Class X
(CBSE 2019)
Science
All India (Set-1)

General Instructions:

(i) The question paper comprises **five** sections, **A**, **B**, **C**, **D** and **E.** You are to attempt all the sections.

(ii) All questions are **compulsory.**

(iii) Internal choice is given in sections **B**, **C**, **D** and **E**.

(iv) Question numbers **1** and **2** in Section **A** are one mark questions. They are to be answered in **one** word or in **one** sentence.

(v) Question numbers **3** to **5** in Section **B** are two-marks questions. These are to be answered in about **30** words each.

(vi) Question numbers **6** to **15** in Section **C** are three-marks questions. These are to be answered in about **50** words each.

(vii) Question numbers **16** to **21** in Section **D** are five-marks questions. These are to be answered in about **70** words each.

(viii) Question numbers **22** to **27** in Section **E** are based on practical skills. Each question is a two marks question. These are to be answered in brief.

Question 1

State Ohm's law.

SOLUTION:

According to Ohm's law, the electric current flowing through a metallic wire is directly proportional to the potential difference V, across its ends provided its temperature remains the same.

In other words, $V \propto I$

Or, $V = RI$

Where, R is a constant of proportionality called resistance of the resistor, it tends to resist the flow of charge through a conducting wire. Its SI unit is Ohm (Ω).

Question 2

Name any two nutrients that the spent slurry has in the biogas plant.

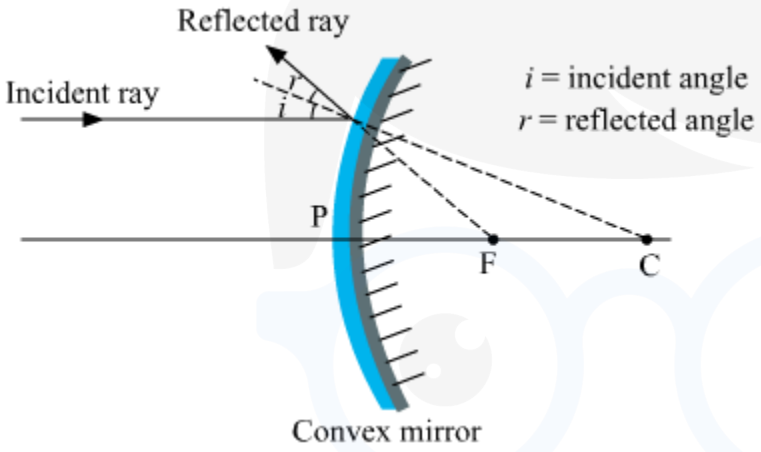
SOLUTION:

Two nutrients that the spent slurry has in the biogas plants are nitrogen and phosphorous.

Question 3

Draw a labelled ray diagram to show the path of the reflected ray corresponding to an incident ray of light parallel to the principal axis of a convex mirror. Mark the angle of incidence and angle of reflection on it.

SOLUTION:



Question 4

A compass needle is placed near a current carrying straight conductor. State your observation for the following cases and give reasons for the same in each case:

(a) Magnitude of electric current is increased.

(b) The compass needle is displaced away from the conductor.

SOLUTION:

(a) Deflection of compass needle increases- Magnetic field strength is directly proportional to the amount of current.

(b) Deflection of compass needle decreases-Magnetic field strength is inversely proportional to the distance from the wire.

Question 5

Out of HCl and CH_3COOH, which one is a weak acid and why? Explain with the help of an example.

OR

"Sodium hydrogen carbonate is a basic salt." Justify this statement. How is it converted into washing soda?

SOLUTION:

HCl (hydrochloric acid) when comes in contact with water, liberates more H^+ ions into the solution when compared to the number of hydrogen ions liberated by the same amount of CH_3COOH (acetic acid) into the solution. Thus acetic acid (CH_3COOH) is a weaker acid.

Example: When we make two separate electrolytic cells, one with HCl (aq) as an electrolyte and the other cell with CH3COOH (aq) as an electrolyte, in both the cells when we connect a bulb to check the voltage produced in the respective cells, we find that the bulb connected to the cell with HCl glows brighter compared to the other cell. From this, it is proved that HCl is a stronger acid because when there are more ions in the solution there will be more conduction of electricity and thus the bulb would glow brighter.

OR

When a strong base reacts with a weak acid it results in a basic salt and water.

$$\underset{}{NaOH} + \underset{}{H_2CO_3} \rightarrow \underset{\text{basic salt}}{NaHCO_3} + \underset{}{H_2O}$$

Thus we can justify that sodium hydrogen carbonate ($NaHCO_3$) is a basic salt.
Washing soda can be formed by heating of sodium hydrogen carbonate followed by recrystallisation.

$$2\,NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$$

Recrystallisation

$$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$$

Question 6

Define genetics. Why is decrease in the number of surviving tigers cause of concern from the point of view of genetics? Explain briefly.

SOLUTION:

Genetics is a branch of biology which deals with the study of genes, genetic variation and heredity in organisms.

From the point of genetics, a small population of an organism means, limited scope of variation which in turn would result in reduced traits and diversity. A decrease in the number of surviving tigers is a cause of concern because it can lead to the loss of genetic variability which can negatively impact the fitness of tiger populations. If the

entire population of tigers get extinct due to any reason, it would result in the loss of their genes. This would have a direct effect on the ecological balance and effect the ecosystem adversely.

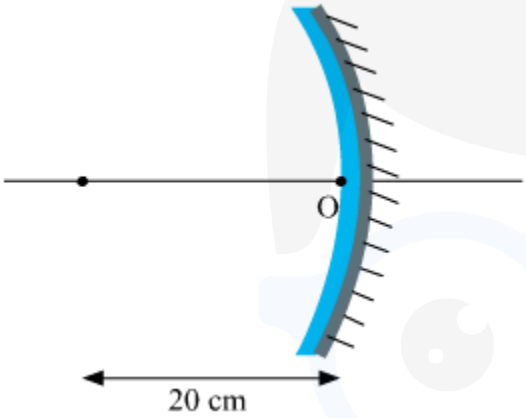
Question 7

A concave mirror has a focal length of 20 cm. At what distance from the mirror should a 4 cm tall object be placed so that it forms an image at distance of 30 cm from the mirror ? Also calculate the size of the image formed.

OR

A real image 2/3rd of the size of an object is formed by a convex lens when the object is at a distance of 12 cm from it. Find the focal length of the lens

SOLUTION:



As per sign convention

f = −20 cm

v = −30 cm

Now mirror formula

Now mirror formula

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

$\frac{1}{(-30)}+\frac{1}{u}=\frac{1}{(-20)} \Rightarrow \frac{1}{u}=\frac{1}{30}-\frac{1}{20}=\frac{2-3}{60}=\frac{-1}{60}$

u = -60 cm

So object distance = -60 cm i.e. 60 cm in front of mirror.

$\text{Now magnification } = m=\frac{-v}{u}$

$\text{so } m=\frac{-v}{u}=\frac{h_i}{h_o}$

$m=\frac{-(-30)}{(-60)} \Rightarrow -\frac{1}{2}=\frac{h_i}{h_o}$

$h_i=-\frac{h_0}{2}=\frac{-4}{2}=-2 \text{ cm}$

So, height of image = 2 cm and image is real & inverted

OR

Magnification = $-\frac{2}{3}$ (Negative since image is real and inverted)

$m=-\frac{2}{3}=\frac{h_i}{h_o}$

$u=-12 \text{ cm}$

$\text{now } m=\frac{v}{u} \Rightarrow -\frac{2}{3}=\frac{v}{(-12)}$

$v=-\frac{2}{3} \times (-12)=8 \text{ cm}$

So, Real image is formed 8 cm behind the mirror.

Now lens formula

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

$\frac{1}{8}-\frac{1}{(-12)}=\frac{1}{f}$

$f=\frac{24}{5}=4.8 \text{ cm}$

Hence, focal length is 4.8 cm

Question 8

2 g of ferrous sulphate crystals are heated in a dry boiling tube.

(a) List any two observations.

(b) Name the type of chemical reaction taking place.

(c) Write balanced chemical equation for the reaction and name the products formed.

OR

You might have noted that when copper powder is heated in a china dish, the reddish brown surface of copper powder becomes coated with a black substance.

(a) Why has this black substance formed ?

(b) What is this black substance ?

(c) Write the chemical equation of the reaction that takes place.

(d) How can the black coating on the surface be turned reddish brown?

SOLUTION:

(a) On heating 2 g ferrous sulphate following observations are obtained:

i) On heating, the colour changes from light green to white.

ii) On further heating, the white substance changes to dark brown solid.

iii) The gas emitted has the characteristic odour of burning sulphur.

b) Decomposition reaction is taking place on heating ferrous sulphate.

$$\text{c)}\ 2\,FeSO_4.\ 7H_2O\,(s) \xrightarrow{\text{Heating}} Fe_2O_3\,(s) + SO_2\,(g) + SO_3\,(g) + 14H_2O\,(g)$$

a) The black colour is due to the oxidation of Cu.

b) When the copper powder is heated, it combines with oxygen in the air to form copper oxide which is black in colour.

c) $2\,Cu + O_2 \rightarrow 2CuO$

d) We can use the wire strippers to remove this black coating of copper oxide.

Question 9

What is a food chain? Why is the flow of energy in an ecosystem unidirectional? Explain briefly.

OR

(a) Why should National Parks be allowed to remain in their pristine form?

(b) Why is reuse of materials better than recycling?

SOLUTION:

A food chain is a series of organisms where one is eaten by the next member in the series. Organisms are grouped according to their feeding habit into trophic levels. Grass (a producer) gets eaten by insects (primary consumers), which in turn get eaten by rats (secondary consumer) and finally is itself eaten by snakes (tertiary consumer). In this food chain, the organisms placed in the higher level get energy by consuming the ones at the lower level. Consumers, like insects, eat grass and thus the energy flows from grass to insects; the opposite is not possible. Hence, the flow of energy in an ecosystem in unidirectional

OR

(a) A National park is an area designated as protected by the government and is aimed at protecting the natural environment therein. It might comprise well-developed ecosystems where interactions between the components are well established. Any perturbations in such ecosystems will cause a cascade of effects given to the relationships between the biotic and abiotic components in the ecosystems. Hence, we should abstain from producing any changes in such parks.

(b) Recycling involves processes that use waste material to produce a commodity. Several things like some plastics, papers are recyclable. However, all such processes require some inputs as well as processing. Reusing increases the time for which the commodity is in usage and thus prevents the processing and inputs required for recycling. Thus, reusing can decrease the pressure on digging up for more resources for manufacturing or recycling and hence is a better approach.

Question 10

A white powder is added while baking cakes to make it soft and spongy. Name its main ingredients. Explain the function of each ingredient. Write the chemical reaction taking place when the powder is heated during baking.

SOLUTION:

The white powder which is added while baking cakes to make it soft and spongy is called Baking soda. Its chemical formula is $NaHCO_3$. Its main ingredients are Sodium hydrogen carbonate, tartarate salt and starch.

The function of each ingredient: The following reaction takes place when heated during cooking,

$$\underset{\text{Sodium hydrogen carbonate}}{2NaHCO_3} \xrightarrow{\text{Heating}} \underset{\text{Sodium carbonate}}{Na_2CO_3} + \underset{\text{Carbon dioxide}}{CO_2} + \underset{\text{Water}}{H_2O}$$

Carbon dioxide produced during the reaction causes bread or cake to rise making them soft and spongy.

The function of the tartarate salt → When the baking powder comes in contact with water the tartaric acid gets active and reacts with the sodium bicarbonate and carbon dioxide gas is evolved in this reaction which is the reason of puffiness of the cake and bread.

The function of corn starch in the baking soda is to act a filler, it absorbs any extra moisture and prevents the baking soda from acting too quickly.

Question 11

Two circular coils P and Q are kept close to each other, of which coil P carries a current. What will you observe in the galvanometer connected across the coil Q

(a) if current in the coil P is changed?

(b) if both the coils are moved in the same direction with the same speed?

Give reasons to justify your answer in each case.

SOLUTION:

(a) When the current in coil P is changed, a current is induced in coil Q, hence the galvanometer connected across the ends of coil Q will show the deflection.

(b) If both the coils are moved in the same direction with the same speed, their relative motion is zero. It is equivalent to not moving them at all. So because of this motion, there will not be any current induced in the coil Q, hence, the galvanometer will not show any deflection.

Question 12

(a) Write two water conducting tissues present in plants. How does water enter continuously into the root xylem?

(b) Explain why plants have low energy needs as compared to animals

SOLUTION:

(a) Xylem vessels and tracheids are the water-conducting tissues in vascular plants. Roots of most of the vascular plants first actively absorb minerals and salts from the soil, leading to endosmosis of water into the root tissue. This creates a positive and upward hydrostatic pressure into the xylem tissue of the plant. Thereafter transpirational pull creates a suction force to pull up the water column upwards to the higher regions of the plant body. Forces of cohesion between the water molecules and adhesion between the water molecules and xylem vessel walls lead to the creation of unbroken upward column of water being pulled up.

(b) Plants are primarily stationary and do not show or use muscular energy for movement and locomotion. Thus a lot of energy is saved as they cannot use muscular energy and thus have comparatively very less energy requirement compared to the animals.

Question 13

Why does the flow of signals in a synapse from axonal end of one neuron to dendritic end of another neuron take place but not in the reverse direction? Explain.

SOLUTION:

The dendrites contain the receptors for the neurotransmitters while the axon terminals have synaptic vesicles that are filled with the neurotransmitters. So, when the impulse is generated, the synaptic vesicles fuse with the membranes of the synaptic knobs of axon terminal and the neurotransmitters are released in the synaptic cleft. These are then sensed by the receptors present on the dendrites of the post-synaptic neuron. As dendrites do not release the neurotransmitters, the impulse cannot travel from the dendrites of one neuron to the axonal end of the other neuron. It is always uni-directional, that is, from the axonal end of the pre-synaptic neuron to the dendrites of the post-synaptic neurons.

Question 14

Mention the environmental consequences of the increasing demand for energy. List four steps you would suggest to reduce the consumption of energy

SOLUTION:

The increasing demand for energy is met by fossil fuels like coal and petroleum. There are several environmental consequences of the increased usage of these fossil fuels as below -

1. Fossil fuels are non-renewable sources of energy and can be exhausted faster upon being increasingly used.

2. The burning of fossil fuels produces smoke and that causes severe environmental pollution.

3. The gases produced upon combustion of fossil fuels leads to the greenhouse effect, which is responsible for the change in environmental weather all across the world.

Steps that can be taken to reduce energy consumption are on the whole is all about using energy very judiciously.

1. Use of electricity and electrical appliances like air conditioners must be reduced and should be used only when necessary.
2. Public transport means should be chosen by one and all for mass transit.
3. Prevent unnecessary waste of water.

4. Solar heaters should be used in place of electrical heaters wherever possible.

Question 15

An ore on treatment with dilute hydrochloric acid produces brisk effervescence. Name the type of ore with one example. What steps will be required to obtain metal from the enriched ore ? Also write the chemical equations for the reactions involved in the process

SOLUTION:

An ore on treatment with dilute hydrochloric acid releases brisk effervescence of colourless and odourless gas. Then the ore should be carbonate ore. As only metal carbonate on treatment with dilute hydrochloric acid releases carbon dioxide gas.
Example: Zinc Carbonate

$ZnCO_3 + 2\ HCl \rightarrow ZnCl_2 + H_2O + CO_2$

Steps required to obtain metal from the enriched ore:

1. Carbonate ores are converted to their metal oxides by the calcination process.

Heating of carbonate ores in the limited supply of air to convert them into oxides is known as calcination.

$ZnCO_3 \rightarrow ZnO + CO_2$

2. ZnO obtained is then reduced by carbon in the form of coke.

$ZnO + C \rightarrow Zn + CO$

Question 16

(a) State the reason why carbon can neither form C^{4+} cations nor C^{4-} anions, but forms covalent bonds. Also state reasons to explain why covalent compounds

(i) are bad conductors of electricity.
(ii) have low melting and boiling points.

(b) Write the structural formula of benzene, C_6H_6.

OR

(a) Define the term 'isomer'.

(b) Two compounds have same molecular formula C_3H_6O. Write the name of these compounds and their structural formula.

(c) How would you bring the following conversions:

(i) Ethanol to ethene
(ii) Propanol to propanoic acid

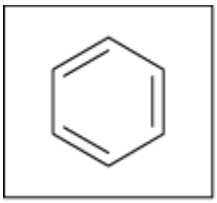
SOLUTION:

(a) Carbon can neither form C^{4+} cations nor C^{4-} anions because it involves a huge amount of energy for loosing or gaining of four electrons which is not feasible. Thus it completes its octet by sharing of electrons, i.e. forming covalent bonds.

(i) Covalent compounds are bad conductors of electricity because they do not contain ions.

(ii) Covalent compounds are made up of electrically neutral molecules. So, the force of attraction between the molecules of a covalent compound is very weak. Only a small amount of heat energy is required to break these weak molecular forces, due to which covalent compounds have low melting points and low boiling points.

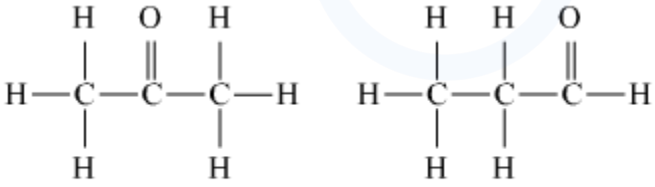
(b) The structural formula of benzene, C_6H_6 is



OR

(a) The organic compounds having the same molecular formula but different structures are known as isomers.

(b) Two compounds have same molecular formula C_3H_6O are



Propanone (Ketone)

Propanal (aldehyde)

(c) (i) Ethanol to ethene

$$CH_3CH_2OH \xrightarrow[\text{dehydration}]{\text{conc. } H_2SO_4;\ 170\,^\circ C} CH_2 = CH_2 + H_2O$$

(ii) Propanol to propanoic acid

$$CH_3CH_2CH_2OH + 2[O] \xrightarrow{\text{alkaline } KMnO_4;\ \text{heat}} CH_3CH_2COOH + H_2O$$

Question 17

(a) A 5 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 30 cm. Find the position, nature and size of the image formed.

(b) Draw a labelled ray diagram showing object distance, image distance and focal length in the above case.

SOLUTION:

(a) Convex lens,

f = 20 cm

u = -30 cm

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$
$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$
$$\frac{1}{v} = \frac{u+f}{uf}$$
$$v = \frac{uf}{u+f} = \frac{-30\times20}{-30+20} = 60 \text{ cm}$$
$$v = +60 \text{ cm}$$

The image will be formed at 60 cm on the other side of the lens.

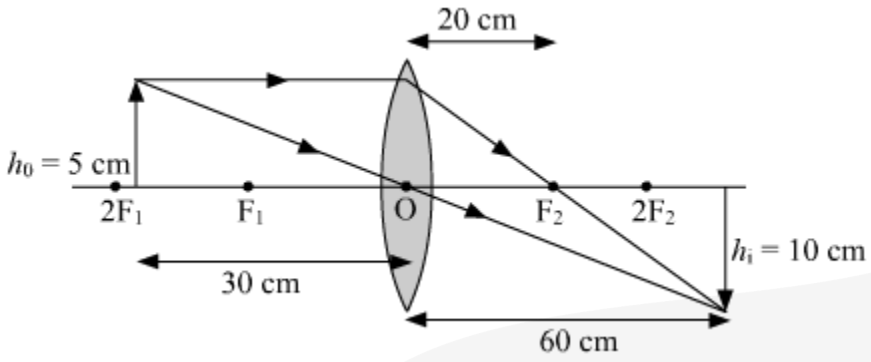
Since the image distance is positive, therefore, the nature of the image is real.

Now, magnification, $m = \frac{v}{u} = \frac{60}{-30} = -2$

Since magnification is negative, therefore, the image formed will be inverted.

$$m = \frac{h_i}{h_o}$$
$$2 = \frac{h_i}{5}$$
$$h_i = 10 \text{ cm}$$

(b)



Question 18

(a) How does metallic character of elements in Modern Periodic Table vary on moving from

(i) left to right in a period?

(ii) top to bottom in a group?

Explain with the help of an example in each case.

(b) If an element X is placed in group 14, what will be the nature of bond in its chloride? Write the chemical formula of the compound formed.

(c) An element X has mass number = 35 and number of neutrons = 18. What is the atomic number of X? Write electronic configuration of X and determine its valency.

SOLUTION:

(a) (i) On moving from left to right in a period the metallic character of elements decreases.

This is because as we move from left to right in a period in the periodic table, the atomic size decreases as a result the electrons come closer to the nucleus and cannot be lost easily.

Example: Alkali metals and Alkaline earth metals are strong metals as they have a very high tendency to lose their valance electrons and as we move from left to right in the periodic table, the tendency to lose electrons decreases and the non-metals have a tendency to gain electrons because they have higher electronegativity than metals.

(ii) On moving from top to bottom in a group the metallic character of elements increases.

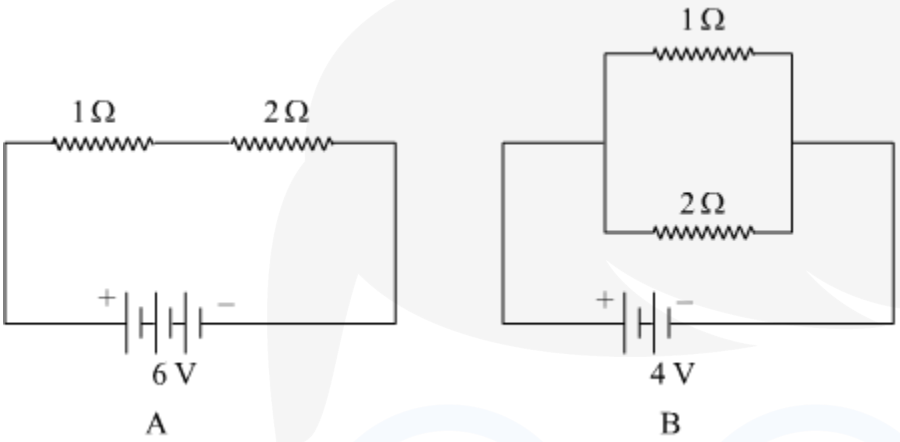
This is because as we move from top to bottom in a group in the periodic table the atomic size increases as a result the electrons are far away from the nucleus and can be easily lost.

Example: Caesium has high tendency to loose electron in comparison to sodium. Thus caesium has high metallic character.

(b) An element present in group 14 has 4 valance electrons so, to satisfy its combining capacity preferably the element will have covalent bonds in its chlorides. The chemical formula of the compound will be XCl_4.

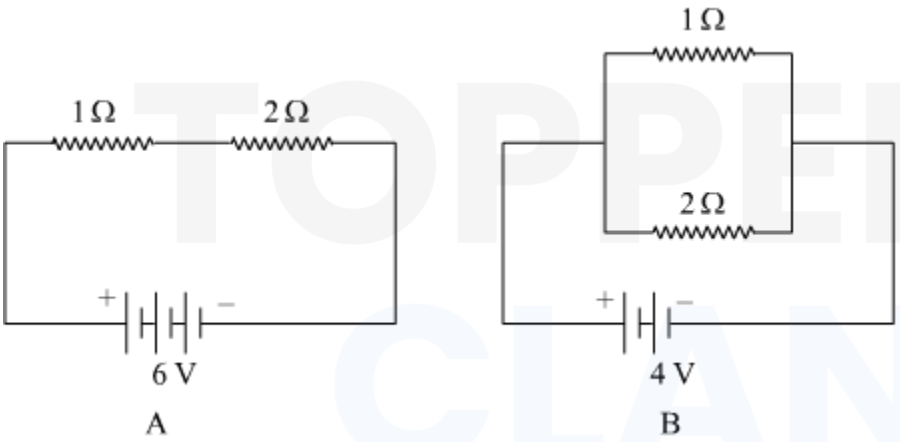
Question 19

Compare the power used in 2 Ω resistor in each of the following circuits:



A bulb is rated 40 W; 220 V. Find the current drawn by it, when it is connected to a 220 V supply. Also find its resistance. If the given bulb is replaced by a bulb of rating 25 W; 220 V, will there be any change in the value of current and resistance? Justify your answer and determine the change.

SOLUTION:



For circuit I[st]:-

Total resistance = (1 + 2) = 3 Ω

$$\text{Current} = \frac{V}{R} = \frac{6}{3} = 2\text{A}$$

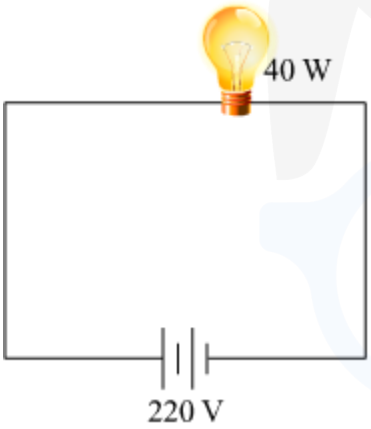
Power in 2 Ω Resistor = $I^2R = 4(2) = 8\ \text{Watt}$

For circuit II[nd]:-

Power in 2 Ω Resistor = $\frac{V^2}{R} = \frac{16}{2} = 8\ \text{Watt}$

Hence the Power consumed is the same in both cases.

OR

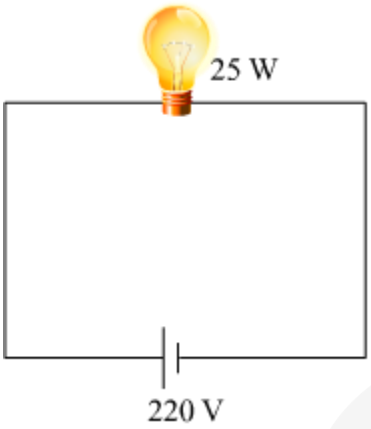


We have, P = 40 W & V = 220 V

$$R = \frac{V^2}{P} = \frac{(220)(220)}{40}$$
$$R = 1210\ \Omega$$

Current Drawn = $\frac{P}{V} = \frac{40}{220} = \frac{2}{11}\text{A} = 0 \cdot 18\ \text{A}$

Replaced Condition:-



$P = 25\ \text{W}$ & $V = 220\ \text{V}$

$$R = \frac{V^2}{P} = \frac{220 \times 220}{25}$$
$$= 22 \times 22 \times 4$$
$$= 484 \times 4$$
$$= 1936\ \Omega$$

Current drawn = $\frac{P}{V} = \frac{25}{220} = 0.11\ \text{A}$

Resistance in the first case is less as compared to the IInd case, Hence current in the first case is more as compared to the IInd case.

Question 20

(a) Distinguish between cross-pollination and self-pollination. Mention the site and product of fertilization in a flower.

(b) Draw labelled diagram of a pistil showing the following parts:

Stigma, Style, Ovary, Female germ cell

OR

(a) Draw a diagram of human female reproductive system and label the parts:

(i) which produce an egg.
(ii) where fertilization takes place.

(b) List two bacterial diseases which are transmitted sexually.

(c) What are contraceptive devices? Give two reasons for adopting contraceptive devices in humans.

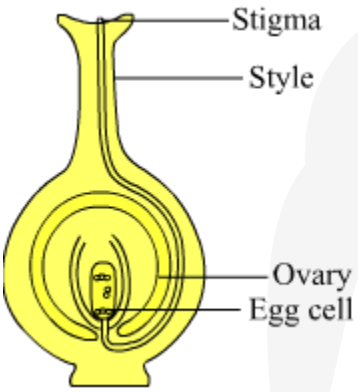
SOLUTION:

(a) Self-pollination: It is the transfer of pollen from the anther of a flower to the stigma of a flower on the same plant. There is less variation.

Cross-pollination: It is the transfer of pollen from an anther of a flower to the stigma of a flower on another plant. There is much more variation.

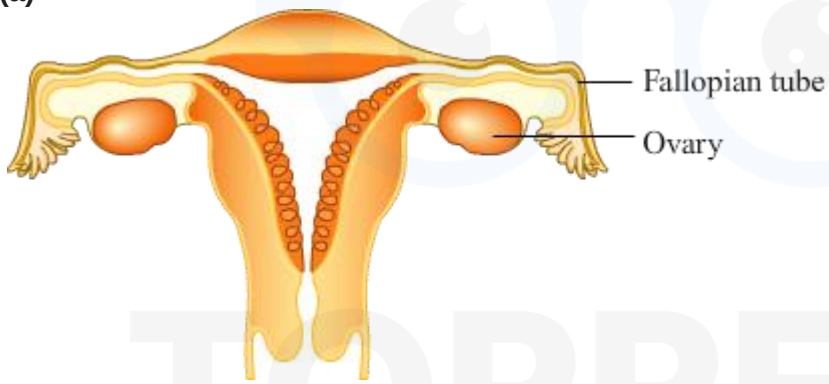
The site of fertilization in flowers is ovule. The products of fertilization are zygote (2n) and primary endosperm nucleus (3n).

(b)



OR

(a)



(i) Ovary produces the egg.
(ii) Fertilisation takes place in the fallopian tube.

(b) Gonorrhea and syphilis are the bacterial diseases which are transmitted sexually.

(c) Contraceptive devices are devices which prevent fertilization and pregnancy in females. These contraceptive devices fall in the following categories :

Barrier method: In this method, the fertilization of the ovum and the sperm is prevented with the help of barriers such as a condom.

Oral contraceptive method: In this method, tablets or drugs are taken orally to prevent fertilization.

Implants and surgical methods: Contraceptive devices, such as a loop and a copper-T rod, are placed in the uterus to prevent pregnancy. However, they can cause side effects on the uterus.

Reasons for adopting contraceptive devices in humans are -

- They prevent unwanted pregnancies.
- They prevent the transmission of sexually transmitted diseases.

Question 21

(a) How do the following provide evidences in favour of evolution in organisms? Explain with an example for each.

(i) Homologous organs
(ii) Analogous organs
(iii) Fossils

(b) Explain two methods to determine the age of fossils.

SOLUTION:

(a) (i) Homologous organs: These organs are similar in form (or are embryologically same), but perform different functions in different organisms. These organs provide strong evidence in the favour of evolution. For example, the bone structure observed in the forelimbs of birds and bats, flippers of dolphins and arms of human beings are similar and have the same pentadactyl plan but they perform different functions.

(ii) Analogous organs: These organs have different origin and different basic structure but perform same function. For example, wings of birds and wings of insects; wings of birds and wings of bats (bird wings are made of feathers while bat wings are the folds of skin) have different structure but perform same function of flying. Thus, these organs provide evidence for evolution that they are different in origin but evolve to perform same function to survive in hostile environmental conditions.

(iii) Fossils: They are the impressions of dead organisms and they can tell a great deal about the changes that various species of organisms have gone through. For example, Archaeopteryx is a connecting link between birds and reptiles and it suggests that the present animals have evolved from the existing ones through the process of continuous evolution.

(b) The methods to determine the age of fossils are -

- **Radiometric dating:** In this method, the age of fossils can be determined by tracing the radioactive elements present in the rocks and by examining them chemically.
- **Relative dating:** Fossils are found in sedimentary rocks in the form of layers accumulated over a large span of time. Considering the fact that fossils found in

the bottom layers are older than those found in the layers above them, geologists find the age of the fossils.

Question 22

What would you observe on adding zinc granules to freshly prepared ferrous sulphate solution? Give reason for your answer.

SOLUTION:

Ferrous sulphate is green in colour. When zinc granules are added to ferrous sulphate, its green colour will fade away. This happens because zinc is more reactive than iron, it will displace iron and form zinc sulphate.

$Zn(s) + FeSO_4(aq) \rightarrow ZnSO_4(aq) + Fe(s)$

Question 23

How is the presence of an acid tested with a strip of red litmus paper?

OR

A student is performing an experiment to study the properties of acetic acid. Answer the following questions:

(i) Name the substance he must add to acetic acid to produce carbon dioxide.

(ii) Give the relevant chemical equation for the reaction.

(iii) How would he test CO2 gas in the laboratory?

SOLUTION:

Red litmus changes to blue in case of base while remains the same in case of acid. So acids don't change the red litmus.

OR

i). The reaction of sodium carbonate with acetic acid can be used to produce carbon dioxide gas.

ii). $CH_3COOH + Na_2CO_3 \rightarrow CO_2 + CH_3COO^- Na^+ + H_2O$

iii). Limewater test can be used to test the presence of carbon dioxide gas. Passing the gas from limewater, it turns milky, due to the formation of insoluble suspension calcium carbonate.

$$Ca(OH)_2 + CO_2 \rightarrow \underset{\text{(insoluble)}}{CaCO_3} + H_2O$$

If more carbon dioxide is passed through the solution then the milkiness gets disappeared due to the formation of calcium bicarbonate which is soluble in water.

$$CaCO_3 + H_2O + CO_2 \rightarrow \underset{\text{(soluble)}}{Ca(HCO_3)_2}$$

Question 24

A teacher gives a convex lens and a concave mirror of focal length of 20 cm each to his student and asks him to find their focal lengths by obtaining the image of a distant object. The student uses a distant tree as the object and obtains its sharp image, one by one, on a screen. The distances d1 and d2 between the lens/mirror and the screen in the two cases and the nature of their respective sharp images are likely to be

(a) (20 cm, 40 cm) and (erect and erect)

(b) (20 cm, 40 cm) and (inverted and inverted)

(c) (20 cm, 20 cm) and (inverted and inverted)

(d) (20 cm, 40 cm) and (erect and inverted)

Give reason for your answer.

SOLUTION:

Convex lens and concave mirror both are converging in nature. The parallel rays incident on the lens or the mirror from a distant object converge on the focal plane. Thus, the distance d_1 = 20 cm and d_2 = 20 cm. As the image formed is real for lens and mirror both, so the image will be inverted. Hence, the correct answer is option C.

Question 25

The rest position of the needles in a milliammeter and voltmeter, not in use, are as shown in Figure A. When a student uses these instruments in his experiment, the readings of the needles are in the positions shown in Figure B. Determine the correct values of current and voltage the student should use in his calculations.

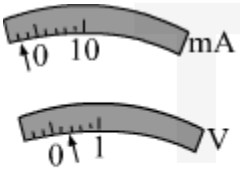


Figure A

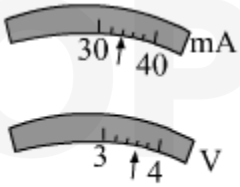


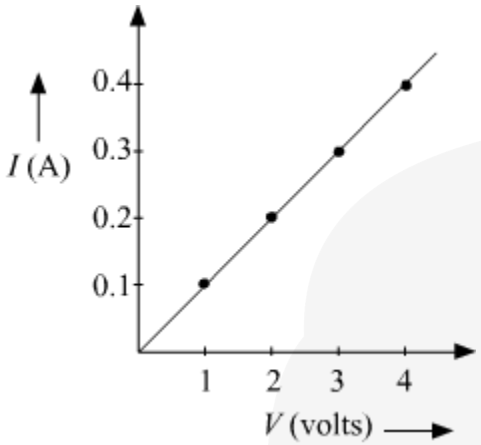
Figure B

OR

In the experiment to study the dependence of current (I) on the potential difference (V) across a resistor, a student obtained a graph as shown.

(i) What does the graph depict about the dependence of current on the potential difference?

(ii) Find the current that flows through the resistor when the potential difference across it is 2.5 V.



Question 26

In the experiment "To prepare a temporary mount of a leaf peel to show stomata", glycerine and safranin are used. When and why are these two liquids used? Explain.

SOLUTION:

Glycerine is used while preparing temporary mount of leaf peel -

- It is a good dehydrating agent which means it avoids the drying of the specimen.
- It tends to reflect light due to its refractive nature, as a result of which image appears clearer under the microscope.
- Safranin is used to prepare temporary mount of onion peel as it binds to the component of the cells and impart them a colour which makes it easier to visualise them under the microscope.

Question 27

Draw labelled diagram to show the following parts in an embryo of a pea seed:

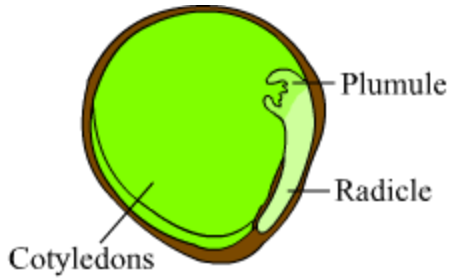
Cotyledon, Plumule, Radical

OR

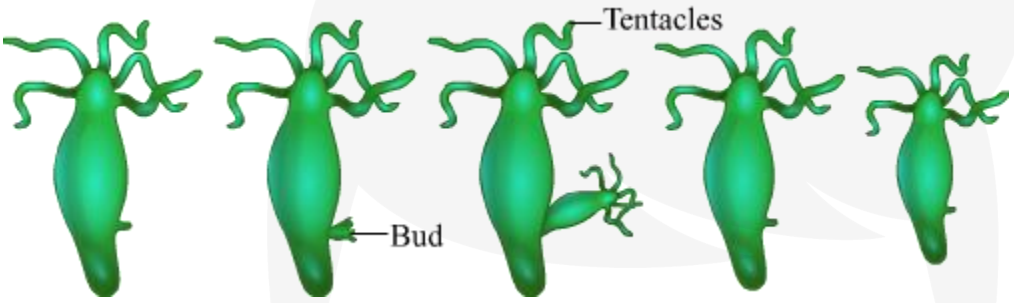
A student observed a permanent slide showing asexual reproduction in Hydra. Draw labelled diagram in proper sequence of the observations that must have been made by the student. Name the process of reproduction also.

SOLUTION:

Embryo of a pea seed



OR



The process shown above is called budding.