CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-11

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. Name the colour of light for which the angular deviation is (a) maximum (b) minimum. [1]

Ans :

(a) Violet, (b) Red

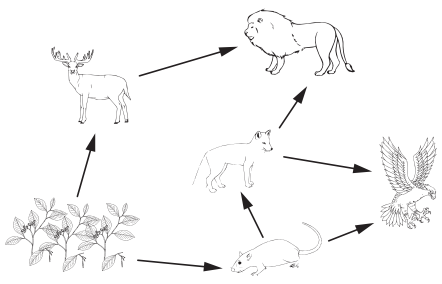
2. Why should management of natural resources ensure their equitable distribution? [1]

Ans :

Equitable distribution should be ensured. So that the benefit goes widespread and not limited to the privileged ones only.

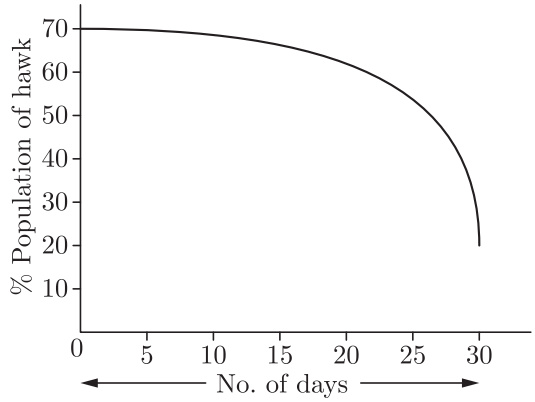
3. Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.

An ecosystem that retains a high biodiversity is more likely to adapt to human-caused environmental changes than the one that shows low biodiversity. Consider the two food webs shown in the diagrams A and B.



(B)

These food webs are highly simplified as compared to the food webs present in natural ecosystems but they still illustrate a key difference between more diverse and less diverse ecosystems. Food web A represents a situation with high biodiversity, which implies many more alternative feeding pathways while food web B represents a situation with low biodiversity, which means, only a single type of organism is available for other organisms.



3.1 Why does every food chain start with a producer? [1]

Ans : A food chain starts with a producer (green plants and certain bacteria) because only they can make organic compounds like sugar and starch from inorganic substances using the energy from the Sun in the presence of chlorophyll.

3.2 State the significance of food web for an ecosystem. [1]

Ans : Food web is a network of interconnected food chains. It helps in maintaining ecological balance.

3.3 Name an organism that acts as a prey as well as a predator in food web A. [1]

Ans : Snake is a predator for frog and sparrow and at the same time, it is a prey for hawk.

3.4 Based on the data represented in the graph, state what could be the reason for decrease in the population of hawks when considering the food web A and food web B. [1]

Ans : The decrease in the population of hawks may be due to the unavailablity of frogs, mice, fox and snakes which constitute the food of hawk.

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

Table A: Blood Glucose Chart

Remarks	Mean Blood Glucose Level (mg/dL)
Doctor's advice required	200 - 400
Good	100 - 140
Excellent	80 - 100

Table B: Blood report of Patient

Checking Time	Blood Sugar Range (mg/dL)
Fasting (before breakfast)	$>$ 126
Just after eating	$>$ 220
3 hours after eating	$>$ 200

4.1 Refer Table B that shows the blood sugar level of a patient. Which disease can be diagnosed from the given data? [1]

Ans : Diabetes

4.2 Which hormone is responsible for the disease diagnosed? [1]

Ans : Deficiency of insulin hormone in the body causes diabetes.

4.3 Which of the following glands secretes the hormone identified in (b)? [1]
(a) Thyroid gland
(b) Adrenal gland
(c) Pancreatic gland
(d) Parathyroid gland

Ans : (b) Adrenal gland

4.4 What would be the diagnosis of a patient whose blood sugar level 120 mg/dL just after eating? [1]
(a) It is good.
(b) It is excellent.
(c) It is high.
(d) It is low.

Ans : (a) It is good.

5. A solution turns pink when a drop of phenolphthalein is added to it. The pH value of this solution is likely to be [1]
(a) 3 (b) 5
(c) 7 (d) 10

Ans : (d) 10

or

Which of the following will turn blue litmus to red?
(a) Lime water (b) Human blood
(c) Milk of magnesia (d) Lime juice

Ans : (d) Lime juice

6. To focus the image of a nearby object on the retina of the eye, [1]
(a) the curvature of the eye lens is decreased.
(b) the focal length of the eye lens is increased.
(c) the thickness of the eye lens is increased.
(d) the thickness of the eye lens is decreased.

Ans : (c) the thickness of the eye lens is increased.

7. A, B and C are three elements with atomic numbers 9, 10 and 11 respectively. Identify the group to which the elements A and C belong. [1]
(a) Inert gas, halogen
(b) Halogen, inert gas
(c) Halogen, alkali metal
(d) Inert gas, alkali metal

Ans : (c) Halogen, alkali metal

8. Tungsten is used almost exclusively for filaments of electric bulbs because [1]
(a) its resistivity is high and melting point is low.
(b) both the resistivity and the melting point are high.
(c) its resistivity is low and melting point is high.
(d) both the resistivity and the melting point are low.

Ans : (b) both the resistivity and the melting point are high.

9. You have dil. sulphuric acid in a test tube. Which of the following aqueous solutions would you add to this test tube to get white precipitate? [1]
(a) NaCl solution (b) $CuSO_4$ solution
(c) Na_2SO_4 solution (d) $BaCl_2$ solution

Ans : (d) $BaCl_2$ solution

10. In torches, searchlights and headlights of vehicles the bulb is placed [1]
(a) between the pole and the focus of the reflector.
(b) at the centre of curvature of the reflector.
(c) between the focus and centre of curvature of the reflector.
(d) close to the focus of the reflector.

Ans : (d) close to the focus of the reflector.

or

The image of an object placed at infinity will be highly diminished and point sized in [1]
(a) Concave mirror only
(b) Convex mirror and convex lens both
(c) Convex lens only
(d) Concave mirror and convex lens both

Ans : (d)Concave mirror and convex lens both

11. A basic salt is formed by the neutralisation of a [1]
(a) strong acid with a strong base.
(b) strong acid with a weak base.
(c) weak acid with a strong base.
(d) weak acid with a weak base.

Ans : (c) weak acid with a strong base.

12. An object is placed on the principal axis of a concave mirror of focal length 24 cm. If the image distance is 20 cm more than the object distance, the magnification of the image is [1]
(a) 1.2 (b) 1.5
(c) 2.4 (d) 4.8

Ans : (b) 1.5

or

The refractive index of dens flint glass is 1.65 and for alcohol, it is 1.36 with respect to air, then the refractive index of the dens flint glass with respect to alcohol is [1]

(a) 1.31 (b) 1.21

(c) 1.11 (d) 1.01

Ans : (b) 1.21

Given,
Refractive index of flint glass with respect to air $n_a = 1.36$

$$_fn_a = \frac{n_f}{n_a} = \frac{1.65}{1.36} = 1.21$$

Thus, the refractive index of flint glass with respect to alcohol is 1.21.

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 : Corrosion of iron is known as rusting.
Reason : Corrosion of iron takes place in the presence of both air and moisture. [1]

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

14. Assertion : A freely suspended magnet always rests in the geographical north-south direction.
Reason : The Earth behaves like a huge magnet with its north pole towards geographical south and south pole towards geographical north. [1]

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

Section B

15. Give the chemical name and formula of bleaching powder. What happens when it is exposed to air? List two uses of bleaching powder. [3]

Ans :

1. Chemical name: calcium oxychloride
2. Formula: Ca0C12
3. When exposed to air, it absorbs moisture.
4. Two uses:
   (a) As an oxidising agent in chemical industries
   (b) For disinfecting drinking water/swimming pools

16. You must have tasted or smelled food containing fat which has been left for a long time. Such food tastes and smells bad. Name the phenomenon responsible for this and state the reason. List two measures for its prevention. [3]

Ans :

1. Phenomenon: Rancidity
2. Reason: Food material gets oxidised by atmospheric oxygen
3. Preventive measures:
   (a) Keep the food material in airtight containers.
   (b) Flush the food packets with nitrogen gas before packing.

or

A silver article generally turns black when kept in the open for a few days. The article when rubbed with toothpaste again starts shining.

(a) Why do silver articles turn black when kept in the open for a few days? Name the phenomenon involved.
(b) Name the black substance formed and give its chemical formula. [3]

Ans :

(a) Metals such as silver, when attacked by air, moisture, acids, gases etc., form thin layers of undesirable compounds on their surfaces. Silver tarnishes and gets a black coating. This process is called corrosion.
(b) Ag reacts with H_2S to form black coloured silver sulphide (Ag_2S). Toothpaste generally contains traces of hydrogen peroxide (H_2O_2) as one of its constituents. It reacts with Ag_2S formed on the surface and restores brightness.

17. An element M with electronic configuration (2, 8, 2) combines separately with radicals, $(NO_3)^-$, $(SO_4)^{2-}$ and $(PO_4)^{3-}$. Write the formula of three compounds so formed. To which group and period of the Modern Periodic Table does the element M belong? Will M form covalent or ionic compounds? Give reason to justify your answer. [3]

Ans :

1. The valency of M is 2 as it has 2 valence electrons. Thus it forms M^{2+} ions.
   Compounds formed with different radicals
   With $(NO_3)^-$: $M(NO_3)_2$
   With $(SO_4)^{2-}$: MSO_4 or $M_2(SO_4)_2$
   With $(PO_4)^{3-}$: $M_3(PO_4)_2$
2. Element M belongs to group 2 and period 3 of the Modern Periodic Table.
3. M will form ionic compounds, as it is a metal and has the tendency to lose 2 electrons to form a complete octet.

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

Ans :

In plants, chemical coordination is brought about by plant hormones: auxins, gibberellins, cytokinins and abscisic acid.
Auxins cause growth of stem and root. They are responsible for phototropism, apical dominance, flowering and help fruits in attaining large size.
Gibberellins cause stem elongation and make genetically dwarf plants tall. Gibberellins also induce onset of germination of seeds.
Cytokinins promote cell division and they are present in roots, developing fruits and in the embryo. They work in association with auxins.
Abscisic acid is the only plant hormone which

functions in plants as a growth retarder or growth inhibitor. It is responsible for wilting of leaves and inducing dormancy of seeds and buds.

19. What constitutes the central and peripheral nervous systems? How are the components of central nervous system protected? [3]

Ans :

1. The central nervous system consists of the brain and the spinal cord.
2. The peripheral nervous system consists of nerves arising from the brain and the spinal cord.
3. Brain and spinal cord are delicate and vital organs of the body. Brain is secured safely inside the skull, i.e., cranium. Additional protection is provided by three membranes. Between three membranes viscous cerebro-spinal fluid is found that acts as a shock absorber and lubricant.
4. Likewise the spinal cord is protected inside the vertebral column along with membranes.

20. Give an example of characteristics that are used to determine how close two species are in evolutionary terms. [3]

Ans :

In evolutionary relationships, common characteristics are identified between two species and this similarity indicates that these two species had a common ancestor. For example, all the mammals have forelimbs which are also possessed by other vertebrates such as birds, reptiles, amphibians and fish.

Similarly, presence of a large sized cerebrum in mammals, intelligence, dexterity of hands, parental care are some of the characteristics which show that human beings and other members of primate group are closely related.

or

Explain how genes control the characteristics or traits of an organism. [3]

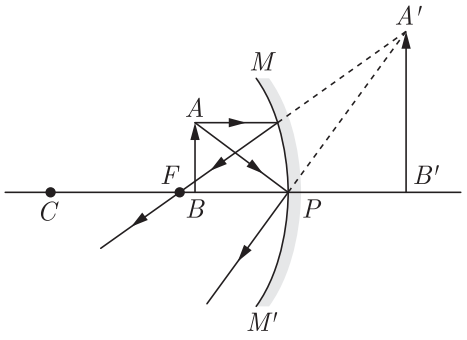
Ans :

A section of DNA that provides information for one protein is called the gene for that protein. Gene codes the formation of a particular protein and the protein further controls the characteristics of an organism. Let us take an example of tallness as a characteristic. Plant have hormones that can trigger growth. Thus height of plant depends upon the amount of a particular hormone. The amount of plant hormone synthesized depends upon the efficiency of enzyme which makes it. A lot of hormone is synthesized if the enzyme is efficient hence plant will be tall. Any alteration in the gene for that enzyme can make it less efficient. Less efficiency of enzyme leads to less hormone production and thus the plant will be short. Therefore, genes control characteristics or traits of an organism.

21. To obtain an erect image of an object, using a concave mirror of focal length 15 cm, what should be the range of distance of the object from the mirror? What is the nature of the image? Is the image larger or smaller than the object? Draw a ray diagram to show the image formation in this case. [3]

Ans :

1. The object should be placed in between the pole and focus in front of the concave mirror, i.e., at a distance less than 15 cm from the mirror.
2. The image formed is virtual and magnified.
3. The ray diagram is as shown.



or

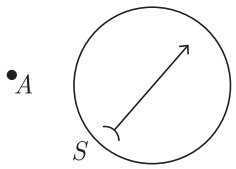
What are spherical lenses? What are two types of these lenses? Explain in brief the meanings of the following terms.

(a) Principal axis
(b) Optical centre
(c) Aperture

Ans :

1. **Spherical lens:** An optical device made up of a transparent medium bounded by two surfaces of unequal curvatures.
2. **Two types:** (i) Convex/Converging, (ii) Concave/ Diverging
3. (a) **Principal axis:** An imaginary straight line passing through the two centres of curvature of a lens.
   (b) **Optical centre:** The central point of lens.
   (c) **Aperture:** The effective diameter of the circular outline/refracting surface of spherical lens.

22. A magnetic compass needle is placed in the plane of paper near point A as shown in the given figure. In which plane should a straight current carrying conductor be placed so that it passes through A and there is no ‘A change in the deflection of the compass? Under what condition is the deflection maximum and why? [3]



Ans :

1. The straight current carrying conductor should be placed in the plane of the paper itself. Because the axis of rotation of the compass needle is vertical and the field due to current carrying conductor is also vertical, there will be no change in the deflection of the compass needle.
2. When the conductor passes through A and is perpendicular to the plane of paper, the deflection in the compass needle will be maximum, because in this case the field due to current carrying conductor will be maximum in the plane of the paper and will provide maximum torque to the compass.

23. What is the function of an earth wire? Why is it necessary to earth metallic appliances? [3]

Ans :

1. The earth wire in an electric circuit is a safety device and it has a vital role specially for those appliances that have a metallic body and are touched while working with them, e.g. electric iron, electric kettle, table fan, electric toaster, etc. The metallic body of these appliances is connected to the earth-wire, which provides low resistance conducting path for electric current in case of any kind of leakage.
2. If the appliances are not earthed, the current, if any, in the metallic body of the appliance will pass through the user body and give him/her an electric shock which may prove to be fatal. If there is a provision of earth wire, this current flows to the earth through the earth wire and the user is prevented from getting electric shock.

24. Explain the role of decomposers in the environment.[3]

Ans :

Decomposers are vital for biogeochemical cycles. When producers (green plants) and consumers (animals) die, the complex organic molecules in their bodies get slowly and gradually broken down into simple inorganic molecules which become part of soil, air and water. This is done with the help of decomposers, i.e. fungi and bacteria. Thus decomposers play a vital role in the environment.

Section C

25. A non-metal A which is the largest constituent of air, when heated with H_2 in 1: 3 ratio in the presence of catalyst (Fe) gives a gas B. On heating with O_2 it gives an oxide C. If this oxide is passed into water in the presence of air it gives an acid D which acts as a strong oxidising agent.

(a) Identify A, B, C and D.

(b) To which group and period of periodic table does this non-metal belong? [5]

Ans :

(a) (i) Non-metal A is nitrogen (N_2), as it is the largest constituent of air.

(ii) B is ammonia (NH_3), as N_2 on heating with H_2 in the ratio of 1 : 3 forms NH_3(B), according to the reaction

$$N_2 + 3H_2 \xrightarrow{\text{Heat}} 2NH_3$$

(iii) C is nitric oxide (NO), as N_2 on heating with O_2 forms nitric oxide, according to the reaction

$$N_2 + O_2 \longrightarrow 2NO$$

(iv) D is nitric acid (HNO_3) as NO when passed through water in the presence of air forms nitric acid, HNO_3(D) which is a strong oxidising agent.

$$4NO + 2H_2O + 3O_2 \longrightarrow 4HNO_3$$

(b) Non-metal A belongs to group 15 and period 2 of the Modern Periodic Table.

26. A compound C (molecular formula, $C_2H_4O_2$) reacts with Na-metal to form a compound R and evolves a gas which burns with a pop sound. Compound C on treatment with an alcohol A in presence of an acid forms a sweet smelling compound S (molecular formula, $C_3H_6O_2$). On addition NaOH to C, R and water are produced. S on treatment with NaOH solution gives back R and A.
Identify C, R, A and S d write down the reactions involved. [5]

Ans :

1. C — Ethanoic acid (CH_3COOH)
2. R — Sodium ethanoate/sodium acetate (CH_3COONa) and gas evolved is hydrogen(H_2)
3. A — Methanol (CH_3OH)
4. S — Methyl ethanoate/Methyl acetate/ester/ CH_3COOCH_3
5. Reactions involved

(a) $\underset{(C)}{CH_3COOH} + 2Na \longrightarrow \underset{(R)}{CH_3COONa} + H_2$

(b) $\underset{(C)}{CH_3COOH} + \underset{(A)}{CH_3OH} \longrightarrow \underset{(S)/C_3H_6O_2}{CH_3COOCH_3} + H_2O$

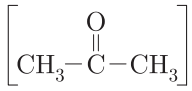
(c) $\underset{(C)}{CH_3COOH} + NaOH \longrightarrow \underset{(R)}{CH_3COONa} + H_2O$

(d) $\underset{(S)}{CH_3COOCH_3} + NaOH \longrightarrow \underset{(R)}{CH_3COONa} + \underset{(A)}{CH_3OH}$

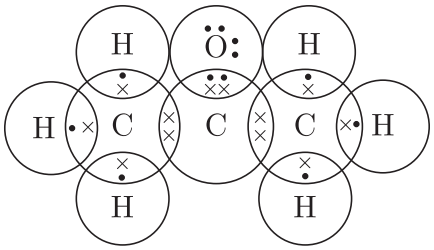
or

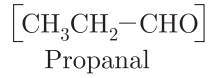
Draw the structural formulae of all the possible isomers of the compound with the molecular formula C_3H_6O and also give their electron dot structures. [5]

Ans :

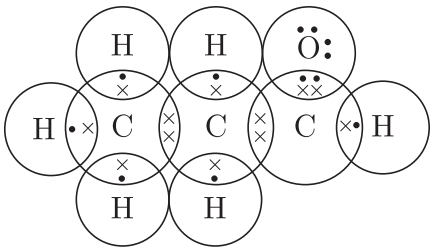


Propanone





Propanal



27. List in tabular form four differences between aerobic and anaerobic respiration. Name two organisms that use the anaerobic mode of respiration. [5]

Ans :

Four differences between aerobic respiration and anaerobic respiration:

	Aerobic Respiration	Anaerobic Respiration
(i)	It is the type of respiration in which an organism uses oxygen for the breakdown of glucose.	It is the type of respiration in which an organism does not use oxygen for the breakdown of glucose.
(ii)	Complete oxidation of glucose takes place and a lot of energy is liberated.	Incomplete oxidation of glucose takes place and very little energy is released.
(iii)	The end products are carbon dioxide and water.	The end products are ethanol and carbon dioxide.
(iv)	It occurs partly in cytoplasm and partly in mitochondria.	It occurs only in cytoplasm.

Yeast and bacteria use anaerobic mode of respiration.

28. (a) How does fertilisation take place in human beings? 'Fertilisation occurs once in a month'. Comment.

(b) What changes are observed in the uterus subsequent to implantation of young embryo? [5]

Ans :

(a) (i) With the onset of menstruation a female is ready to conceive. During mating, semen is transferred through penis into vagina. The sperms in semen travel/swim onwards in the direction of the fallopian tube. The egg, released by the ovary, is picked by the fallopian tube.

(ii) If the sperm fuses with the egg, fertilisation is ensured. The zygote so formed gets implanted in the uterus and starts dividing.

(iii) Fertilisation occurs once in a month because ovary, in normal situation, releases only one egg per month.

(b) Post implantation of young embryo, blood circulation around uterus is increased. Soon embryo starts deriving its nutrition from the mother's blood with the help of a special tissue called placenta. This contains villi-like structure embedded in the wall of uterus. Tissue and blood capillaries of uterus surround villi. Through the villi nutrients and oxygen from mother's blood pass on to the embryo. The wastes produced by the embryo is passed on to mother's blood through the placenta.

or

(a) Why is DNA copying an essential part of the process of reproduction? Write two advantages of sexual reproduction over asexual reproduction.

(b) What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained. [5]

Ans :

(a) Because DNA copying makes possible the transmission of characters from parents to the next generation.

Advantages:

(i) Source of a large number of variations in the population.

(ii) Gives survival advantages to the species/ helps in continuity of the species.

(b) (i) Chromosomes are thread-like structures present in the nucleus and contain DNA as the genetic material.

(ii) In sexually reproducing organisms, each cell has two sets of chromosomes (inherited from two parents). During gamete formation, the chromosome number is reduced to half in male and female germ cells/gametes. When these germ cells from two individuals fuse to form a new individual, it reestablishes the original number of chromosomes.

29. (a) Write the importance of ciliary muscles in the human eye. Name the defect of vision that arises due to gradual weakening of the ciliary muscles in old age. What type of lenses are required by the persons suffering from this defect to see the objects clearly?

(b) A person needs a lens of power –5.5 dioptre for correcting his distant vision. For correcting his near vision he needs a lens of power +1.5 dioptre. What is the focal length of the lens required for correcting (i) distant vision, and (ii) near vision? [5]

Ans :

(a) Function/Importance of ciliary muscles: The ciliary muscles modify the curvature of the eye lens to enable the eye to focus objects at varying distances. Ciliary muscles help in adjusting the focal length of the eye lens.

(i) Defect of vision: Presbyopia

(ii) Bifocal lens are used for the correction of this defect.

(b) (i) For distant vision, power of the lens = –5.5 dioptre

$$\because \quad P = \frac{1}{f}$$

$$\therefore \quad \text{Focal length, } f = \frac{1}{P} = \frac{1}{-5.5\ D}$$

$$= -\frac{10\text{ m}}{55} = -0.182\text{ m}$$

(ii) For near vision, power of the lens = +1.5 dioptre

$$\because \quad P = \frac{1}{f}$$

$$\therefore \quad \text{Focal length, } f = \frac{1}{P} = \frac{1\text{ m}}{1.5}$$

$$= \frac{10\text{ m}}{15}$$

$$= +0.667\text{ m}$$

$$\text{or } +66.7\text{ cm}$$

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 electric iron of 1.32 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 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.

$$V = V_1 + V_2 + V_3$$

$$V_1 = IR_1;\ V2 = IR_2;\ V3 = IR_3$$

If the equivalent resistance of the series combination of the three resistors is R, then

$$V = IR$$

$$IR = IR_1 + IR_2 + IR_3$$

$$\therefore \quad R = R_1 + R_2 + R_3$$

(b) Power = 1.32 kW

= 1320 W

V = 220 V

P = VI

$$I = \frac{P}{V} = \frac{1320\ W}{220\ V} = 6.0\ A$$

∴ 10 A fuse will be most suitable for operating the electric iron.

or

What is Joule's heating effect? How can it be demonstrated experimentally? List its four applications in daily life. [5]

Ans :

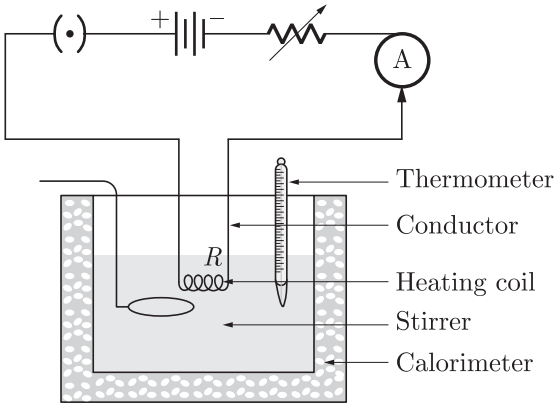
Joule's heating effect: When an electric current is passed through a conductor, it becomes hot. This phenomenon is called heating effect of electric current. The amount of heat, H, produced in a conductor of resistance R, on passing a current I, for a time t, is given as:

$$H = I^2Rt$$

This is known as Joule's law of heating.

Experimental Demonstration of Joule's Heating Effect:

Adjust the apparatus as shown in the diagram. In this a conductor of resistance, R is immersed in water filled in the calorimeter. The two ends of the conductor are connected to a plug key, battery, an ammeter and a rheostat. When the plug key is closed, adjust the rheostat allowing current Ito flow through the conductor of resistance R, for a time t. Unplug the key and note the rise in temperature.



Here, the electrical energy consumed = I^2Rt

Heat developed in the conductor, H, is given by the sum of the heat gained by the calorimeter with stirrer and the water filled in the calorimeter.

Experimentally it is found that $H = I^2Rt$.

Thus, the Joule's Law of Heating is verified.

Applications of Joule's Heating Effect: Electric heater, electric geyser, electric oven, electric toaster, etc.