

CBSE Class 10 Science
Sample Paper 02 (2020-21)

Maximum Marks: 80

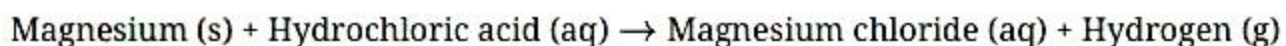
Time Allowed: 3 hours

General Instructions:

- i. The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.
- ii. Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each. These questions contain multiple-choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.
- iii. Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should in the range of 30 to 50 words.
- iv. Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should in the range of 50 to 80 words.
- v. Section–D – question no. - 34 to 36 are long answer type questions carrying 5 marks each. Answers to these questions should be in the range of 80 to 120 words.
- vi. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- vii. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. Write the balanced chemical equation for the following reaction and identify the type of reaction.



OR

Write the balanced chemical equation for the following reaction and identify the type of reaction.

Potassium bromide (aq) + Barium iodide (aq) → Potassium iodide (aq) + Barium bromide (aq)

2. Is the **decomposition of ferrous sulphate** exothermic or endothermic in nature?
3. The hardness of water is caused by:
 - a. All of these
 - b. $\text{Mg}(\text{HCO}_3)_2$
 - c. CaCl_2
 - d. CaSO_4
4. Name a mirror that can give an erect and enlarged image of an object.
5. Why are danger light signals red in color?
6. Give two examples of hydrated salts.

OR

Explain how antacid works.

7. How does the resistance of a wire vary with its area of cross-section? Explain.
8. Why is an alternating current considered to be advantageous over direct current for long range transmission of electric energy?
9. Name the physical quantity whose unit is JC^{-1} .

OR

What happens to the other bulbs in a series circuit, if one bulb blows off?

10. Name minute tubules which end in the alveoli of the lungs.
11. From which substance urea is formed in the liver?

OR

In which part of plants sugar and other metabolites are synthesized?

12. In the following food chain, 5 J of energy is available to man. How much energy was available at producer level?
Plants → Sheep → Man

OR

What name has been given to those organisms which break down the complex organic

compounds present in dead animals and plants?

13. Mention any three methods adopted by plants to minimise the transpiration rate.

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

Reason: Specific heat of water is quite large.

- a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
 - b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
 - c. Assertion is CORRECT but, reason is INCORRECT.
 - d. Assertion is INCORRECT but, reason is CORRECT.
15. **Assertion (A):** Garden is an artificial ecosystem.

Reason (R): Biotic and abiotic components of the ecosystem are manipulated by humans.

- 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 of the assertion
- c. A is true but R is false.
- d. A is false but R is true.

OR

Assertion (A): In plants, there is no need for specialised respiratory organs.

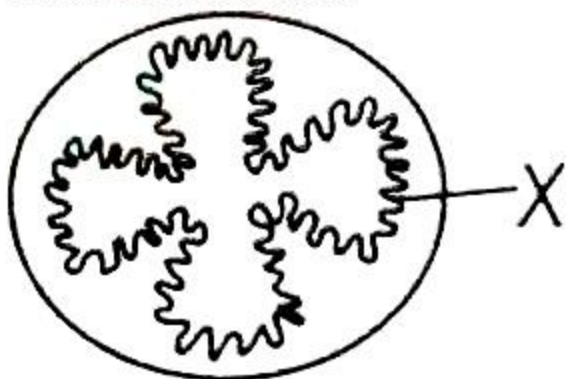
Reason (R): Plants do not have great demands for gaseous exchange.

- 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.
16. **Assertion (A):** The sex of a child is determined by the mother.
- Reason (R):** Humans have two types of sex chromosomes: XX and XY.
- 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 false but R is true.
 - d. A is true but R is false.
17. **Read the following and answer any four questions:**

In human beings, the process of intake of essential nutrients in the form of food takes place through an entire system known as the digestive system. The human digestive

system constitutes a long tubular structure called the alimentary canal and various digestive glands associated with it. These glands secrete different digestive enzymes.

- i. In which order do these events occur in human nutrition?
 - a. Digestion → Ingestion → Absorption → Assimilation
 - b. Digestion → Ingestion → Assimilation → Absorption
 - c. Ingestion → Absorption → Assimilation → Digestion
 - d. Ingestion → Digestion → Absorption → Assimilation
- ii. The diagram shows the human digestive system. Identify the structures which secrete digestive enzymes.
 - a. A, B, C, and D
 - b. A, C, D, and E
 - c. A, C, and E
 - d. B, C, and D
- iii. Only two of the following statements accurately describes what happens in the mouth.
 - A. Amylase breaks down large starch molecules into smaller maltose molecules.
 - B. Chewing increases the surface area of food for digestion.
 - C. Saliva emulsifies fat into smaller droplets.
 - D. Teeth break large insoluble molecules into smaller soluble molecules.Which statements are correct?
 - a. A and B
 - b. B and C
 - c. C and D
 - d. A and D
- iv. The diagram represents a transverse section of the human intestine. What is the role of structure labelled X?

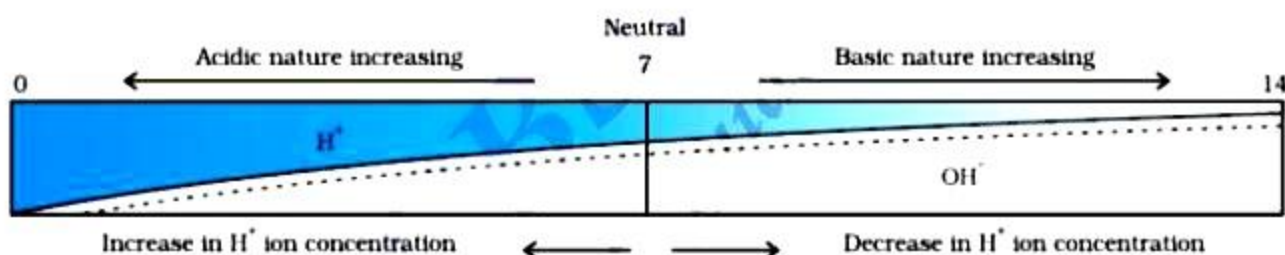


- a. They help to digest food

- b. They increase the surface area for absorption of food
 - c. They protect against bacteria
 - d. They move mucus over the surface
- v. The gall bladder of a patient is removed because of gall bladder stones. Which kind of nutrient in the diet should be avoided?
- a. Carbohydrates
 - b. Proteins
 - c. Fats
 - d. Vitamins and minerals

18. Read the following and answer any four questions:

A scale for measuring hydronium ion in a solution called the pH scale. The pH of a neutral solution is 7. A value of less than 7 on the pH scale represents an acidic solution. As the pH value, increases from 7 to 14 it represents OH^- ion concentration in solution i.e a basic solution.



- i. Human Body works within the pH range of
 - a. 7.4 to 8
 - b. 4.4 to 5.4
 - c. 7 to 7.8
 - d. 6.1 to 7
- ii. The strength of acid and bases depend on the _____
 - a. number of H^+ ion produce
 - b. number of OH^- ion produce
 - c. both (a) and (b)
 - d. none of the above
- iii. A solution turns red litmus blue, its pH is likely to be
 - a. 1
 - b. 4

- c. 5
- d. 10

iv. Tooth decay starts when the pH of the mouth lower than

- a. 7.5
- b. 5.5
- c. 6.7
- d. 8.4

v. The higher the hydronium ion concentration _____ is the pH value.

- a. lower
- b. greater
- c. same
- d. zero

19. Read the following and answer any four questions:

For the flow of charge in a conductor metallic wire, gravity does not play any role. The electron moves only if there is a difference in electric potential. The difference of potential may be produced by a battery, consist of one or more electric cells. The chemical action with a cell generate the potential difference across the terminal of the cell, even when no current is drawn from it, potential difference set the charges in motion in the conductor produce an electric current, the cell has to expend its chemical energy stored in it.

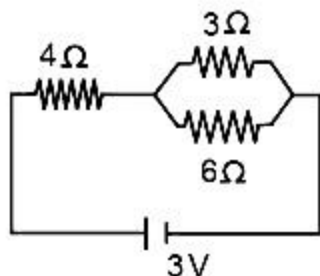
i. The potential difference between 2 points is measured as:

- a. $V = \frac{W}{Q}$
- b. $V = \frac{R}{I}$
- c. $V = \frac{Q}{I}$
- d. $V = IR$

ii. Keeping the potential difference constant, the resistance of the circuit is halved. The current will become:

- a. one-fourth
- b. four times
- c. half
- d. double

iii. The potential difference across the 3-ohm resistance in the following diagram is:



- a. $\frac{1}{9}$ V
- b. 3 V
- c. 2 V
- d. 1 V

iv. The other name of the potential difference is:

- a. amperage
- b. wattage
- c. voltage
- d. potential energy

v. The S.I unit of electric potential difference is volt (V) named after:

- a. Alessandra volta
- b. Alandra volta
- c. Alessandra volt
- d. Alexandra volt

20. **Read the following and answer any four questions:**

The Earth's crust is a major source of metal. The element which occurs naturally in earth crust is known as mineral, metal is found in a free state, combined state as oxides. Ores are usually contaminated by impurities. These impurities are removed by various methods such as roasting, calcination, and electrolytic refining, etc.

i. Which of the following pair of metals exist in their native state in nature?

- a. Ag and Hg
- b. Ag and Zn
- c. Au and Hg
- d. Au and Ag

ii. Sulphide ore is converted into metal oxide by the process of:

- a. carbonation
- b. roasting
- c. calcination

- d. anodising
- iii. _____ is an ore of mercury.
 - a. Cinnabar
 - b. Mercury oxide
 - c. Hematite
 - d. Bauxite
- iv. Which of the following statement is correct?
 - a. Na and K are the least reactive elements
 - b. Mg and Al are highly reactive elements
 - c. Zn, Fe are highly reactive elements
 - d. Pb is the least reactive element
- v. Which of the following alloys contains mercury as one of the constituents?
 - a. Stainless steel
 - b. Solder
 - c. Duralumin
 - d. Zinc amalgam

Section B

21. What are villi? What are its functions?

OR

Why breathing rate increases after a vigorous physical exercise?

- 22. Why is it necessary to separate the oxygenated and deoxygenated blood in mammals and birds?
- 23. Why does an atom of an element react with another atom to form a molecule?
- 24. Five solutions A, B, C, D and E when tested with universal indicators showed pH as 4, 1, 11, 7 and 9 respectively. Which solution is:
 - a. Neutral
 - b. Strongly alkaline
 - c. Strongly acidic
 - d. Weakly acidic
 - e. Weakly alkaline

Arrange the pH in increasing order of H^+ ion concentration.

- 25. Sudha finds out that the sharp image of window pane of her science laboratory is formed

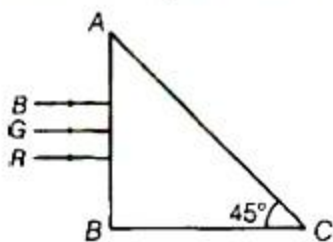
at a distance of 15 cm from the lens. She now tries to focus the building visible of her outside the window instead of the window pane without disturbing the lens. In which direction will she move the screen to obtain a sharp image of the building? What is the approximate focal length of this lens?

26. Draw a circuit diagram of an electric circuit containing of two resistors ammeter, a resistor of 2Ω in series with a combination of two resistors (4 each) in parallel and a voltmeter across the parallel combination. Will the potential difference across the 2Ω resistors be the same as that across the parallel combination of 4Ω resistors? Give reason.
27. A study found that children with light-coloured eyes are likely to have parents with light coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not?

OR

List any three structures of animals as examples of homologous organs.

28. State any three ways of effective Garbage disposal so that pollution caused by it can be minimized.
29. Differentiate between Right ventricle and Left ventricle
30. What happens when dilute hydrochloric acid is added to iron filings?
31. Arrange the following elements in increasing order of their atomic radii: Li, Be, F and N.
32. Atomic number of an element is 16. Write its electronic configuration. Find the number of valence electrons and its valency.
33. Three light rays, red (R), green (G) and blue (B) are incident on a right-angled prism ABC at face AB. The refractive indices of the material of the prism for red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively.
- Out of the three, which colour of ray will emerge out of face AC? Justify your answer.
- Trace the path of these rays after passing through face AB.



34. A student wants to project the image of a candle flame on the walls of school laboratory by using a lens.

- i. Which type of lens should he use and why?
- ii. At what distance in terms of focal length F of the lens should he place the candle flame, so as to get
 - a. a magnified and
 - b. a diminished image respectively, on the wall?
- iii. Draw ray diagrams to show the formation of the image in each case.

OR

- i. Define optical centre of spherical lens.
 - ii. A divergent lens has a focal length of 20 cm. At what distance should an object of height 4 cm from the optical centre of the lens be placed, so that its image is formed 10 cm away from the lens. Find the size of the image also.
 - iii. Draw a ray diagram to show the formation of image in above situation.
35. a. What is reproduction? List its two types.
- b. Write the difference between modes of reproduction unicellular and multicellular organisms?
36. a. State Fleming's left-hand rule.
- b. Write the function of the following parts of an electric motor.
- i. Brushes
 - ii. Split ring

OR

- a. Draw magnetic field lines produced around a current-carrying straight conductor passing through cardboard. Name, state and apply the rule to mark the direction of these field lines.
- b. 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.

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Solution

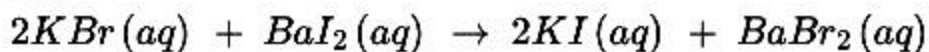
Section A

1. Magnesium (s) + Hydrochloric acid (aq) → Magnesium chloride (aq) + Hydrogen (g)
 $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$.

This is a displacement reaction.

OR

Potassium bromide (aq) + Barium iodide (aq) → Potassium iodide (aq) + Barium bromide (aq)



It is double displacement reaction.

2. The decomposition of ferrous sulphate is an endothermic reaction because heat is required to decompose the compound into its components.
3. (a) All of these

Explanation: The hardness of water is caused by magnesium and calcium salts. Calcium and magnesium dissolved in water are the two most common minerals that make water hard. Temporary hardness is a type of water hardness caused by the presence of dissolved bicarbonate minerals (calcium bicarbonate and magnesium bicarbonate).

4. Only a concave mirror can give a erect and enlarged image of an object.
5. As red light is scattered the least and it covers longer distances. That's why it is used in danger signal.
6. Washing soda, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
Blue vitriol crystals $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

OR

Hyperacidity is caused by excess of hydrochloric acid in stomach. Antacid is basic in nature. It neutralizes excess of acid and gives relief from pain caused by hyperacidity.

7. Resistance of a conductor is inversely proportional to its area cross-section. As resistivity increases area decreases and as area increases, resistivity decrease.

8. Alternating current can be transmitted without much loss of electric energy to the distant places. So AC is considered to be advantageous over DC.
9. It is potential difference or e.m.f. The other name of this is volt.

OR

If one bulb blows off in a series circuit then all other bulbs stop glowing because current stop flowing .

10. Alveolar ducts are attached to the end of each respiratory bronchiole.
11. Urea is formed by the deamination of uric acid in liver.

OR

Sugar and other metabolites are synthesized in leaves.

12. According to law if 5 J of energy is available to man then 10% energy is available to primary consumer so primary consumer is filled with 50J. Producers consume only 1% of energy which is available from sun therefore 5000J of energy is available to the producers.

OR

Organisms that break down the complex organic compounds present in dead animals and plants are called decomposers.

13. Three methods adopted by plants to minimize the rate of transpiration are:
 - i. In some cases leaves are rolled to cover stomata (e.g. some grasses)
 - ii. The stomata may be sunken (e.g. Nerium)
 - iii. In some cases, leaves may be dropped or absent as in most cacti.
14. (a) Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
15. (a) Both A and R are true and R is correct explanation of the assertion.

OR

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

16. (c) A is false but R is true.
17. i. (d) Ingestion → Digestion → Absorption → Assimilation
ii. (c) A, C, and E

- iii. (c) C and D
 - iv. (b) They increase the surface area for absorption of food
 - v. (c) Fats
- 18.
- i. (c) 7 to 7.4
 - ii. (c) Both (a) and (b)
 - iii. (d) 10
 - iv. (b) 5.5
 - v. (a) Lower
- 19.
- i. (a) $V = \frac{W}{Q}$
 - ii. (d) double
 - iii. (d) 1 V
 - iv. (c) voltage
 - v. (a) Alessandra volta
- 20.
- i. (d) - Au and Ag
 - ii. (b) - roasting
 - iii. (a) - Cinnabar
 - iv. (b) - Mg and Al are highly reactive elements
 - v. (d) - Zinc amalgam

Section B

21. Microscopic finger like projections present in the inner lining of the wall of the small intestine are called villi. They increase the surface area for the absorption of digested food in the small intestine.

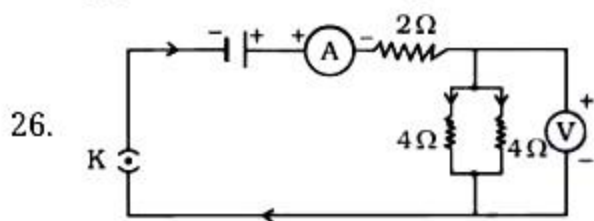
OR

1. During vigorous exercise a lot of oxygen is used by our body to release energy from glucose .
 2. This leads to lack of oxygen in our cells.
 3. We take in oxygen when we breathe.
 4. Hence to increase the amount of oxygen intake there is an increase in breathing rate during exercising.
22. In the heart of these organisms left side have oxygenated blood and right side deoxygenated blood – The separation of blood allows a highly efficient supply of oxygen to the body. It is essential for such animals which have high energy needs. They also

constantly use energy for maintain body heat.

23. The atom of an element reacts with another atom to form a molecule because by doing so it gets its octet (or duplet) completed. Also, it results in the decrease of energy.
24. a. Neutral: Solution D (pH 7)
b. Strongly alkaline: Solution C (pH 11)
c. Strongly acidic: Solution B (pH 1)
d. Weakly acidic: Solution A (pH 7)
e. Weakly alkaline: Solution E (pH 4)
25. Let us assume that the window pane is between F_2 and infinity from this lens and this is a convex lens. We know that when the object is between infinity and F_2 , its inverted and real images is formed between $2F$ and $2F_2$.

Now, the distant building is at infinity from the lens. Its image would be formed at $2F$. So, the screen needs to be moved towards the lens in order to get a sharp image. Its approximate focal length is 10 cm (less than image distance in earlier case).



Total resistance for parallel combination of 4Ω resistor can be calculated as follow:

$$\frac{1}{R} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

or, $R = 2\Omega$

Thus, resistance of parallel combination is equal to resistance of resistors in series. So, potential difference across 2Ω resistance will be same as potential difference across the other two resistors which are connected in parallel.

27. On this basis we cannot say that light eye colour is dominant or recessive until a cross is made between parent having light eye colour and another with dark eye colour is made. Only then it will be possible to predict the dominant or recessive nature of gene.

OR

Forelimbs of horse, forelimbs of bat and forelimbs of turtle are homologous organs.

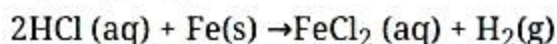
28. Pollution caused by garbage can be controlled by-
- a. Recycling of certain wastes products like plastic and paper.

- b. Maximizing the use of biodegradable products like that of paper, cloth bags etc.
- c. Producing biogas from the organic wastes.
- d. Separation of biodegradable and non-bio-degradable waste during disposal.
- e. Making the compost of biodegradable wastes by decomposing them under the layers of soil.

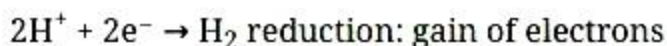
29.

Right ventricle	Left ventricle
1) Right ventricle is the lower chamber of the right side of the heart.	1) Left ventricle is the lower chamber of the left side of the heart.
2) Right ventricle gives rise to the pulmonary artery which carries deoxygenated blood to the lungs.	2) Left ventricle gives rise to the aorta which supplies oxygenated blood to different organs of the body.
3) Right ventricle is a part of pulmonary circulation.	3) Left ventricle is a part of systemic circulation.
4) The right ventricle is connected with tricuspid valve.	4) Left ventricle connected with the bicuspid valve.

30. Hydrogen gas and Iron chloride are produced.



This is a redox reaction



So it is certainly a chemical reaction: bonds are broken and made.

HCl is not a sufficiently strong oxidizing agent to produce FeCl_3 (need Cl_2).

31. The given elements belongs to 2nd period. Atomic radii decreases along a period from left to right due to increase in nuclear charge. Thus, the atomic radii of Li, Be, F and N increases in the order: $\text{F} < \text{N} < \text{Be} < \text{Li}$

32. Since, atomic number of the given element is 16. Hence, the element is sulphur(S). It is kept in group VI A or group 16 in modern periodic table.

Electronic configuration = $\overset{K}{2}, \overset{L}{8}, \overset{M}{6}$

Number of valence electrons in sulphur are 6, present in M-shell. Its valency is 2 as it requires 2 electrons to complete its octet or achieve the nearest noble gas configuration.

33. By geometry, angle of incidence (i) of all three rays is 45° . Light suffers total internal

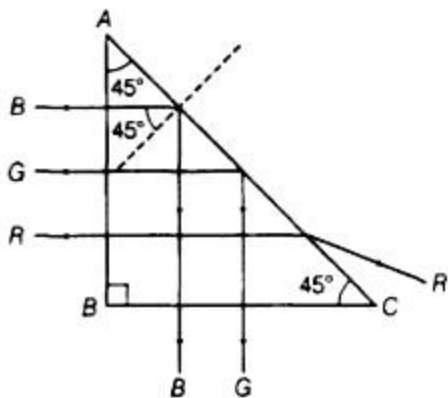
reflection for which this angle of incidence is greater than the critical angle.

$$i > i_c \Rightarrow \sin i > \sin i_c$$

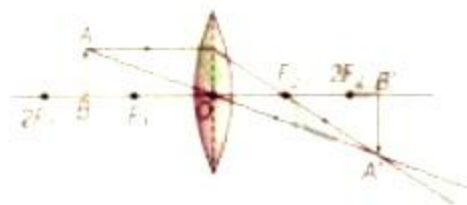
$$\text{or } \sin 45^\circ > \sin i_c \text{ or } \frac{1}{\sin 45^\circ} < \frac{1}{\sin i_c}$$

$$\sqrt{2} < \mu$$

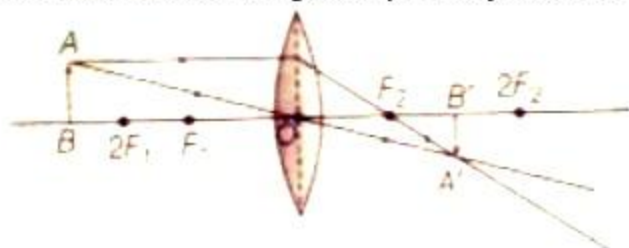
Total internal reflection takes place on AC for rays with $\mu > \sqrt{2} = 1.414$, i.e green and blue colour suffers total internal reflection whereas red undergoes refraction.



34. i. He should use a convex lens as real images are formed by a convex lens, when objects are placed between the focus and infinity .
- ii. a. For magnified image candle should be placed between focus (F) and centre of curvature (2F) of lens.
- b. To get diminished image candle should be placed beyond centre of curvature (2F) of lens.
- iii. a. For magnified image, (object between F and 2F).

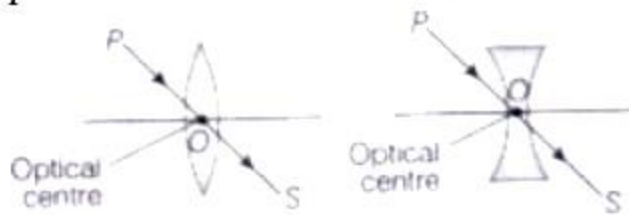


- b. For diminished image, (object beyond 2F).



OR

- i. The centre point of a lens is known as its optical centre. The optical centre is a point within the lens, directed to which incident rays refract without any deviation in the path whether it is convex lens or concave lens as represented below:



- ii. Given, there is a divergent lens(concave lens.)

Given, $f = -20\text{cm}$, $h_0 = 4\text{ cm}$, $v = -10\text{ cm}$

\therefore By lens formula,

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

$$\Rightarrow \frac{-1}{10} - \frac{1}{u} = \frac{-1}{20}$$

$$\Rightarrow \frac{1}{u} = \frac{-1}{10} + \frac{1}{20} \Rightarrow \frac{1}{u} = \frac{-2+1}{20}$$

$$\Rightarrow u = -20\text{ cm}$$

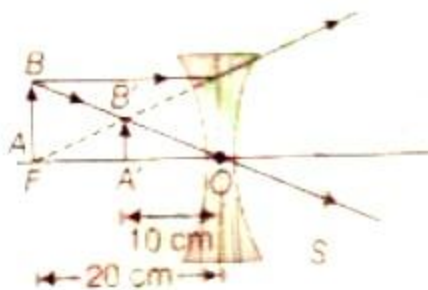
$$\therefore \text{Magnification, } m = \frac{v}{u} = \frac{h_i}{h_0}$$

$$\Rightarrow \frac{h_i}{4} = \frac{-10}{-20}$$

$$\Rightarrow h_i = 2\text{ cm}$$

Size of the image, $h_i = 2\text{ cm}$

iii.



Thus, the object is placed at 20 cm from the concave lens.

35. a. **Reproduction-** It is a biological process by which new individual organisms (offspring) are produced from their parents.

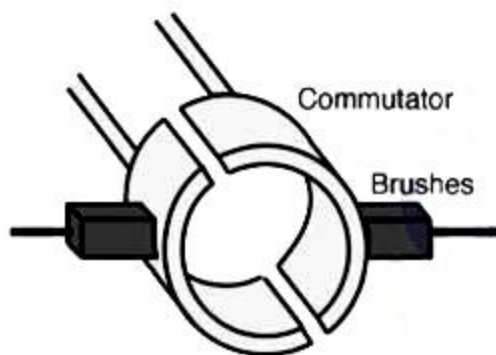
Types of reproduction:-

- Asexual reproduction
- Sexual reproduction

b.

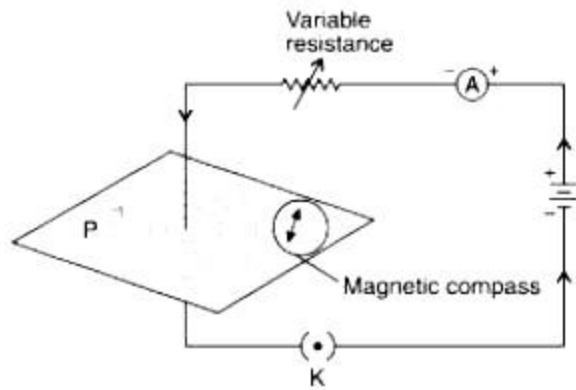
Unicellular Organisms	Multicellular Organisms
Only one parent is required for reproduction.	Two parents are required for reproduction.
It is a fast process of reproduction.	Slower than unicellular organisms.
No specialized cells are required for reproduction.	Specialized cells are required for reproduction.

36. a. **Fleming's left-hand rule:** Adjust your forefinger, middle finger and thumb of left hand in such a way that they are mutually perpendicular to one another. If the forefinger point in the direction of magnetic field, middle finger point in the direction of current then the thumb show the direction of force or motion on the current carrying conductor.
- Function of brushes:** Maintain contact between the coil and the external circuit.
 - Function of split rings:** Reverse the direction of current after each half rotation of the coil so that the coil can keep rotating continuously.



OR

- The magnetic field lines produced around a current-carrying straight conductor passing through cardboard is shown below.



A right-hand thumb rule is applied to find the direction of these field lines. Imagine that you are holding a current-carrying straight conductor in your right hand such that the thumb points towards the direction of the current. Then your fingers will wrap around the conductor in the direction of the field lines of the magnetic field.

- b. When we move away from the straight wire, the deflection of the needle decreases which implies the strength of the magnetic field decreases. The reason is that the concentric circles representing the magnetic field around a current-carrying straight wire become larger and longer as the distance increases.