

**CLASS X (2019-20)**  
**SCIENCE (CODE 086)**  
**SAMPLE PAPER-20**

**Time : 3 Hours**

**Maximum Marks : 80**

**General Instructions :**

- (i) The question paper comprises of three sections-A, B and C. Attempt all the sections.
- (ii) All questions are compulsory.
- (iii) Internal choice is given in each sections.
- (iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
- (v) All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.
- (vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.
- (vii) This question paper consists of a total of 30 questions.

**Section A**

1. State the nature of the lens in human eye and name the part responsible for adjusting its focal length. [1]

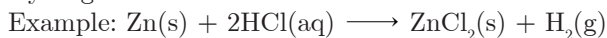
**Ans :**

- 1. Nature of Lens: converging/convex
- 2. Ciliary muscles

2. Name the gas generally liberated when an acid reacts with a metal. Illustrate with an example. [1]

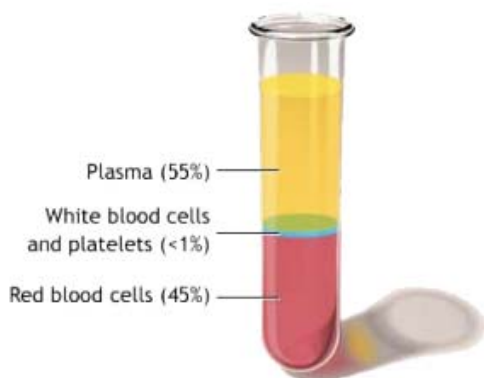
**Ans :**

Hydrogen



3. Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Blood is a fluid connective tissue that circulates throughout our body and delivers essential substances like oxygen to the body cells. It also transports metabolic waste products away from the cells. Figure alongside depicts the percentage composition of different components of blood.



Blood cannot be made or manufactured outside the body. Blood donation is the only source of blood for patients that need blood transfusion.

- 3.1 Why do you think donating blood isn't harmful even though red blood cells carry oxygen to the body cells? [1]

**Ans :** Red blood cells make up about 40% of our blood and are constantly being replaced in our body.

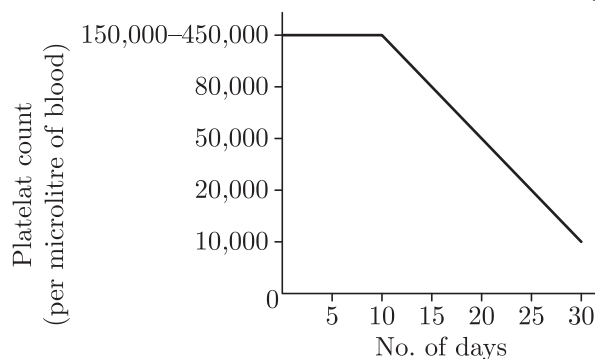
- 3.2 Which component is deficient in your blood if you lose too much of blood from a cut? [1]

**Ans :** Platelets, as they help in clotting of blood.

- 3.3 Name the pigment present in red blood cells that carries oxygen from the lungs to all the body tissues. [1]

**Ans :** Haemoglobin

- 3.4 Based on the information shown by the bar graph, what could be the possible cause for reduced platelet count? [1]



**Ans :** Dengue, which is caused by the dengue virus, reduces the blood platelet count of a person drastically.

4. Question numbers 4.1-4.4 are based on the two tables given below and the related studied concepts. Analyse these tables and answer the questions that follow.

**Table A: Amount of air pollutants (microgram per cubic metre)**

Air Pollutants	Microgram per cubic metre
SO <sub>2</sub>	50
NO <sub>2</sub>	40
PM10	60

**Table B: Status of ambient air quality in five metropolitan cities of India**

S.No.	Name of the city	State	2011		
			SO <sub>2</sub>	NO <sub>2</sub>	PM10

1.	Banglore	Karnataka	14	28	91
2.	Delhi	U.T.	6	61	777
3.	Gwalior	M.P.	12	20	311
4.	Chennai	Tamil Nadu	9	24	92
5.	Agra	U.P.	3	23	155

4.1 Refer to Table B showing the status of ambient air quality in five metropolitan cities of India. Which city has the maximum risks of respiratory diseases? [1]

Ans : The concentration of PM10 (particulate matter) in air is the highest in Gwalior. Hence the risk of respiratory diseases is maximum in this city.

4.2 Which is the least polluted city among the five metropolitan cities of India and why? [1]

Ans : Chennai (Tamil Nadu), as the air has least concentration of SO<sub>2</sub>, NO<sub>2</sub> and PM10 in this city.

4.3 Taj Mahal in Agra is said to be suffering from 'Marble Cancer'. Which of the following statements correctly defines marble cancer? [1]

- (a) Formation of fungus at Taj Mahal
- (b) Corrosion of marble by acid rain
- (c) Formation of perforations in Taj Mahal
- (d) Yellowing of marble by soot particles

Ans : (b) Corrosion of marble by acid rain

4.4 Which of the following steps should be taken to reduce SO<sub>2</sub> and NO<sub>2</sub> pollutants in the air? [1]

- (a) Increase the use of fossil fuels
- (b) Cut a large number of trees
- (c) Install catalytic converters in the vehicles
- (d) Use petrol run vehicles for covering short distances

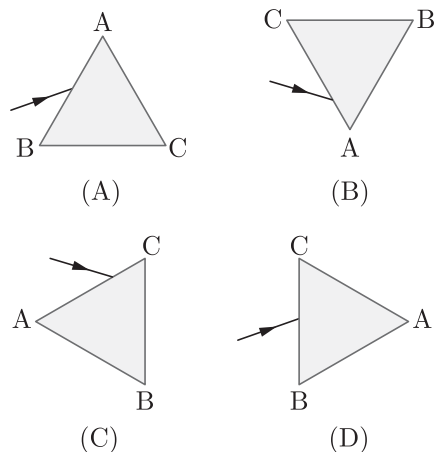
Ans : (c) Install catalytic converters in the vehicles

5. One of the constituents of the baking powder is sodium hydrogencarbonate, the other constituent is [1]

- (a) oxalic acid
- (b) lactic acid
- (c) ethanoic acid
- (d) tartaric acid

Ans : (d) tartaric acid

6. A prism ABC (with BC as base) is placed in different orientations. A narrow beam of white light is incident on the prism as shown in the figure. In which of the following cases, after dispersion, the third colour from the top corresponds to the colour of the sky? [1]



- (a) A
- (b) B
- (c) C
- (d) D

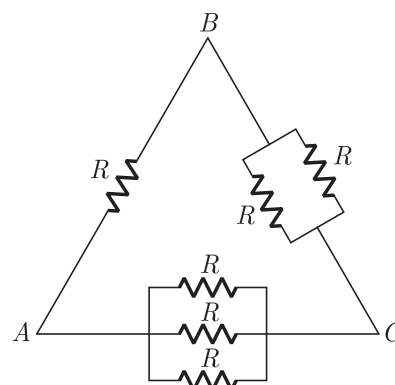
Ans : (b) B

7. An element E forms a halide with formula EH<sub>4</sub> which is a solid with low melting point. Element E is most likely to be in the same group of periodic table as [1]

- (a) Be
- (b) Mg
- (c) Ca
- (d) Si

Ans : (d) Si

8. Consider the following network of six identical resistors. If the equivalent resistance of this circuit between A and B, B and C, and A and C are R<sub>AB</sub>, R<sub>BC</sub> and R<sub>AC</sub> respectively then which of the following relations is correct? [1]

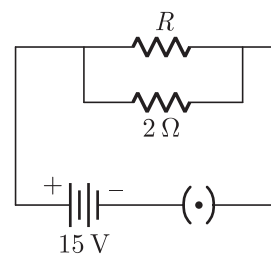


- (a) R<sub>AB</sub> = R<sub>BC</sub> > R<sub>AC</sub>
- (b) R<sub>AC</sub> > R<sub>BC</sub> > R<sub>AB</sub>
- (c) R<sub>AB</sub> = R<sub>BC</sub> = R<sub>AC</sub>
- (d) R<sub>BC</sub> > R<sub>AC</sub> > R<sub>AB</sub>

Ans : (b) R<sub>AC</sub> > R<sub>BC</sub> > R<sub>AB</sub>

or

The power dissipation in this circuit would be 150 W, if the value of R is



- (a) 4 Ω
- (b) 6 Ω
- (c) 8 Ω
- (d) 12 Ω

Ans : (b) 6 Ω

9. What happens when copper rod is dipped in iron sulphate solution? [1]

- (a) Copper displaces iron
- (b) Blue colour of copper sulphate solution is obtained
- (c) No reaction takes place
- (d) Reaction is exothermic

Ans : (c) No reaction takes place

or

A student added dilute HCl to a test tube containing zinc granules and made following observations :

- (a) the zinc surface became dull and black

- (b) a gas evolved which burnt with a pop sound  
 (c) the solution remained colourless  
 (d) the solution becomes green in colour

**Ans :** (b) a gas evolved which burnt with a pop sound

10. Which of the following phenomena of light are involved in the formation of a rainbow? [1]

- (a) Reflection, refraction and dispersion  
 (b) Refraction, dispersion and total internal reflection  
 (c) Refraction, dispersion and internal reflection  
 (d) Dispersion, scattering and total internal reflection

**Ans :** (c) Refraction, dispersion and internal reflection

11. Which of the following gives the correct increasing order of the atomic radii of chlorine (Cl), phosphorous (P) and sulphur (S)? [1]

- (a) Cl, S, P (b) P, S, Cl  
 (c) S, P, Cl (d) P, Cl, S

**Ans :** (a) Cl, S, P

12. A plane mirror is moving towards you with a speed of 1 m/s. The speed with which your image is approaching you is [1]

- (a) 1 m/s (b) 2 m/s  
 (c) 4 m/s (d) 8 m/s

**Ans :** (b) 2 m/s

**For question numbers 13 and 14, two statements are given—one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.**

- (a) Both A and R are true and R is correct explanation of the assertion.  
 (b) Both A and R are true but R is not the correct explanation of the assertion.  
 (c) A is true but R is false.  
 (d) A is false but R is true.

13. **Assertion :** Sodium metal is stored under Kerosene. [1]  
**Reason :** Metallic sodium melts when exposed to air.

**Ans :** (c) Assertion (A) is true but reason (R) is false.

Sodium is a very reactive metal. It is kept in kerosene to prevent it from coming in contact with oxygen and moisture present. If this happens, it will react with the moisture present in air and form sodium hydroxide. This is a strongly exothermic reaction, and lot of heat is generated.

**or**

**Assertion :** To dilute sulphuric acid, acid is added to water and not water to acid.

**Reason :** Specific heat of water is quite large.

**Ans :** (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

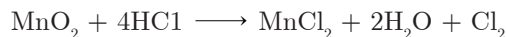
14. **Assertion :** When two long parallel straight conductors hanging freely are connected in parallel to a powerful battery, they come near to each other.

**Reason :** Conductors carrying current in same direction attract each other. [1]

**Ans :** (a) Both A and R are true and R is correct explanation of the assertion.

## Section B

15. (a) Give an example of a combination reaction which is exothermic.  
 (b) Identify the substance oxidised and the substance reduced in the following reaction:



- (c) Name the phenomenon due to which the taste and smell of oily foods change when left for a long time. Suggest one method to prevent it. [3]

**Ans :**

- (a)  $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{Heat}$   
 (b) HCl is oxidised to  $\text{Cl}_2$  and  $\text{MnO}_2$  is reduced to  $\text{MnCl}_2$ .  
 (c) Rancidity  
 It is prevented by adding antioxidants to food containing fats and oils.

**or**

What are exothermic and endothermic reactions? Give examples. [3]

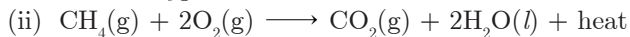
**Ans :**

**Exothermic reactions:** Those reactions which are accompanied by the evolution of heat.

Example: (any one example)



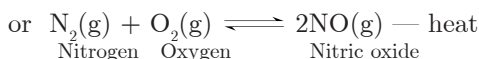
Coke      Oxygen      Carbon dioxide



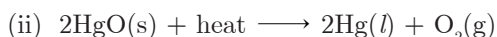
Methane      Oxygen      Carbon dioxide      Water

**Endothermic reactions:** Those reactions which are accompanied by the absorption of heat.

Example: (any one example)



Nitrogen      Oxygen      Nitric oxide



Mercuric oxide      Mercury      Oxygen

16. Differentiate between strong and weak acids. Identify the strong and weak acids from the following list of acids. [3]

Hydrochloric acid, Acetic acid, Formic acid, Nitric acid

**Ans :**

Acids which dissolve completely in aqueous solution to give large number of hydrogen ions are called strong acids. On the other hand, the acids which dissolve only partially in the aqueous solution to give a small amount of hydrogen ions ( $\text{H}^+$ ) or hydronium ions ( $\text{H}_3\text{O}^+$ ) are called weak acids.

**Strong acids:** Hydrochloric acid, Nitric acid;

**Weak acids:** Acetic acid, Formic acid

17. Four elements P, Q, R and S belong to the third period of the Modern Periodic Table and have 1, 3, 5 and 7 electrons respectively in their outermost shells. Write the electronic configurations of Q and R and determine their valencies. Write the molecular formula of the compound formed when P and S combine. [3]

**Ans :**

Elements P, Q, R and S are the elements of third period, so these must have three filled shells.  
 Electronic configuration of Q: 2, 8, 3  
 Valency of Q: 3  
 Electronic configuration of R: 2, 8, 5  
 Valency of R:  $8 - 5 = 3$   
 Electronic configuration of P: 2, 8, 1  
 Electronic configuration of S: 2, 8, 7  
 Formula of the compound formed by the combination of P and S: PS, i.e., NaCl.

18. (a) Name the part of brain which controls:  
 (i) voluntary actions (ii) involuntary actions  
 (b) State the significance of the peripheral nervous system. Name the components of this nervous system and distinguish between their origins. [3]

**Ans :**

- (a)  
 (i) The voluntary actions are controlled by cerebellum.  
 (ii) The involuntary actions are controlled by midbrain or medulla oblongata.  
 (b)  
 (i) The peripheral nervous system facilitates the communication between the central nervous system and other parts of the body.  
 (ii) It consists of cranial nerves (12 pairs) which arise from brain and the spinal nerves (31 pairs) that arise from spinal cord.  
 (iii) Cranial nerves emerge directly from the brain, in contrast to spinal nerves which emerge from the segments of the spinal cord.

19. How does chemical coordination occur in plants? [3]

**Ans :**

Chemical coordination in plants takes place with the help of the plant hormones. Various hormones are synthesised in one part of the plant and simply diffuse to the site of action. They are produced in minute quantities. They are responsible for growth, development and response to environmental stimuli.

20. "It is possible that a trait is inherited but may not be expressed." Give a suitable example to justify this statement. [3]

**Ans :**

Yes, it is possible.  
 Example: When pure tall pea plants are crossed with pure dwarf pea plants, only tall pea plants are obtained in  $F_1$  generation.  
 On selling tall plants of  $F_1$ , both tall and dwarf plants are obtained in  $F_2$  generation in the ratio 3 : 1. Reappearance of the dwarf character, a recessive trait in  $F_2$  generation shows that the dwarf trait/character was present in the individuals of  $F_1$  but it was not expressed (due to the presence of tallness, a dominant trait/character).

or

Describe any three methods of tracing evolutionary relationship among organisms. [3]

**Ans :**

- (a) Homologous organs: Homologous organs are

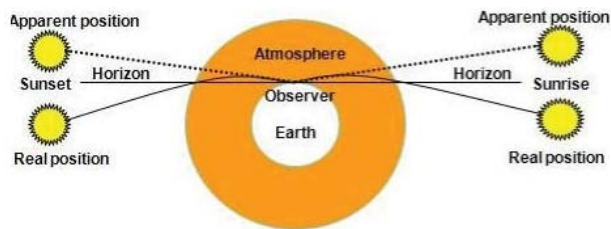
those organs which are formed on the same fundamental structural plan but differ in their shapes because they have to function differently.  
 Example: Forelimbs of frog and bird

- (b) Analogous organs: Analogous organs are structurally and developmentally quite different from each other, i.e., they have different origins. But, they perform similar functions in different animals.  
 Example: The wings of a bird and the wings of a bat.  
 (c) Fossils: The remains or impressions of dead and decayed plants and animals of remote past are called fossils. The fossils tell us how new species are developed from the old ones. Example: Fossils of dinosaurs

21. What is advanced sunrise and delayed sunset? Draw a labelled diagram to explain these phenomena. [3]

**Ans :**

Due to atmospheric refraction, the sun is visible to us a few minutes before the actual sunrise and a few minutes after the actual sunset. This is called advanced sunrise and delayed sunset.



or

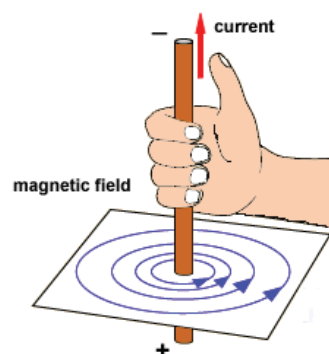
Why does the sun appear reddish early in the morning? Will this phenomenon be observed by an astronaut on the Moon? Give reason to justify your answer. [3]

**Ans :**

The sun appears reddish early in the morning because at sun-rise, the shorter wavelengths scatter out. Only the longer wavelengths like red reach our eye. This phenomenon will not be observed on the Moon because there is no atmosphere on the Moon.

22. Draw magnetic field lines produced around a current-carrying straight conductor passing through a cardboard. Apply right hand thumb rule to mark the direction of these field lines. How will the strength of the magnetic field change, when the point where the magnetic field is to be determined, is moved away from the straight wire carrying constant current? Justify your answer. [3]

**Ans :**



- i. The direction of current flowing through the conductor is vertically upwards (i.e. outwards) then, if seen from the above, the direction of the magnetic field lines produced is anticlockwise.
- ii. The strength of the magnetic field will decrease as the distance from the current increases. We also notice that the concentric circles become larger as we move away from the conductor.

**23.** What is meant by the term overloading of an electrical circuit? Explain two possible causes due to which overloading may occur in household circuits. State one preventive measure that should be taken to avoid the overloading of domestic electric circuits. [3]

**Ans :**

Overloading of an electrical circuit happens when an excessive amount of electric current passes through the wire and excessive heating takes place.

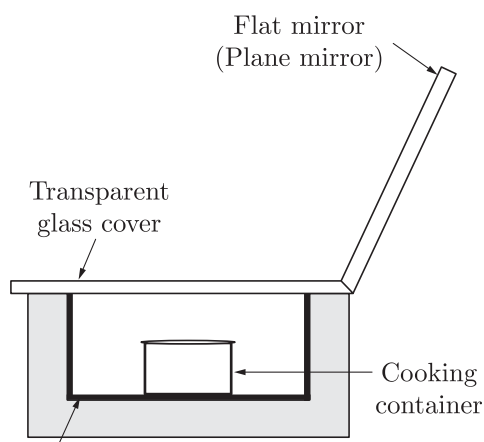
- (i) Two possible causes of overloading:
  - (a) Live and neutral wires come in contact with each other. The resistance becomes close to zero in such a situation and the wires of the supply get heated due to extremely large current flowing through them. Consequently the circuit may catch fire.
  - (b) Connecting too many appliances in parallel to a single socket. In this case also excessive current flows and excessive heating takes place.
- (ii) Preventive measures:
  - (a) Proper insulation
  - (b) Not connecting too many appliances to a single socket

**24.** Draw schematic labelled diagram of a box-type solar cooker.

Name three components of a solar cooker which are responsible for increasing the temperature inside it. Explain their functions in brief. [3]

**Ans :**

- (i) The components of a box type solar cooker, which are responsible for increasing the temperature inside it are (a) transparent glass cover; (b) insulated box blackened from inside and (c) plane mirror.



- (ii) Transparent glass cover helps in trapping of heat (infra-red radiations), blackened box helps in more absorption of heat and plane mirror helps to maximise the amount of sunlight on the food.

## Section C

- 25.** (a) In the formation of compound between two atoms A and B, A loses two electrons and B gains one electron. [5]
- (i) What is the nature of bond formed between A and B?
  - (ii) Suggest the formula of the compound formed by the combination of A and B.
- (b) On similar lines explain the formation of  $MgCl_2$  molecule.
- (c) Common salt conducts electricity only in the molten state. Why?
- (d) Why is melting point of sodium chloride high?

**Ans :**

- (a) (i) Ionic bond (ii)  $AB_2$
- (b) Magnesium atom loses two electrons and becomes positively charged magnesium ion ( $Mg^{2+}$ ). Each chlorine atom gains one electron and becomes negatively charged chloride ion ( $Cl^-$ ). Now the two ions attract each other due to electrostatic attraction and form  $MgCl_2$ , which is an ionic compound.
- (c) When common salt is in solid state, the ions are held together in a giant crystal lattice. When the common salt is in molten state, the ions are free to move. These free moving charged particles (ions) conduct electricity.
- (d) This is because sodium chloride is an ionic compound that has a crystalline structure. Therefore, a lot of energy is needed to break the ionic bonds.

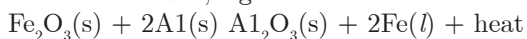
**or**

- (a) Name the systematic steps involved in metallurgy.
- (b) If A, B, C, D, E, F, G, H, I, J and K represent the metals in decreasing order of reactivity, which metal is likely to occur in the free state?
- (c) Carbon reduction process is not applied for reducing aluminium oxide to aluminium. Give reasons.
- (d) Thermite process is quite useful for repairing the broken parts of railway tracks. Justify.
- (e) Aqueous solution of sodium chloride cannot be used for the isolation of sodium by electrolytic reduction. Give reasons. [5]

**Ans :**

- (a) The systematic steps involved in metallurgy are:
  - (i) Concentration of the ore
  - (ii) Conversion of ore into metal oxide
  - (iii) Reduction of metal oxide to metal
  - (iv) Refining of impure metal
- (b) K is the least reactive metal (as it lies at the bottom of the series) so it is likely to occur in the free state.
- (c) Carbon cannot be used for reducing aluminium oxide to aluminium because aluminium metal itself is a very powerful reducing agent and can easily take up oxygen from the oxides of metals like iron, magnesium and chromium.
- (d) In thermite process, oxides of metals like iron are reduced by aluminium. The reaction is highly exothermic and a large amount of heat is evolved

during this reaction. As a result, metal will be in the molten state, e.g.



Ferric oxide Aluminium Aluminium oxide Molten iron

This molten iron is made to fall on the broken parts of the railway tracks, the gaps get filled up and the tracks are repaired.

- (e) If an aqueous solution of sodium chloride is used, sodium metal which is formed at cathode will immediately react with water. Since sodium has great affinity for water, the reaction will be highly exothermic and the metal will catch fire.

26. Elements forming ionic compounds attain noble gas electronic configuration by either gaining or losing electrons from their valence shells. Explain giving reason why carbon cannot attain stable configuration in this manner to form its compounds. Name the type of bonds formed in ionic compounds and in the compounds formed by carbon. Also explain with reason why carbon compounds are generally poor conductors of electricity. [5]

Ans :

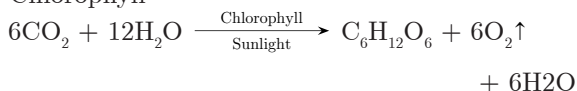
- i. Carbon has 4 electrons in its outermost shell. It cannot lose 4 electrons to form  $\text{C}^{4+}$  because very high energy is required to remove 4 electrons.
- ii It cannot gain 4 electrons to form  $\text{C}^{4-}$  ions because it is difficult for 6 protons to hold on to 10 electrons.
- iii Ionic/Electrovalent bonds in ionic compounds; and Covalent bonds in the compounds formed by carbon.
- iv There are no charged particles in carbon compounds and hence they are poor conductors of electricity.

27. Name the organelle which is site of photosynthesis in green plants. List the raw materials essential for this process to take place. How are they obtained by the green plants? Write balanced chemical equation for the process, stating the by product of the reaction. [5]

Ans :

- i. Photosynthesis takes place in the grana and stroma of chloroplast in the green plants.
- ii. Raw materials  $-\text{CO}_2$ , water, sunlight and chlorophyll.
- iii.  $\text{CO}_2$  of the atmospheric air enters into the leaves through stoma and water enters the plant through roots which absorb it from the soil.

Chlorophyll

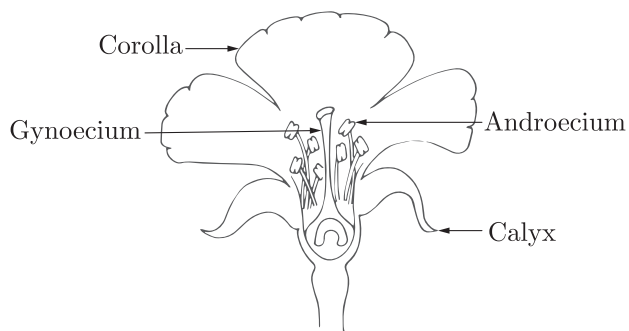


- iv. Byproduct-Oxygen gas

28. (a) Draw the diagram of a flower and label the four whorls.  
 (b) What is pollination? Explain its significance.  
 (c) Explain the process of fertilisation in flowers. [5]

Ans :

- (a) **Labelled diagram of a flower with four whorls:**



(b) **Pollination :** Transfer of pollen grains from anther to the stigma of a flower of same species.  
**Significance of pollination:** Process of pollination leads to fertilisation as it brings the male and female gametes together for fusion.

(c) After a pollen falls on a suitable stigma, the pollen tube grows out of the pollen grain and travels through the style to reach the ovule in the ovary. Here, the male germ cell (carried by the pollen tube) fuses with the female germ cell to form zygote.

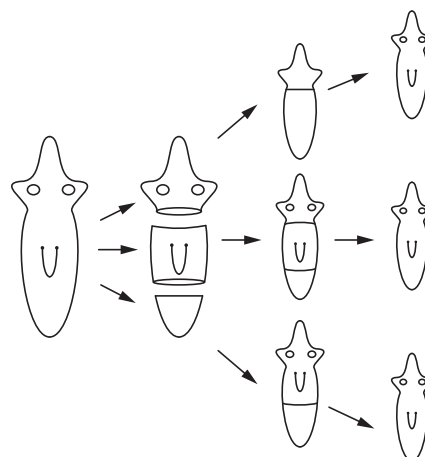
or

Why are budding, fragmentation and regeneration all considered as asexual types of reproduction? With neat diagrams explain the process of regeneration in Planaria. [5]

Ans :

Budding, fragmentation and regeneration are all considered as asexual types of reproduction for the following reasons:

- (a) They involve only one parent.
- (b) Progeny formed are similar to their parent.
- (c) Gametes are not involved in reproduction.



In the diagram, the body of a Planaria is accidentally cut into three pieces. Each piece restores its lost parts through regeneration. Regeneration is carried out by specialised cells which proliferate and make large number of cells mitotically to generate tissue that slowly differentiate into the desired part.

29. A student has focused the image of a candle flame on a white screen using a concave mirror. The situation is as given below: [5]

Length of the flame = 1.5 cm

Focal length of the mirror = 12 cm

Distance of flame from the mirror = 18 cm

If the flame is perpendicular to the principal axis of the mirror, calculate the following:

- (a) Distance of the image from the mirror
- (b) Length of the image

If the distance between the mirror and the flame is reduced to 7 cm, what would be observed on the screen? Draw ray diagram to justify your answer for this situation.

**Ans :**

Here,  $h_0 = +1.5 \text{ cm}$   
 $f = -12 \text{ cm}$   
 $u = -18 \text{ cm}$   
 $v = ?$   
 $h_i = ?$

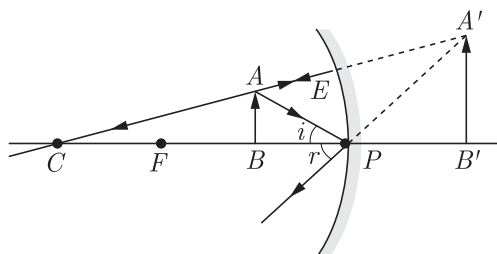
(a)  $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$   
 $\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{(-12 \text{ cm})} - \frac{1}{(-18 \text{ cm})}$   
 $= \frac{-1}{12 \text{ cm}} + \frac{1}{18 \text{ cm}} = \frac{-3 + 2}{36 \text{ cm}}$   
 $= \frac{-1}{36 \text{ cm}}$

$\therefore v = -36 \text{ cm}$

(b)  $h_i = -\frac{v}{u} \times h_0$   
 $= \frac{-36 \text{ cm}}{-18 \text{ cm}} \times 1.5 \text{ cm} = -3 \text{ cm}$

(Two times magnified, inverted image)

- (c) If  $u = -7 \text{ cm}$ , the object will be between pole and principal focus of the mirror and thus, no distinct image would be formed on the screen. In this case the image formed will be virtual, erect and magnified.
- (d) Ray diagram



or

- (a) What is meant by power of a lens? The focal length of a lens is  $-10 \text{ cm}$ . Write the nature of the lens and find its power.
- (b) The image of an object formed by a lens is real, inverted and of the same size as the object. If the image is at a distance of  $40 \text{ cm}$  from the lens, find the nature and power of the lens. Draw a ray diagram to justify your answer. [5]

**Ans :**

- (a) (i) **Power of lens** – Ability of a lens to converge or diverge light rays. /Degree of convergence or divergence of light rays achieved by a lens./ Reciprocal of focal length of a lens.
- (ii) **Nature of lens** – Concave/Diverging

$$P = \frac{100}{-10 \text{ cm}} = -10 \text{ D}$$

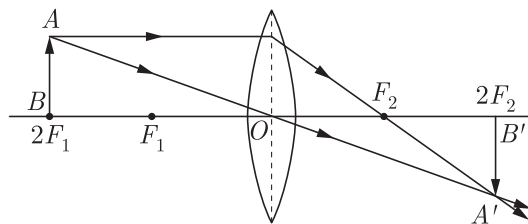
- (b) Here the image distance  $v = +40 \text{ cm}$ ;  $h_i = h_0$   
 $(\because \text{Size of image} = \text{size of object})$

The lens is convex/converging. Image is real, inverted and of the same size as the object.  
 $\therefore$  Object is at  $2F$ .

$$2f = 40 \text{ cm}; f = 20 \text{ cm}$$

$$\text{Power of lens, } P = \frac{1}{f} = \frac{100}{20 \text{ cm}} = 5 \text{ dipotre}$$

**Ray diagram**



- 30. (a) Calculate the resistance of the wire using the graph.

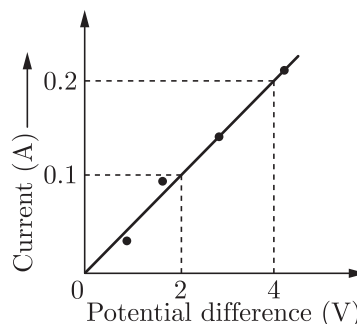


Fig: Potential difference (V)

- (b) How many  $176 \Omega$  resistors in parallel are required to carry  $5 \text{ A}$  on a  $220 \text{ V}$  line?
- (c) Define electric power. Derive relation between power, potential difference and resistance. [5]

**Ans :**

(a)  $V = IR \Rightarrow R = \frac{V}{I} = \frac{2 \text{ V}}{0.1 \text{ A}} = 20 \Omega$

- (b) One resistor has  $176 \text{ ohm}$  resistance.

Given, Current,  $(I) = 5 \text{ A}$ ,  
 Potential difference,  $(V) = 220 \text{ V}$

$$\text{Total resistance of the circuit} = \frac{V}{I} = \frac{220 \text{ V}}{5 \text{ A}} = 44 \Omega$$

Let the number of  $176 \Omega$  resistors in parallel be  $x$ .  
 The resistance of parallel combination of  $x$  resistors of  $176 \Omega$  each  $\frac{176 \Omega}{x}$

This resistance must be equal to the resistance of the circuit, i.e.  $44 \Omega$ .

$$\frac{176}{x} \Omega = 44 \Omega \Rightarrow x = \frac{176 \Omega}{44 \Omega} = 4$$

Therefore, the number of resistors is 4.

- (c) The rate at which electric energy is consumed is called electric power.

The relation between power, potential difference and resistance is given by:

$$\text{Power} = \frac{\text{Work done}}{\text{Time}} = \frac{VQ}{t} = V \times I$$

$$\therefore P = \frac{V^2}{R} \quad (\because I = \frac{V}{R})$$