

SCIENCE

Toppers' Answers 2018

(Issued by Board)

Time : 3 Hours

Max. Marks : 80

Set : 31/1

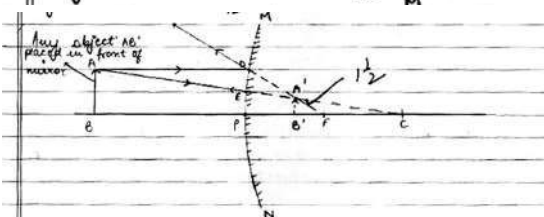
SECTION - A

- As violet colour of flowers is dominant,
 Genotype of white flowers :- 'vv'
 Genotype of violet flowers :- 'VV'
 Genotype of F₁ progeny :- 'Vv'
 According to law of dominance, colour of flowers in F₁ progeny will be violet.
- Potential energy of water stored in reservoir → Kinetic energy of flowing water → Mechanical (Kinetic) energy of turbines and
 ↓
 Electrical energy (converted in generator)
- X - Ethanol [C₂H₅OH]
 Y - Ethene [C₂H₄] $\frac{1}{2} + \frac{1}{2}$
 Z - Hydrogen [H₂]

$$\text{C}_2\text{H}_5\text{OH} \xrightarrow[473\text{K}]{\text{conc. H}_2\text{SO}_4} \text{C}_2\text{H}_4 + \text{H}_2\text{O}^{\frac{1}{2}}$$

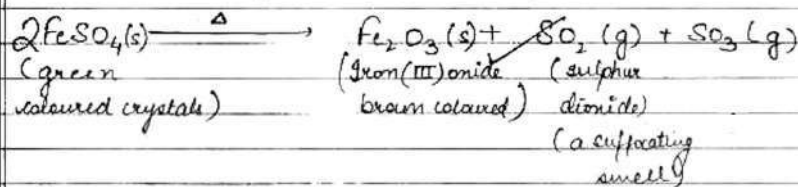
Sulphuric acid (conc. H₂SO₄) acts as a dehydrating agent and removes a molecule of water from ethanol to give unsaturated compound ethene.
- (a) Gustatory receptor present in tongue to detect taste.
 Olfactory receptor present in nose to detect smell.

(b) Dendrite → Cyton/Cell body → Axon → End pt of neuron
- Convex mirror always form erect and diminished object.



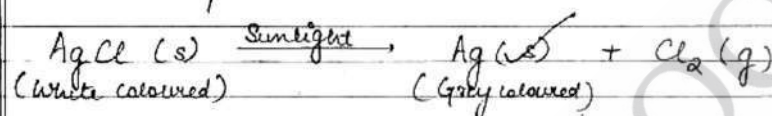
A'B' - virtual & erect img. formed between pole & focus of concave mirror

6. (i) Thermal decomposition reaction

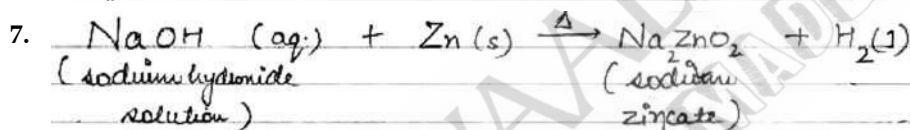
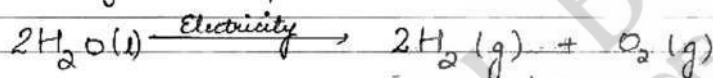


Green coloured crystals change to brown coloured Fe_2O_3 along with gases like SO_2 & SO_3 .

(ii) Photo decomposition reaction



(iii) Electrolytic decomposition reaction



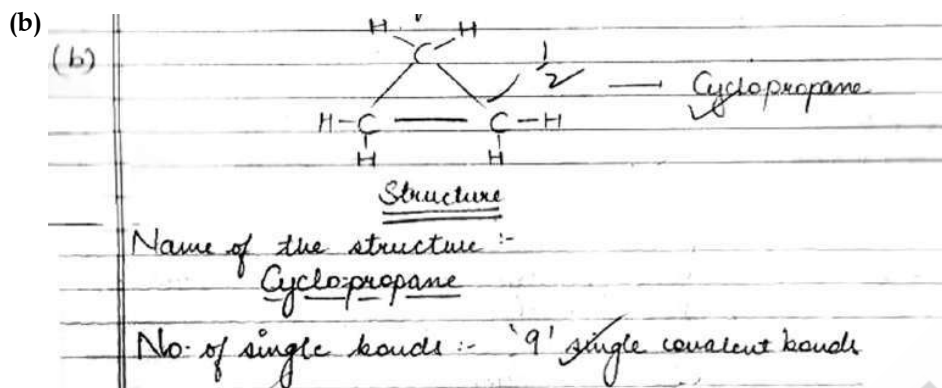
Thus, in this reaction, hydrogen gas is evolved

As the gas is passed through soap solution, bubbles filled with hydrogen gas come out. Bring a candle near the bubbles evolved, the bubble bursts & the gas inside it starts burning with a pop sound & extinguishes the candle. This tests the presence of H_2 gas in them.

Even if the zinc metal reacts with a solution of strong acid, hydrogen gas is produced (evolved)

[Eq. $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$]

8. (a) (a) Carbon compounds are covalently bonded and hence the bond is formed by sharing of electrons between two or more combining atoms. Due to this, they don't form any ions or charged particles within the solution nor they give free electrons. As we know, conduction of electricity requires flow of free electrons in solids & ions in fluids, they don't conduct electricity.



9. (a) Thyroid gland :- Thyroxine hormone !
Thyroxine hormone helps in metabolism of carbohydrates, fats and proteins and is thus responsible for best balanced body growth.

(b) Pituitary gland :- Growth hormone !
It regulates growth and development of body. However, its reduced secretion causes 'dwarfism' and excess secretion causes 'gigantism'.

(c) Pancreas — Insulin)
Insulin regulates the blood sugar level & brings back the excess sugar level to normal.

10. Asexual mode of reproduction is uniparental & thus, doesn't involve any fusion of gametes & hence, fertilization.

Sexual mode of reproduction is biparental & thus involves fusion of both male & female gametes.

Among the two, sexually reproducing species have a better chance of survival. This is because reproduction in such species require contribution of equal genetic material from both the parents. This results in various combinations for genes.

Hence, the process of creation of variations is increased manifold. Thus, accumulation of such variations for long time, may lead to evolution. Not only this, we also know that variations are helpful for continuation of species in case the niche changes drastically due to factors not under our control like global warming, meteorite hits etc. Asexual reproduction involves slight variations & thus, will not be very beneficial to produce a variation adaptable to drastically changed m

11. Power of a lens is defined as the reciprocal of its focal length when expressed in metres. It tells us about its (lens') converging or diverging capacity for a beam of parallel rays or any other as well.

SI unit of power is Dioptre (D) ✓

$$P = \frac{1}{f(\text{in metres})}$$

(i) Focal length of lens (f) = 40 cm
 $= \frac{40}{100} = \frac{2}{5} \text{ m}$

As we know, $P = \frac{1}{f}$
 $P = \frac{1}{\frac{2}{5}} = \frac{5}{2} = +2.5 \text{ D}$

The lens is convex lens which is a converging lens ($\because f$ & P are +ve) ✓

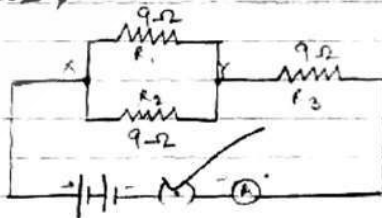
(ii) Focal length of lens (f) = -20 cm = $-\frac{20}{100} = -\frac{1}{5} \text{ m}$

As we know, $P = \frac{1}{f}$
 $P = \frac{1}{-\frac{1}{5}} = -5 \text{ D}$ ✓

Nature of lens \because Concave lens which is a diverging lens ($\because f$ & P are -ve) ✓

12. Let R be the resistor of 9Ω .

(i) For 13.5Ω :-



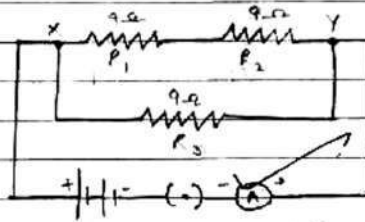
For parallel combination, $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$

$\therefore \frac{1}{R_p} = \frac{1}{9} + \frac{1}{9} = \frac{2}{9} \therefore R_p = \frac{9}{2} \Omega = 4.5 \Omega$

Resistance of total combination (R_T) 13Ω

$$R_p + R_3 = 4.5\Omega + 9\Omega = 13.5\Omega$$

(ii)



$$R_s = R_1 + R_2 + R_3 \text{ ----- [Law of combination of resistors in series]}$$

$$R_s = R_1 + R_2 = 9 + 9 = 18\Omega$$

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \text{ ----- [Law of combination of resistors in parallel]}$$

$$\frac{1}{R_p} = \frac{1}{R_s} + \frac{1}{R_3} = \frac{1}{18} + \frac{1}{9} = \frac{1+2}{18} = \frac{3}{18}$$

$$R_p = \frac{18}{3} = 6\Omega$$

13. (a) (a) Resistance of a conductor depends upon following factors :-

- (i) It is directly proportional to length of conductor [$R \propto l$]
- (ii) It is inversely proportional to area of cross section of conductor [$R \propto \frac{1}{A}$]
- (iii) It depends upon nature of material of conductor
- (iv) It depends upon temperature of conductor when it is being used.

(b) (b) Metals are good conductors of electricity because of their lower resistivity. Metals have a resistivity of the order of 10^{-8} to $10^{-6} \Omega m$. Hence, they provide less opposition to the flow of electric charges through them & hence have higher conductivity. Glass is a bad conductor of electricity as it has extremely high resistivity and hence provides great opposition to flow of free electrons / electric charges. Hence it is included in the group of insulators having resistivity of order of 10^4 to $10^{17} \Omega m$.

- (c) (C) Alloys are used in electrical heating devices as:-
- They have higher resistivity than their constituent metals & thus a lot of heat energy is dissipated as charges flow through them.
 - They don't get oxidised or burnt at even high temperatures.

14. (a) (i) For managing garbage, first we must segregate it into biodegradable & non-biodegradable substances. Biodegradable substances like vegetable peels, domestic waste, animal excreta, cow dung etc. must be converted into manure. This not only helps in enriched growth of plants but also prevents dump of it in open, production of foul smell etc.
- (ii) For non-biodegradable substances, we must further segregate as recyclable & non-recyclable. All recyclable metals, plastic, glass must be sent to different factories which after proper cleaning, process them into new products.
- (iii) For rest over garbage, practices like filling it in landfills which can be converted into playground for children or incineration at places with proper management for it can be done.

- (b) As an individual,
- We must follow the policy of 'reduce'. We should try to switch off lights when unnecessary for our resources & for garbage, try using same sheet of blank paper not used from other side, try making registers with utilising all the pages to reduce our demand for rough copies, reducing usage of plastic disposable cups.
 - We must follow the policy of 'reuse'. Using jam bottles, milk cartons, packaging boxes, ketchup bottles is a good way to use resources already once used.

(c) Teacher has instilled the values of 'environmental concern', 'eco friendliness', 'wise use of resources'.

15. → Dam is a structure made to obstruct the flow of river for creating an impoundment or diverting the flow of water for one's own use. irrigation, electric generation, recreation, protection from drought or flood etc.

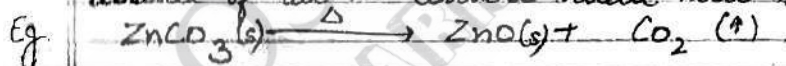
Problems to be addressed to maintain peace among people :-

- (i) They must be provided with full rehabilitation facilities. The oustees of Tawa Dam are still fighting for facilities promised to them in 1970.
- (ii) They must be given required amount of money for once again creating ^{necessary} conditions for them. They should also be provided with equal land area that has been taken from them to construct a dam with a developmental approach.
- (iii) Benefits of dam must be guaranteed to them and not only to rich urban areas & industries.
- (iv) Afforestation to reduce the damages due to large forests being cut & a shelter for wildlife which has been displaced.

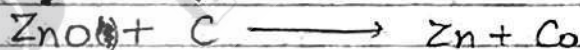
16. (a) (A) Extraction of pure metals from 'CO₃' ores :-

(i) Concentration of ore
Gangue or matrix must be removed from ore by processes taking in mind differences in physical & chemical properties of gangue & ore.

(ii) Calcination :-
The carbonate ores must be heated strongly in absence of air to convert them into metal ores.



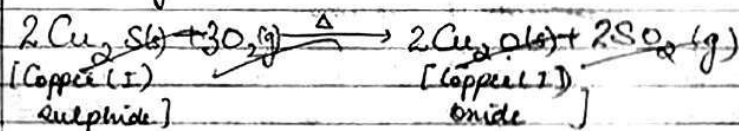
(iii) Reduction by a more reactive metal or carbon :- $\frac{1}{2}$

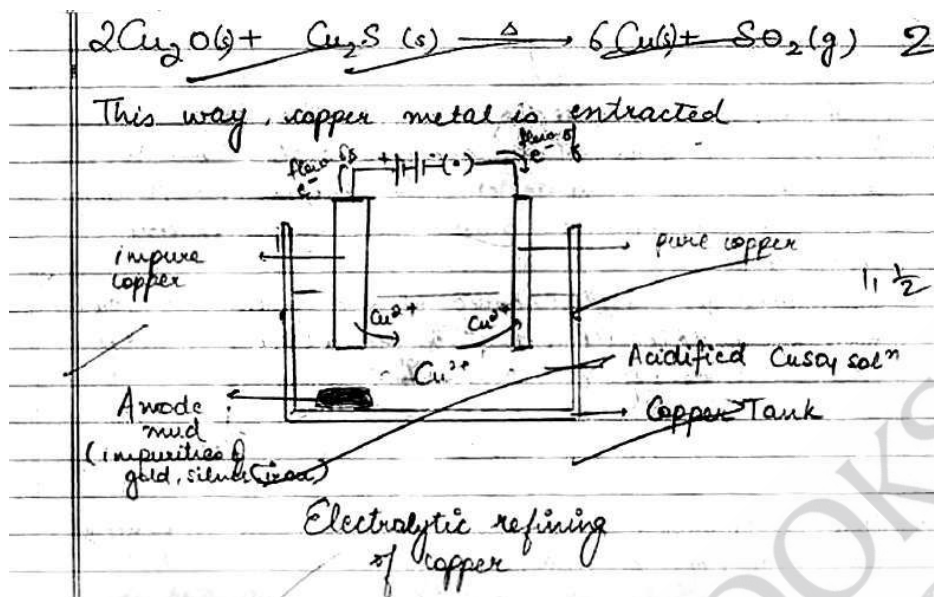


This will happen as Carbon has higher affinity for zinc oxygen than zinc.

(iv) Finally, the obtained metal can be refined by electrolysis of their salt solution.

(b) (b) Copper glance [Cu₂S] is copper's sulphide ore. It is first roasted & then reduced by the remaining Cu₂S in tank.





17. (a)

(i) Dobereiner's method of classification

Advantage: He, for the first time grouped metals on the basis of their similar chemical properties. He could find 3 Dobereiner's triads which had a special characteristic:-

When arranged in increasing atomic masses, the atomic mass of middle element was equal to average of atomic masses of other two.

Li - 6.9 u

Na - 23 u

K - 39.1 u

→ This encouraged others to classify elements on basis of chemical properties and atomic masses.

Disadvantage: He could only place 9 such elements in 3 triads & thus, wasn't efficient for a study of them.

(ii) Newland's law of octaves - Classification of Newland

Advantage: He could place 56 elements known at that time in his classification & also for first time, studied periodic recurrence of properties. In his classification, properties of every eighth element resembled to that of first.

Disadvantage: His system worked only for lighter elements & properties matched only for elements till Calcium. Also, he placed some elements like Co & Ni even in same slot.

(iii) Mendeleev's classification

Advantage: He arranged elements on basis of increasing atomic masses & similar formulas for hydrides & oxides. He also left gaps in his tables which encouraged for discovery of new elements. Like eka-boron, eka-aluminium, etc.

Disadvantage He placed some elements with more atomic mass than those having less atomic mass for similarity of properties but couldn't justify it. $\frac{1}{2}$
 Ex: He placed Te (127.6 u) before I (126.9 u).

(b) Henry Moseley showed atomic no. as a more fundamental property.

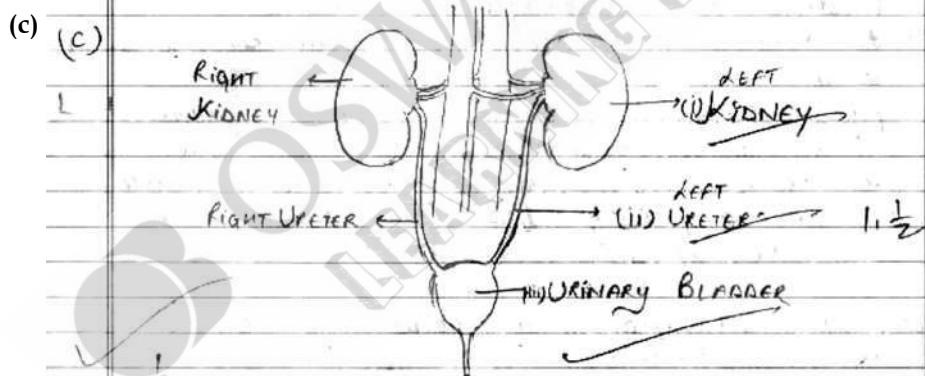
(c) Modern Periodic Law states that properties of elements are periodic function of their atomic ^(number) no.

(b) Henry Moseley showed atomic no. as a more fundamental property.

(c) Modern Periodic Law states that properties of elements are periodic function of their atomic ^(number) no.

18. (a) (a) 'Excretion' is the biological process of removal of harmful nitrogenous wastes like urea, uric acid etc. from our body which are produced as by product of chemical reactions taking place in our body.

(b) (b) 'Nephron' is the basic filtration unit present in kidney.



19. (a) (a) (i) Ovary has following functions :-

- It releases matured egg (female germ cell) once every month & this, is responsible for produce & release (oogenesis & ovulation) of ovum.
- It secretes oestrogen & progesterone. Oestrogen controls secondary sexual characteristics in females at time of puberty & also promotes release & maturation of egg.

(i) Oviduct / Fallopian tube carries the released egg to the uterus.
 • Oviduct is also the site of fertilization.

(ii) Uterus is a bag like structure where embryo is developed & implanted.
 It helps the embryo to grow into foetus & also, develops a thick lining of blood vessels every month in order to receive a fertilized egg.
 • Its rhythmic contractions help the baby to come out from mother's body (womb).

(b) Placenta is a disc shaped tissue embedded in uterine wall once implantation of embryo takes place. It has villi on the embryo's side & blood spaces on mother's side.
 → It helps in nourishment of child inside mother's womb. It also helps in exchange of nutrients, oxygen & waste products (secreted by embryo) between mother's & embryo's blood & thus, is responsible for maturation of embryo.

20. (a) (i) Cornea is a thin transparent layer (membrane) on the outer bulge of eye. At cornea's outer surface, most of the refraction of light entering eye takes place.

(ii) Iris is a thick, dark, muscular diaphragm which controls the size of pupil by its contraction & relaxation & hence controls the amount of light entering the eye.

(iii) Crystalline lens is ^{made up of} a fibrous jelly like material which provides fine adjustment for focal length so that images for objects at all distances can be formed on retina.
 When it becomes thin, focal length increases helpful to view far off objects & when becomes thick, helps to view nearby objects.

(iv) Ciliary muscles help in changing the shape of eye lens by their contraction & relaxation, helpful in changing curvature of eye lens & hence, its power.
 When they contract, eye lens becomes thick & when they relax, it becomes thin.

(b) (b) Sun is near the horizon early morning. Thus, the sun rays have to pass through thicker layers of atmosphere & have to travel larger distance before reaching observer's eyes. Thus, most of the light rays of shorter wavelength like violet, blue etc. are scattered by the smaller particles & hence, only reddish light rays reach our eyes.

On Moon, an astronaut won't see such phenomenon as there is no atmosphere & thus no scattering particles for light to be scattered. Hence, it will be all dark on moon & reddish appearance of sun won't be possible.

21. (a) (a) Fleming's left hand rule states that if we stretch fore finger, middle finger & thumb of our left hand mutually perpendicular to each other, then such that our forefinger gives direction of magnetic field, middle finger gives the direction of current; then our thumb will give the direction of force experienced by conductor.

(b) (b) Principle of electric motor :- When a ^{current carrying} conductor is placed inside a magnetic field, it experiences a force due to the interaction of 2 magnetic fields - one of conductor carrying current & the already existing magnetic field.

(c) (c) Armature is the combination of current carrying coil wound on soft iron core. This is attached to axle & rotates on it.

Brushes

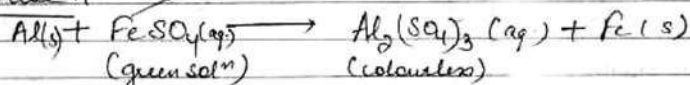
Carbon brush provides conductivity. \neq

Split ring

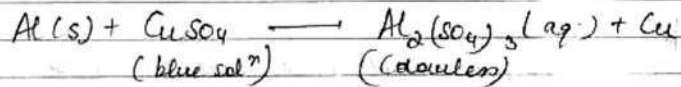
It acts as commutator & reverses direction of \perp current

SECTION - B

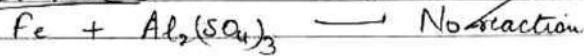
22. Test Tube A :-



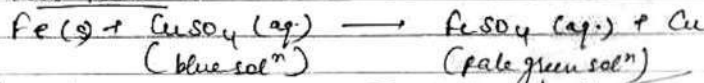
Test Tube B :-



Test Tube C :-

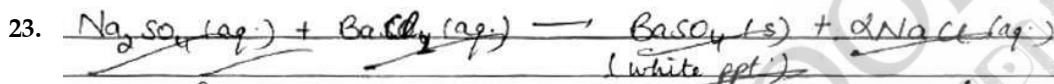


Test Tube D :-



So, colour changed in Test tube A, B, D.

Reactivity :- $\text{Al} > \text{Fe} > \text{Cu}$



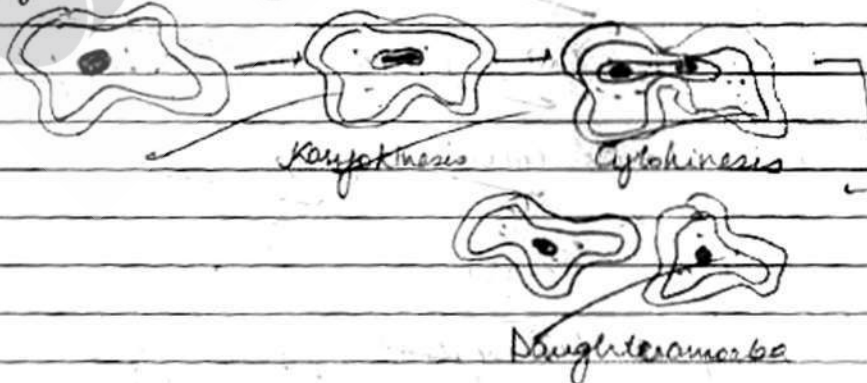
Rxn :- Precipitation Rxn / Double Displacement Rxn $\frac{1}{2}$

Observation - white coloured precipitate is formed. $\frac{1}{2}$

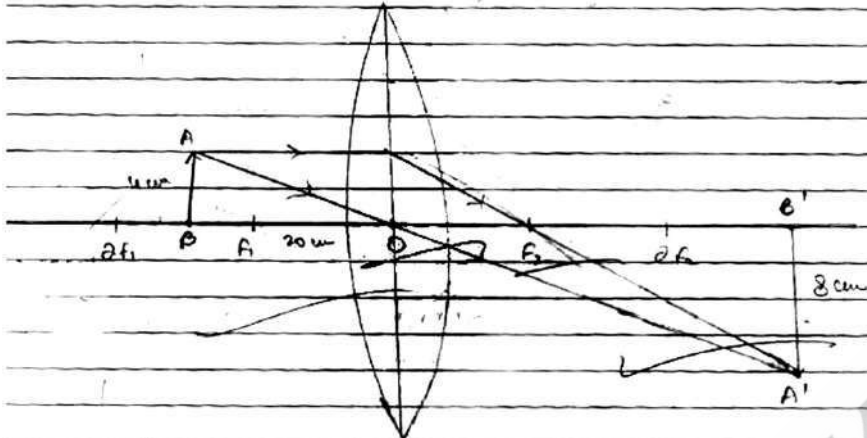
24. Take out
 Peel a leaf peel from ventral side of leaf $\frac{1}{2}$
 Place it on petridish after cutting its pieces $\frac{1}{2}$
 Add some water & saffron (solⁿ stain) on petridish.
 After some time, using brush, take out the peel $\frac{1}{2}$
 place on the slide using blotting paper to drain excess stain.
 Add a drop of glycerine & carefully place a coverslip $\frac{1}{2}$
 to prevent air bubble.

25. Amoeba reproduces by binary fission. $\frac{1}{2}$

Stages :-

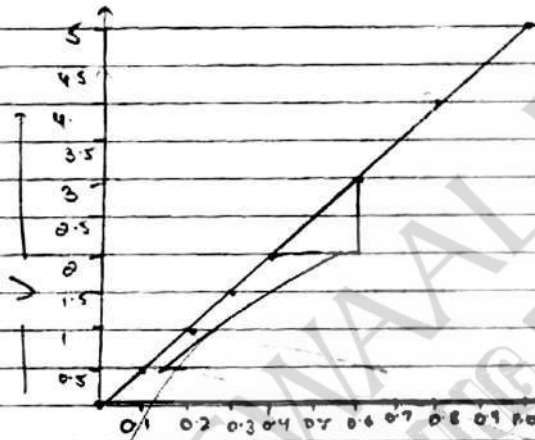


26.



$$\text{Ratio : } \frac{h'}{h} = \frac{8}{4} = \frac{40}{10} = 2:1$$

27.



$$R = \frac{\Delta V}{\Delta I} = \frac{3-2}{0.6-0.4} = \frac{1}{0.2} = \frac{10}{2} = 5 \Omega$$

□□