CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-15

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. A student suffering from an eye defect uses lenses of power –0.2 D. Name the defect of vision he is suffering from and the nature of the corrective lens used.　　[1]

Ans :

1. Defect of vision-myopia/short sightedness
2. Corrective lens-diverging lens/concave lens

2. A compound which is prepared from gypsum has the property of hardening when mixed with the right quantity of water. Identify the compound and write its chemical formula.　　[1]

Ans :

Plaster of Paris; chemical formula: $CaSO_4 . \frac{1}{2} H_2O$

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

Today, our eating habits are different from those of a generation ago in every way. Fast foods, takeaways and eating out are parts of our modern lifestyle. Several studies have shown that the lifestyle adopted by a majority of the youth is extremely disorganised and unhealthy. For them, time is money and corporate and personal ambitions are more important than their health.

It is unfortunate that young people are ignorant towards the fact that smoking, consuming calorie-rich food, alcohol and drugs can eventually lead to serious health issues.

Being physically inactive and disinterested will, at the end of the day, negatively effect the quality of their lives and limit their capabilities.

3.1 Which is the most common health problem that people have because of modern lifestyle?　　[1]

Ans : Obesity

3.2 Name the organ which gets badly affected by smoking cigarette.　　[1]

Ans : Lungs

3.3 "Calorie-rich food increases cholesterol level which can lead to various cardiovascular diseases." Justify this statement.　　[1]

Ans : Calorie-rich food has high amount of saturated fats which raises cholesterol in blood leading to cardiovascular diseases.

3.4 Based on the data shown below, find out which age group has the maximum number of overweight people. Why?　　[1]
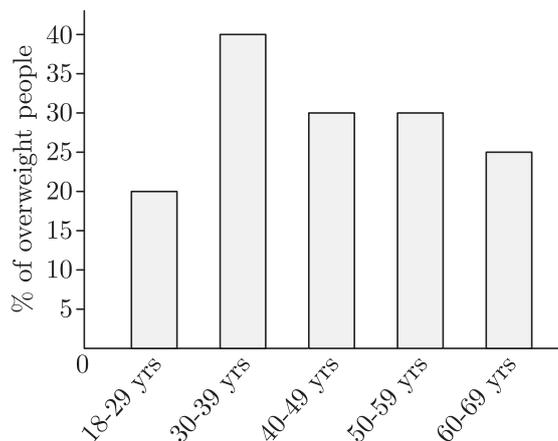
Ans :

(i) 30-39 years
(ii) This is due to a sedentary lifestyle and long working hours.

4. **Answer question numbers 4.1-4.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

Bio-mass, a fuel developed from organic materials, is a renewable and sustainable source of energy used to create electricity or other forms of power. It includes wood, cow-dung and crop residues.

In villages, women still use dried cow-dung cakes as a fuel to cook food and for heating purposes. Burning of cow-dung cakes as fuel produces a lot of smoke and also destroys the nutrients such as nitrogen and phosphorus.

4.1 Name the smokeless fuel that can be prepared from the cow-dung.　　[1]

Ans : Bio-gas is the smokeless fuel that can be

prepared from cowdung.

4.2 'Cowdung cakes have low calorific value'. What is meant by this statement? [1]

Ans : The amount of heat energy produced on complete combustion of 1 kg of a fuel is called its calorific value. Cowdung cakes have low heat producing value.

4.3 Which of the following statements is correct about bio-mass? [1]
(a) It converts chemical energy into kinetic energy.
(b) It is a renewable source of energy.
(c) It is the inorganic matter used as fuel.
(d) It is an organic matter produced by plants only.

Ans : (b) It is a renewable source of energy.

4.4 Which of the following are examples of biodegradable wastes? [1]
(a) Plastic and cow-dung cakes
(b) Cow-dung cakes and vegetable peels
(c) Plastic and rubber
(d) Glass and the cow-dung cakes

Ans : (b) Cow-dung cakes and vegetable peels

5. Which of the following statement is incorrect for atomic size? [1]
(a) Atomic size of $B > Be$
(b) Atomic size of $Be > B$
(c) Atomic size of $N > O$
(d) Atomic size of $C > N$

Ans : (a) Atomic size of $B > Be$

or

Which of the following property increases down the group?
(a) Electro-negativity
(b) Electro-positive nature of element
(c) Atomic size
(d) Both (b) and (c)

Ans : (d) Both (b) and (c)

6. When ciliary muscles are relaxed the eye lens is [1]
(a) thick and its curvature is maximum
(b) thick and its curvature is minimum
(c) thin and its curvature is minimum
(d) thin and its curvature is maximum

Ans : (c) thin and its curvature is minimum

7. Oily and fatty food items are flushed with nitrogen gas because [1]
(a) nitrogen reacts with oils and fats and thus prevents oxidation.
(b) nitrogen is an inert gas and does not react with oily and fatty food items.
(c) nitrogen helps in the decomposition of food items and makes them tasty.
(d) nitrogen is 79% of the atmospheric air.

Ans : (b) nitrogen is an inert gas and does not react with oily and fatty food items.

8. In the given circuits A, B and C, the heat produced in the resistor or combination of resistors connected to a 12 V battery will be [1]
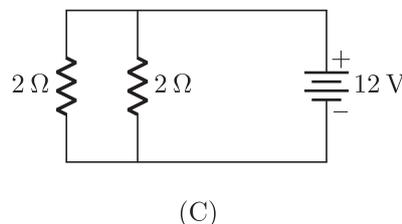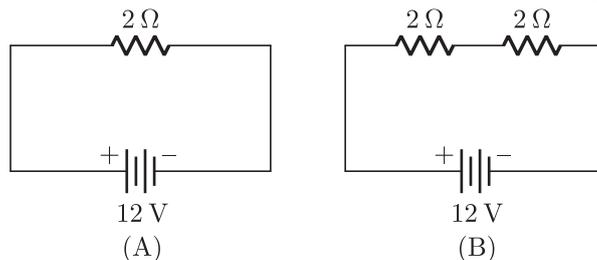
(a) minimum in A.   (b) maximum in B.
(c) maximum in C.   (d) the same in all.

Ans : (c) maximum in C.

or

Two bulbs have the following ratings:
40 W, 220 V
20 W, 100 V
The ratio of their resistance is
(a) 1:2   (b) 2:1
(c) 1:1   (d) 1:3

Ans : (b) 2:1

9. The electronic configurations which corresponds to an alkali metal is [1]
(a) 2, 2   (b) 2, 8, 7
(c) 2, 8, 1   (d) 2, 8, 8

Ans : (c) 2, 8, 1

10. A common type of bifocal lens consists of both concave and a convex lenses and it is used to correct presbyopia. In a bifocal lens the [1]
(a) upper portion is a convex lens which facilitates distant vision.
(b) lower portion is a convex lens which facilitates distant vision.
(c) lower portion is a convex lens which facilitates near vision.
(d) upper portion is a concave lens which facilitates near vision.

Ans : (c) lower portion is a convex lens which facilitates near vision.

11. Milk of magnesia is a mild base and it is used as a medicine for indigestion. This chemical is [1]
(a) magnesium oxide   (b) magnesium sulphate
(c) magnesium hydroxide   (d) magnesium chloride

Ans : (c) magnesium hydroxide

12. In the arrangement shown in the figure given alongside, there are two coils wound on a non-conducting cylindrical rod. Initially the key is not inserted. Then

the key is inserted and later removed. In this case [1]
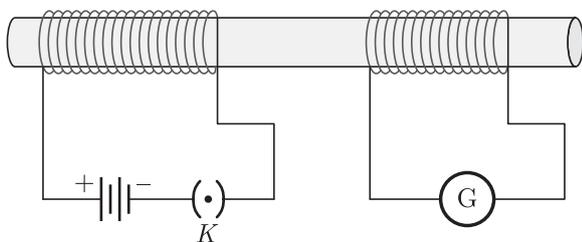
(a) the deflection in the galvanometer remains zero throughout.

(b) there is a momentary deflection in the galvanometer but it dies out shortly and there is no effect when the key is removed.

(c) there are momentary galvanometer deflections that die out shortly; the deflections are in the same direction.

(d) there are momentary galvanometer deflections that die out shortly; the deflections are in opposite directions.

Ans : (d) there are momentary galvanometer deflections that die out shortly; the deflections are in opposite directions.

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 hydrogen-carbonate is an acidic salt.

Reason : The pH of aqueous solution of sodium hydrogen-carbonate is more than 7.0.   [1]

Ans : (d) A is false but R is true.

14. **Assertion :** A point object is placed at a distance of 26 cm from a convex mirror of focal length 26 cm. The image will not form at infinity.

Reason : For above given system the equation $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ gives $v = \infty$.   [1]

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

or

Assertion : An object is placed at a distance of f from a convex mirror of focal length f, its image will form at infinity.

Reason : The distance of image in convex mirror can never be infinity.

Ans : (d) A is false but R is true.

Section B

15. What is a redox reaction? Identify the substance oxidised and the substance reduced in the following reactions: [3]

(a) $2PbO + C \longrightarrow Pb + CO_2$

(b) $MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$
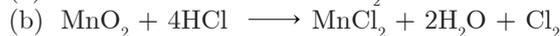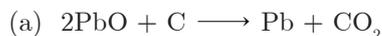
Ans :

The reaction in which oxidation and reduction takes place simultaneously is called redox reaction.

(a) C is oxidised and PbO is reduced.

(b) HCl is oxidised and MnO_2 is reduced.

16. Write the chemical formula of bleaching powder and the balanced chemical equation involved in its preparation. List its three different uses.   [3]

Ans :

1. The chemical formula of bleaching powder is $CaOCl_2$.

2. Chemical equation for the preparation of bleaching powder:
   $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$

3. Bleaching powder is used
   (a) for bleaching cotton and linen in the textile industry/for bleaching wood pulp in paper factories/for bleaching washed clothes in laundry. (any one)
   (b) as an oxidising agent in many chemical industries.
   (c) for disinfecting drinking water to make it free from germs.

17. Write the number of groups and periods in the Modern Periodic Table. How do the atomic size and metallic character of elements vary as we move down a group and from left to right in a period?   [3]

Ans :

1. 18 groups and 7 periods

2. (a) Atomic size increases down a group.
   (b) Metallic character increases down a group.

3. (a) Atomic size decreases from left to right in a period.
   (b) Metallic character decreases from left to right in a period.

or

The atomic number of an element A is 13. Write the electronic configuration of A and on the basis of this configuration, determine the group number and period number of the element A. If the element A reacts with another element B of electronic configuration 2, 8, 7 to form a compound, write the formula of the compound formed.   [3]

Ans :

1. Electronic configuration of A(13) = 2, 8, 3

∴   Group number = 3

   Period number = 3

2. Electronic configuration of B = 2, 8, 7

   Valency of B = 8 – 7 = 1

∵ Valency of A is 3 and valency of B is 1.

∴ Formula of the compound formed by the reaction of A and B is AB_3.

18. (a) How is the brain protected from injury and shock?
    (b) Name two main parts of the hind-brain and state one function of each.   [3]

Ans :

(a) The human brain is located inside a bony case

called the cranium (skull) which protects it from external injuries and shock.

(b) The two main parts of the hind brain are cerebellum and medulla oblongata.

   (i) Cerebellum maintains body balance and posture. It is responsible for precision of voluntary actions.

   (ii) Medulla oblongata is the reflex centre that controls activities like salivating, swallowing, vomiting, breathing, coughing, sneezing and heartbeat. It also controls sleep, consciousness and activity of the cerebrum.

19. Explain how the human body responds when adrenaline is secreted into the blood. [3]

Ans :

Adrenaline is secreted directly into the blood and carried to different parts of the body. The target organs or the specific tissues on which it acts includes the heart. As a result, the heart beats faster, resulting in supply of more oxygen to the muscles. The blood supply to the digestive system and skin, is reduced due to contraction of muscles around small arteries in these organs. This diverts the blood to our skeletal muscles. The breathing rate also increases because of the contractions of the diaphragm and the rib muscles. All these responses together enable the animal body to be ready to deal with the situation.

20. With the help of suitable examples, explain why certain experiences and qualifications earned by an individual during his lifetime are not passed on to the next generations. What are such qualifications (traits) called? [3]

Ans :

1. Examples of the experiences/qualifications not passed on to the next generation:
   Loss of body parts/loss of weight due to starvation/acquiring qualification/skills, etc. (Any two)
2. Explanation: Changes that take place in the non-reproductive tissues cannot be passed on to the DNA of the germ cells. Therefore the traits acquired during life time are not passed on to the next progeny.
3. These traits are called acquired traits.

or

What is homology between forelimbs of frogs, lizards and wings of birds? What does it indicate? State one function each of forelimbs of (a) human beings and (b) birds. [3]

Ans :

1. The fundamental structure of forelimbs of frogs, lizards and wings of birds is same but all these perform different functions.
2. It indicates that species with similar fundamental structure share a common ancestry.
3. Functions of the forelimbs of
   (a) human beings: to hold objects/to write
   (b) birds: to fly

21. What is the cause of dispersion of white light passing through a glass prism? Draw a ray diagram to show the path of light when two identical glass prisms are arranged together in inverted position with respect to each other and a narrow beam of white light is allowed to fall obliquely on one of the prisms. [3]

Ans :

1. **Cause of dispersion of white light:** Different constituent colours of white light bend through different angles with respect to the incident ray as they pass through a glass prism. Violet light bends the most whereas red light bends the least. Thus different colours emerge along different paths forming a spectrum.
2. Ray diagram
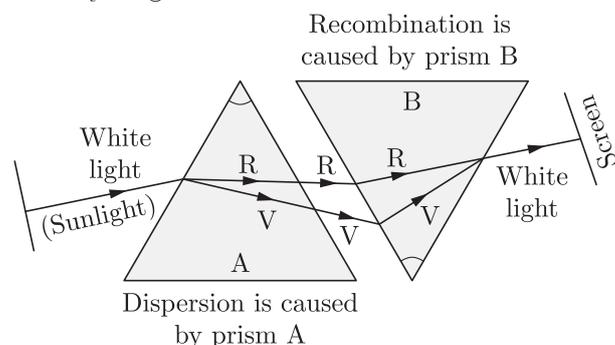
22. (a) Write the principle of working of an electric motor.

(b) Explain the function of the following parts of an electric motor. [3]
   (i) Armature
   (ii) Brushes
   (iii) Split ring

Ans :

(a) An electric motor is a device which works on the magnetic effect of current and converts electrical energy into mechanical energy. The current-carrying conductor when kept in a magnetic field experiences a force whose direction is given by Fleming left hand rule.

(b) Function of
   (i) **armature :** Enhances the power of the motor induces motion.
   (ii) **brushes :** Helps easy transfer of charge between the coil and the external circuit.
   (iii) **split rings :** Reverses the direction of current after each half rotation of the coil so that the coil can keep rotating continuously.

or

(a) What is the function of earth wire in electrical instruments?

(b) Explain what is short circuiting in an electric supply.

(c) What is the usual current rating of the fuse wire in the line to feed
   (i) Lights and fans?
   (ii) Appliances of 2 kW or more power? [3]

Ans :

(a) Earth wire in electrical instruments saves us from all possible electric shocks.

(b) Accidentally, when live and neutral wires of an electric circuit come into direct contact, it is called short circuiting.

(c) (i) 5A, (ii) 15A

23. What is an electromagnet? How can you make an electromagnet in your school laboratory?   [3]

Ans :

Iron rod

N ⬤⬤⬤⬤⬤⬤⬤⬤ S

Key

Battery
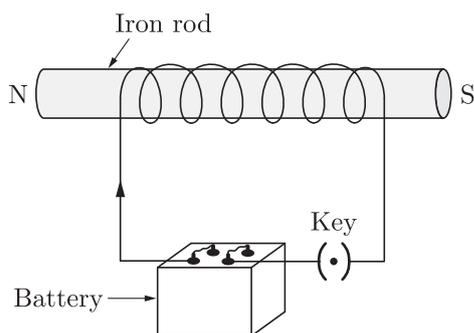
1. An electromagnet is a rod of magnetic material placed inside a current carrying solenoid. This rod starts behaving as a magnet when electric current flows through the solenoid. The rod loses its magnetism as soon as the current through the solenoid is switched off.

2. Wrap a coil of copper wire on an iron rod as shown in the figure. Connect the ends of the wire to a plug key and a battery. The iron rod will start behaving as a magnet on passing electric current through the coil of copper wire.

24. In the context of conservation of natural resources, explain the terms reduce, recycle and reuse. From among the materials that we use in daily life, identify two materials for each category.   [3]

Ans :

Reduce : It means to use the material or commodities in desired and less quantity, e.g. we should reduce the consumption of water, electricity, petroleum products, etc.

Recycle : It means a material, which is used once, is collected and sent to the manufacturer so that some other useful material can be made, e.g. plastic articles like buckets, mugs, cups, glass cup, kettles, glass mirror, newspapers, metal objects.

Reuse : It means an article can be used again and again until it becomes unservicable /unusable. It does not involve the process of recycling, e.g. used garments, bottles of jam or pickle, kitchen utensils, carry-bags, etc.

Section C

25. Explain the following:

(a) Reactivity of aluminium decreases if it is dipped in HNO_3.

(b) Carbon cannot reduce the oxides of Na or Mg.

(c) NaCl is not a conductor of electricity in solid state whereas it does conduct electricity in aqueous solution as well as in molten state.

(d) Iron articles are galvanised.

(e) Metals like Na, K, Ca and Mg are never found in their free state in nature.   [5]

Ans :

(a) When aluminium is dipped in HNO_3; a layer of Al_2O_3 is formed on its surface which is passive

and makes it less reactive.

(b) Since sodium and magnesium are more stronger reducing agent than carbon, the oxides of sodium and magnesium cannot be reduced by carbon.

(c) In solid sodium chloride (NaCl) movement of ions is not possible due to the rigid structure but in aqueous solution (molten state) the ions can move freely and thus conduct electricity.

(d) As iron articles get rusted when kept in open, these articles are galvanised in which a thin coating of zinc is applied on these article to prevent rusting.

(e) Being highly reactive, these metals react with air/moisture/other substances present in the atmosphere, hence not found in nature in their free state.

26. (a) What are hydrocarbons? Name the two categories in which these compounds may be classified.

(b) What are alkanes, alkenes and alkynes? Give one example of each.   [5]

Ans :

(a) (i) Hydrocarbons: The compounds made of only carbon and hydrogen.

(ii) Two categories: Saturated and unsaturated

(b) **Alkanes:** The hydrocarbons in which all the bonds are single covalent bonds.
Example: Methane (CH_4)
Alkenes: The hydrocarbons in which there is a double covalent bond between any two carbon atoms. Example: Ethene (C_2H_4)
Alkynes: The hydrocarbons in which there is a triple covalent bond between any two carbon atoms. Example: Ethyne (C_2H_2)

or

Explain the given reactions with the examples

(a) Hydrogenation reaction

(b) Oxidation reaction

(c) Substitution reaction

(d) Saponification reaction

(e) Combustion reaction   [5]

Ans :

(a) **Hydrogenation reaction:** Reactions in which unsaturated hydrocarbons add hydrogen in the presence of nickel as a catalyst to give saturated hydrocarbons, e.g.,
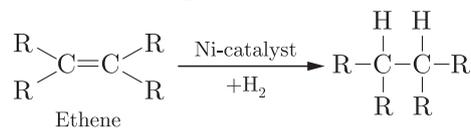
(b) **Oxidation reaction:** Reactions in which alcohols are oxidised to carboxylic acids in the presence of oxidising agent (alkaline $KMnO_4$) on heating, e.g.,

$$CH_3CH_2OH \xrightarrow[\text{Heat}]{\text{Alkaline } KMnO_4} CH_3COOH$$

(c) **Substitution reaction:** Reactions in which hydrogen of alkanes is substituted by halogens in the presence of sunlight, e.g.,

$$CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} CH_3Cl + HCl$$

(d) **Saponification reaction:** Reactions in which esters react with sodium hydroxide to form sodium salt of acids and alcohol, e.g.,

$CH_3COOC_2H_5 + NaOH \longrightarrow CH_3COONa + C_2H_5OH$

(e) **Combustion reaction :** Reactions in which compounds burn with oxygen, liberating a large amount of heat and light, e.g.,

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O + Heat + Light$

27. Draw the diagram of human respiratory system and name and label the following:

(a) part where air is filtered by fine hair and mucus;

(b) part which terminates in balloon-like structures;

(c) balloon-like structures where exchange of gases takes place;

(d) part which separates chest cavity from abdominal cavity. [5]

Ans :

Diagram of Human Respiratory System:
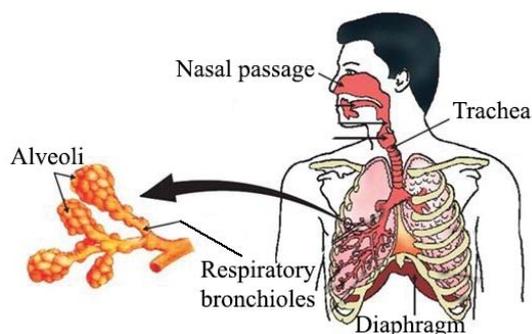
(a) Nostrils (Nasal passage)

(b) Trachea

(c) Alveoli

(d) Diaphragm

28. Name and explain in brief the four different methods of contraception? [5]

Ans :

Contraception means prevention of pregnancy. Different methods for the prevention of pregnancy are as follows:

(a) Barrier methods in which a mechanical barrier such as condom, cervical caps or diaphragm is used for preventing the entry of sperms in the female genital tract or vagina. Thus sperms and egg do not meet and fertilisation is prevented from taking place.

(b) Chemical methods of contraception are those in which release of eggs from the ovary can be prevented by the intake of pills by the female. The oral pills are hormonal preparations and are also termed as Oral Contraceptives (OCs).

(c) Intra-Uterine Contraceptive Devices (IUCDs) are placed in the uterus to prevent pregnancy. These devices are very effective and are popularly used by females. Copper-T and Loop are examples of IUCDs. These devices are placed in the uterus by skilled personnel.

(d) Surgical method: Contraception can also be brought about by surgically removing a part of Vas deferens (vasectomy) in the male and removing a part of fallopian tube (tubectomy) in the female. Both in males and in females after vasectomy and tubectomy, the cut end of sperm duct and oviduct are ligated to prevent the meeting of sperms and egg.

or

(a) List three advantages of vegetative propagation.

(b) What is placenta? Explain its function in humans. [5]

Ans :

(a) Three advantages of vegetative propagation:

(i) Plants which do not produce viable seeds can be propagated by this method.

(ii) Plants raised by this method can bear flowers and fruits earlier than those produced from seeds.

(iii) The characters (traits) of the parent plant can be preserved by this method.

(iv) It is cheap, easier and more rapid method of propagation.

(v) Superior quality of plants can be obtained. (Any three)

(b) **Placenta:** Placenta is a specialized tissue embedded in the uterine wall. It contains villi on the embryo's side and blood spaces on the mother's side.

Function: It helps in the exchange of nutrients, gases and waste materials between the mother and embryo/foetus.

29. The distance between the object and its inverted image formed by a concave mirror is 15 cm. If the magnification produced by the mirror is –2, use mirror formula to determine the object distance, image distance and focal length of the mirror. Draw a ray diagram to illustrate the image formation in this case and also mark these distances. [5]

Ans :

Here, $v - u = 15 \, \text{cm};$

$m = -2;$

$u = ?;$

$v = ?;$

$f = ?$

Magnification, $m = -\dfrac{v}{u}$

$-2 = \dfrac{-v}{u}$

$v = 2u$

$\because \quad v - u = 15 \, \text{cm}$

$2u - u = 15 \, \text{cm}$

$\therefore \quad u = 15 \, \text{cm}$

$\therefore \quad v = 2u = (2 \times 15) \, \text{cm} = 30 \, \text{cm}$

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

$f = \dfrac{uf}{u + f}$

Since the object distance is always taken as negative (new Cartesian sign convention)

$u = -15 \, \text{cm};$

$v = -30 \, \text{cm}$

$\therefore \quad f = \dfrac{-15 \, \text{cm} \times -30 \, \text{cm}}{-15 \, \text{cm} + (-30 \, \text{cm})}$

$= -10 \, \text{cm}$

Ray diagram:

or
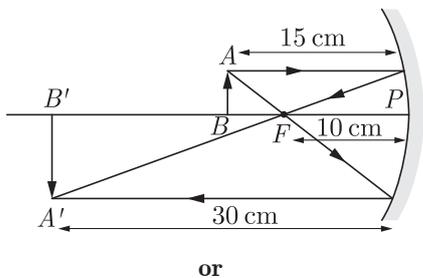
One half of a convex lens is covered with a black paper. Can such a lens produce complete image of an object placed in front of the lens? Draw a labelled diagram to justify your answer.

A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 10 cm. If the distance of the object from the lens is 15 cm, calculate the position, nature and size of the image. [5]

Ans :

1. Yes, it can produce a complete image with reduced intensity and brightness.

2. **Reason:** From an object infinite rays emerge and may pass through the remaining part of the lens to form complete image.
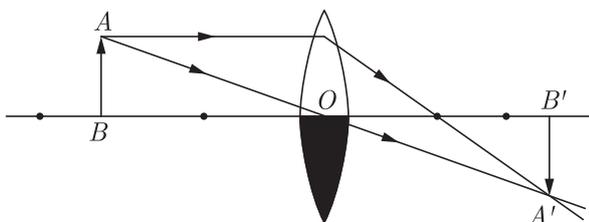
3. Lens formula :

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

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

Here,

$h_o = 4$ cm;

$u = -15$ cm;

$f = 10$ cm;

$v = ?$;

$h_i = ?$

$\therefore$ $v = \frac{-15\,\text{cm} \times 10\,\text{cm}}{-15\,\text{cm} + 10\,\text{cm}} = +30\,\text{cm}$

The positive sign of v shows that the image is formed at a distance of 30 cm, on the other side of the lens. The image is real and inverted.

$$\frac{h_i}{h_o} = \frac{v}{u}$$

$\therefore$ $h_i = \frac{v}{u} \times h_o$

$= \frac{30\,\text{cm}}{-15\,\text{cm}} \times 4\,\text{cm} = -8\,\text{cm}$

The negative sign of h_i shows that the size of the image is 8 cm and it is inverted.

30. (a) Derive an expression for the equivalent resistance of three resistors R_1, R_2 and R_3 connected in series.

(b) Fuse of 3 A, 5 A and 10 A are available. Calculate and select the fuse for operating an electric iron of 1 kW power at 220 V line. [5]

Ans :

(a) When three resistors R_1, R_2 and R_3 are connected in series, the current flowing through them remains the same but the potential difference across each resistor is different.

The total potential difference V across AD will be the sum of potential differences across AB, BC and CD, i.e.,

$$V = V_1 + V_2 + V_3$$

$$V_1 = IR_1; \; V_2 = IR_2; \; V_3 = IR_3$$

If equivalent resistance of the series combination is R, then

$$V = IR$$

$$IR = IR_1 + IR_2 + IR_3$$

$$R = R_1 + R_2 + R_3$$
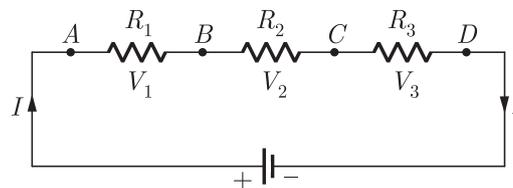
(b) Power $= 1$ kW $= 1000$ W

$$V = 220 \text{ V}$$

$$P = VI$$

$$I = \frac{P}{V} = \frac{1000 \text{ W}}{220 \text{ V}} = 4.54 \text{ A}$$

$\therefore$ 5 A fuse will be most suitable for operating the electric iron.