuron to the dendrite of the next one.

(5) As soon as the chemicals reach the dendritic tip, they again get converted to electrical impulses and move on.

(6) They chemicals are released and move only in one direction and do not reverse inorder to reach their destination that can be spinal
(They are released in one direction)

cord or brain or effectors inorder to deliver the message.

13. ① Populations of organisms live in well defined places or niches.
② They are native to that area. ~~The new~~
③ Reproduction involves DNA replication which can generate errors that is the main source of variations.
④ This Consistency of DNA is responsible for maintainence of body design.

⑤ Suppose the temperature in that region increases or decreases, water level changes or there is a meteorite hit, the population may get wiped out.
⑥ But if there are some organisms that can tolerate the heat, they would survive.

⑦ They would further reproduce and survive in nature.

(8) For e.g. Bacterias are one of the oldest surviving organisms.
Due to variations in their body designs, they adapt most of the inhospitable climates like deserts, ice etc.

14. (1) Food Chain is a sequence of organisms in which one consumes the other to transfer energy.

for eg.

Grass (Producer) $\xrightarrow{10\%}$ (90%) House (Herbivore) $\xrightarrow{10\%}$ (90%) Lion (Carnivore).

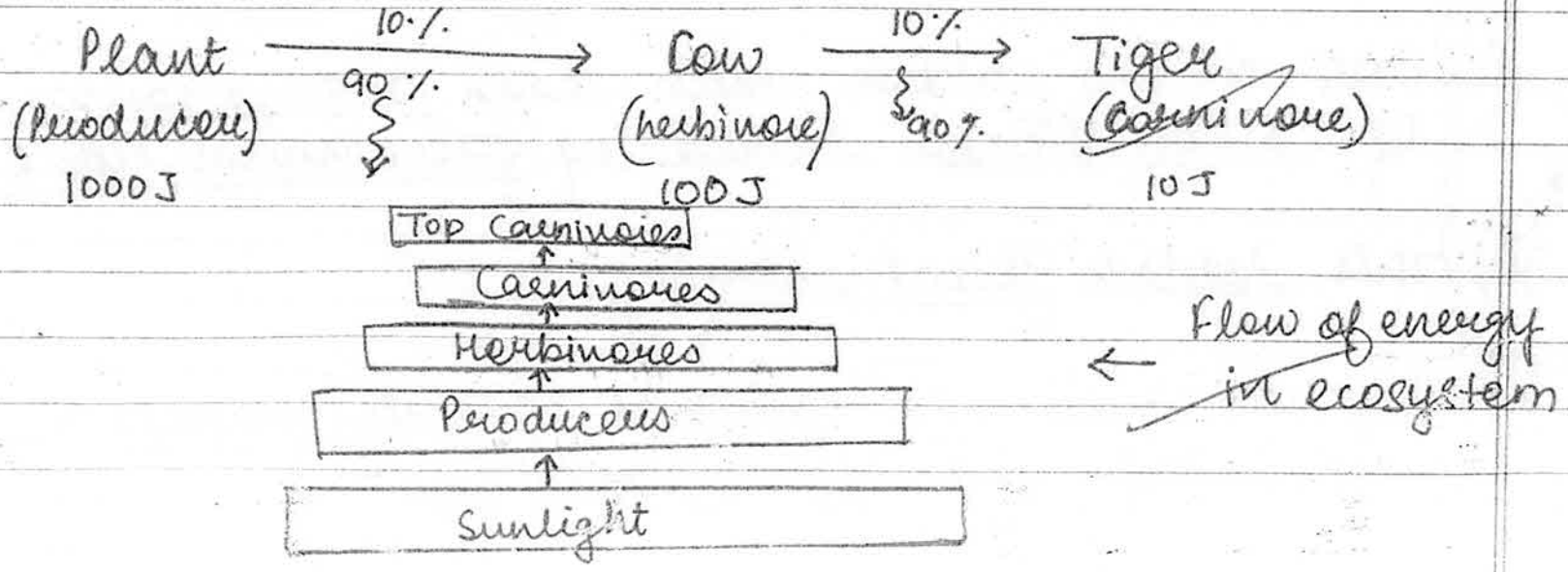
(2) The flow of energy in an ecosystem is always unidirectional as they cannot convert back the energy consumed or lost in environment.

(3) For example, plants cannot convert back the chemical energy into solar energy.

(4) Since they move progressively from one trophic level to the other, the energy content goes on decreasing according to 10% law.

(5) They do not have that much energy to reverse the flow even if they want to.

for eg.



15. (1) Since the industrial revolution, and the development of living standards of people, the demand for energy has also increased.

(2) This energy is mainly met by fossil fuels like coal and petroleum.

(3) They have the following effects on environment:

i) Increased pollution of air, water, soil due to presence of oxides of carbon, nitrogen, sulphur.

ii) Coal contains carbon which leads to emmission of carbon dioxide increasing green house effect.

iii) This leads to Global warming.

iv) They also cause acid rain that corrodes marble on our heritage and affects plants life.

To Reduce their consumption :

1) We must use alternatives like CNG which are cleaner fuels.

2) We must develop healthy habits like using public transport instead of private.

3) We must harness non-conventional sources of energy.

4) We must make people aware of their limited quantity and use them judiciously.

SECTION D

16. Concave lens

~~f = -60 cm~~

~~h' = 9 cm~~

$f = -60$ cm

$h' = +$?

$h = +9$ cm

$u = -30$ cm

$v = -$?

According to lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{-1}{60} = \frac{1}{v} - \frac{1}{(-30)}$$

$$\frac{-1}{60} = \frac{1}{v} + \frac{1}{30}$$

$$\frac{-1}{60} - \frac{1}{30} = \frac{1}{v}$$

$$\frac{1}{v} = \frac{-1}{60} - \frac{1}{30}$$

$$\frac{1}{v} = \frac{-1-2}{60}$$

$$\frac{1}{v} = \frac{-3}{60_{20}}$$

$$\boxed{v = (-20)\ cm}$$

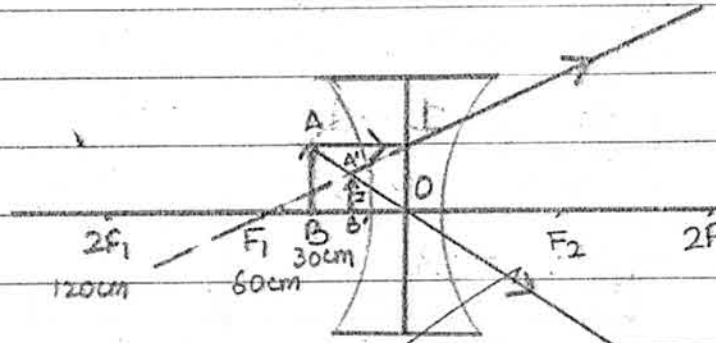
According to linear magnification of lens,

$$m = \frac{v}{u} = \frac{h'}{h}$$

$$\frac{+20}{+30} = \frac{h'}{9}$$

$$h' = \frac{2 \times 9^{3}}{3}$$

$$\boxed{h' = 6\ cm}$$



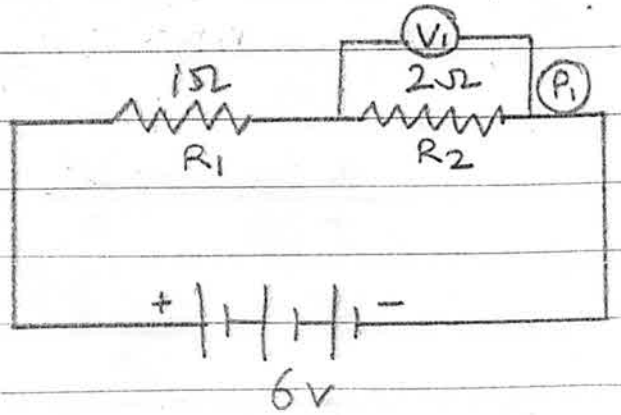
Concave lens

Image

Nature: Virtual & Erect

Position: Infront of object (20cm)

Size: Smaller than Object.



17. Total resistance

$= R_S = R_1 + R_2$

$= 1 + 2$

$= 3\Omega$

$V = 6V$

$I = ?$

According to Ohm's law, $V = IR_S$

$\therefore \quad I = \frac{V}{R_S}$

$\therefore \quad I = \frac{6^2}{3_1}$

$\boxed{I = 2A}$

In a series combination, current is same for all devices, but Potential difference differs.

$\therefore$ let Potential difference of 2Ω Resistor = V_1 volts.
let Power of 2Ω Resistor = P_1 W

$\therefore \quad V_1 = IR_2$

$V_1 = 2 \times 2$

$\boxed{V_1 = 4V}$

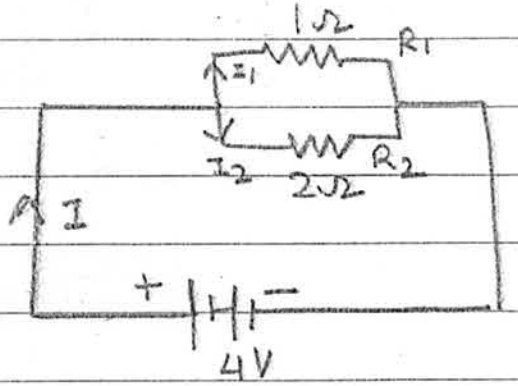
Electric Power = $V \times I$

Power of 2Ω Resistor = $V_1 \times I$

$= 4 \times 2$

$\boxed{P_1 = 8W}$

Case II.



let total current in circuit = I.

In a parallel combination,
V is same but I differs.

let total resistance = R_p

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

$$\frac{1}{R_p} = \frac{1}{1} + \frac{1}{2}$$

$$\frac{1}{R_p} = \frac{2+1}{2}$$

$$\frac{1}{R_p} = \frac{3}{2}$$

$$\boxed{R_p = \frac{2}{3}\Omega}$$

According to Ohm's law;

$$V = IR_p$$

$$24 = I \times \frac{2}{3}$$

$$\boxed{I = 6\ A}$$

$$I_2 = \frac{V}{R_2} = \frac{4^2}{2} = \underline{2\ A}.$$

let Power of $R_2 = P_2$ W

$$\therefore\ P_2 = V \times I_2$$

$$P_2 = 4 \times 2$$

$$\boxed{P_2 = 8\ W}$$

Both the resistors have same powers in ratio $\boxed{1:1}$.

18.

a) Carbon has a tetravalency but can't gain or lose electrons because —.

① If it gains 4 electrons, it will C^{-4} negative charge. It is very difficult for 4 protons to hold on to 8 electrons and it becomes unstable.

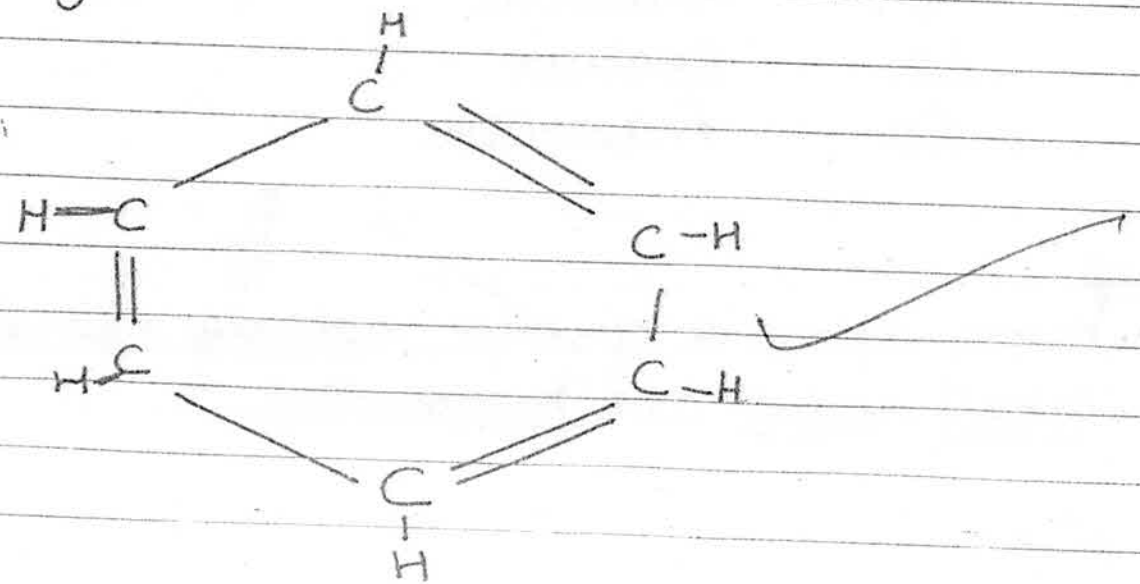
② If it loses 4 electrons, it requires a lot of energy to lose it which it can't afford and again becomes unstable.

(i) Covalent bonds are formed by sharing of electrons and share them as molecules, so no transfer of electrons or involvement of ions takes place.
Since ions are responsible for conducting electricity and they do not have free ions, ∴ They are bad conductors of electricity.
Eg. CCl_4, H_2, CH_4 etc.

(ii) Since the molecules of 2 different elements share electrons, they have weak forces of attraction and weak electrostatic forces due to which their bond can be broken easily.

The bonds are strong within the molecule but inter ionic bonds are weak making them have low melting and boiling points. Eg. Naphthalene has a melting point of about 80°C.

(b) Benzene – C_6H_6



19. (1) The vertical columns present in the modern periodic table having elements with similar valencies and chemical properties are called Groups.

(2) For eg. Alkali metals Group I

H	– Hydrogen
Li	Lithium
Na	Sodium
K	Potassium
Rb	Rubidium
Cs	Cesium
Fr	Francium

(3) Valency
As we move down a group, valency remains same.
eg. all alkali metals are monovalent.

(4) Atomic size

Atomic size is the distance from the centre of nucleus to the last shell.

As we move down a group, the atomic size increases as number of shells increase.

Eg. H → 1
Li → 2, 1
Na → 2, 8, 1 etc.

⑤ Metallic Character

As we go down a group, the chemical reactivity of metals increases as it is easier for a bigger atom to lose electrons due to weaker electrostatic forces. Eg. Francium is more metallic than Lithium.

But in non-metals, it decreases as it is easier for a smaller atom on top to gain electrons due to strong electrostatic forces than a bigger atom.
Eg. Fluorine is more non-metallic than Astanine.

b) Atomic number = 14
Electronic configuration = 2, 8, 4
Element = Silicon
This element has semi properties of both metals and non-metals,
∴ It is a metalloid.

It has 4 valence electrons due to which it can neither gain nor lose electrons as it would become unstable.

∴ It forms covalent bonds.

20. I Homologous organs

1. They are the organs that are similar in structure but have been modified to perform different functions.

(To be entered by Board)

अपना अनुक्रमाँक इस उत्तर–पुस्तिका पर न लिखें
Please do not write your Roll Number on this Answer-Book

अतिरिक्त उत्तर–पुस्तिका (ओं) की संख्या .....
Supplementary Answer-Book(s) No. .....

20: a) For eg.
forelimbs of humans, frog and lizard have similar structures. Frog uses it to hop and as a shock absorber, humans use it to write, hold etc. and lizards use it to creep on walls.

They explain that maybe the reptiles, mammals and amphibians had common ancestors and evolved to be in the present form.

Analogous Organs

(1) They have different structures and appearance but perform similar function.

(2) for eg. wings of a bat and a bird have different structure, but perform function of flying. [Birds have feathers and wings all over body. Bat – Thin flap like, webbed wings.]

(3) They do not show common ancestory but trace evolution due to which they became capable of flying.

(iii) Fossils

(1) They are the remains of plants and animals found under earth that lived in remote past.

(2) They tell us about the evolutionary relationships in the past.

(3) For eg. Archaeopteryx has round cranium and wings similar to birds but claws and beak similar to reptiles.

(4) This shows relation between reptiles and aves or maybe aves evolving from reptiles.

(b) Fossils can be determined by-

(i) Carbon-14 Dating

① All organisms have some percentage of carbon which decreases as we die.

② The % percentage of fossil is compared with the present percentage in living organisms to determine their age.

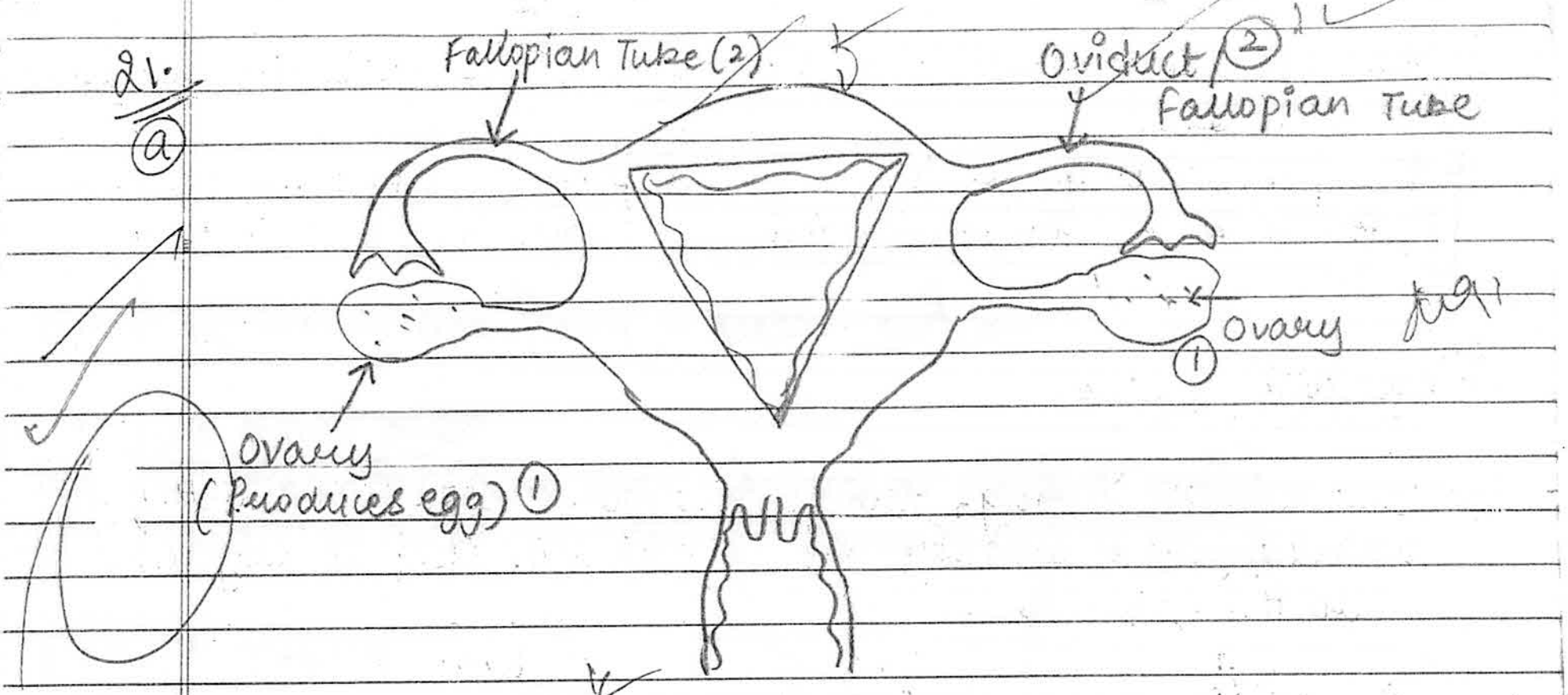
(ii) Relative method

① The earth is dug, the fossils found closer to earth are recent whereas the ones found in deeper layers are the older ones.

Eg. Dinosaurs are found in deeper layers.

21.

(a)



(b) Gonorrhoea and Syphilis are bacterial diseases transmitted sexually.

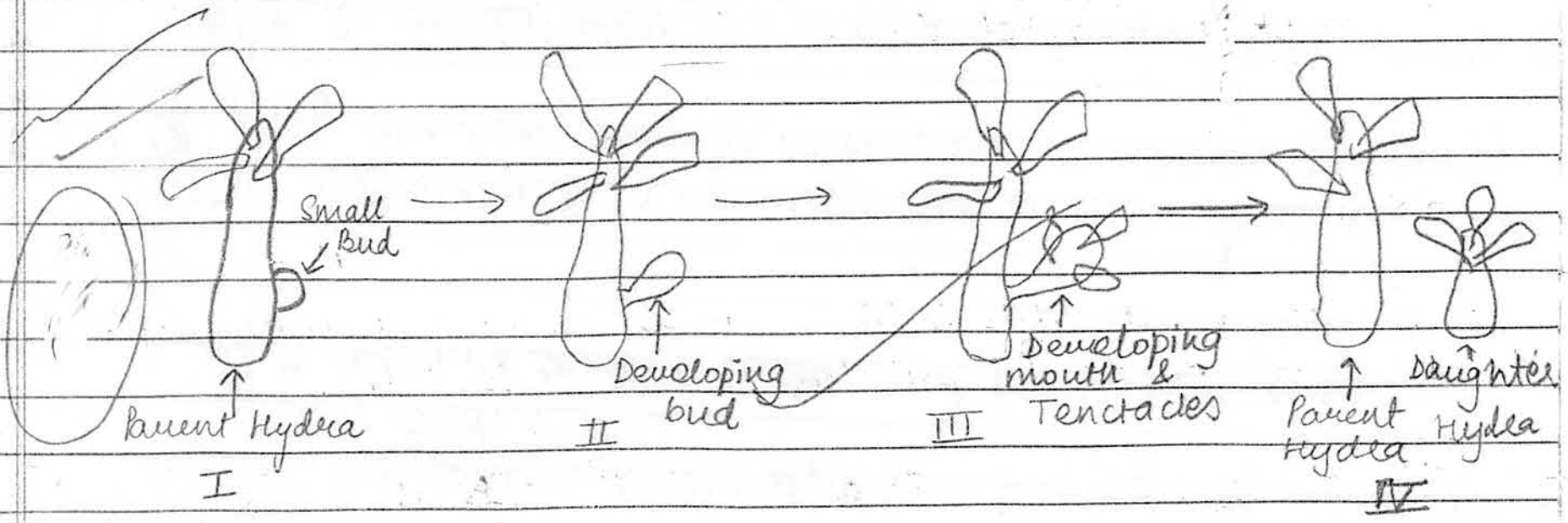
(c) The devices used to prevent fertilisation in human females are known as contraceptive devices.

(1) They are adopted to prevent unwanted pregnancies.

(2) They help to maintain the reproductive wealth of women & in order to control birth & death rate.

SECTION E

22. Hydra reproduces by Budding.



23. ① Glycerine is used just before placing the specimen on the slide.

② It helps it to keep moist and prevents drying.

① Safranin is a synthetic dye used to stain the cells of the leaf so that each part is visible properly.

② It is applied after the leaf peel is washed in water and kept in a watch glass.

24.

(i) He must add Sodium carbonate or Sodium hydrogen carbonate to produce carbon dioxide.

(ii) $2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + CO_2\uparrow + H_2O$

Ethanoic — Sodium — Sodium — Carbon dioxide — water

(iii) To test CO_2 in a laboratory, bring a burning candle near it, it would extinguished as it is a non supporter of combustion.

OR

Pass it through freshly prepared limewater which turns milky

$$Ca(OH)_2(aq) + CO_2 \longrightarrow CaCO_3 + H_2O$$

Lime water (calcium hydroxide) + Carbon dioxide → Calcium Carbonate (white ppt.) + Water

25. $$FeSO_4(aq) + Zn(s) \xrightarrow{\text{displacement}} ZnSO_4(aq) + Fe(s)$$

Ferrous sulphate + Zinc Granules → Zinc sulphate + (Ferrous) Iron

The green colour of the solution changes to greyish - white as there is a displacement reaction occurring. Zinc being more reactive than iron displaces it from its salt solution.

∴ Fe powder can be observed.

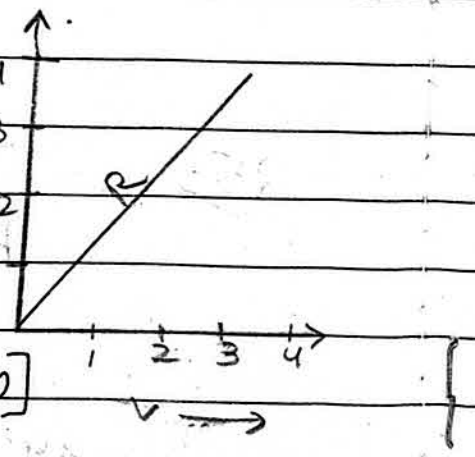
26: (c) (20 cm, 20 cm) & (inverted and inverted) is correct as focal length remains the same.

The convex lens and concave mirror always form real and inverted images except in a few rare cases.

Since the object is a distant one, the image obtained on the screen will be the focus and when calculated focal length remains the same i.e. 20 cm.

27: (b) As the graph depicts, the resistance (slope) is constantly increasing which explains that the potential difference and the current are proportionately increasing.

∴ $\boxed{I \propto V}$ [Based on Ohm's Law]



Resistance for a particular conductor at a particular temperature is constant. ∴ $R = \frac{V}{I} = \frac{1}{0.1} = 10\ \Omega$ or $\left[\text{Avg. } R = \frac{1+2+3+4}{0.1+0.2+0.3+0.4} = \frac{10}{1} = 10\ \Omega\right]$

(Ohm's law) $I = \frac{V}{R}$ ∴ $I = \frac{25}{10} \times \frac{1}{10} = \boxed{0.25\ A}$