

Class X
(CBSE 2019)
Science
Abroad (Set-2)

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.
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Question 1

Define current. Give its S.I. unit.

SOLUTION:

The rate of flow of charge through a conductor is known as current. If a net charge Q , flows across any cross-section of a conductor in time ' t ', then the current I , through the cross-section is, $I = \frac{Q}{t}$. Its SI unit is Ampere (A).

Question 2

Name the component of sunlight which facilitates drying of wheat after harvesting.

SOLUTION:

Infrared component of sunlight facilitates the drying of wheat after harvesting.

Question 3

State laws of refraction of light.

OR

List four characteristics of the image formed by a concave mirror of focal length 40 cm when the object is placed in front of it at a distance of 20 cm from its pole.

SOLUTION:

The laws of refraction are as follows:

- (i) The incident ray, the refracted ray, and the normal to the interface of two media at the point of incidence, all lie on the same plane.
- (ii) The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for the given color of light and for the given pair of media.

OR

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

Here, $u = -20$ cm

$f = -40$ cm

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

$$\frac{1}{v} = \frac{1}{(-40)} - \frac{1}{(-20)} = \frac{1}{20} - \frac{1}{40} = \frac{1}{40}$$

$$\Rightarrow v = 40 \text{ cm}$$

$$\text{Magnification, } m = -\frac{v}{u} = -\frac{40}{(-20)} = 2$$

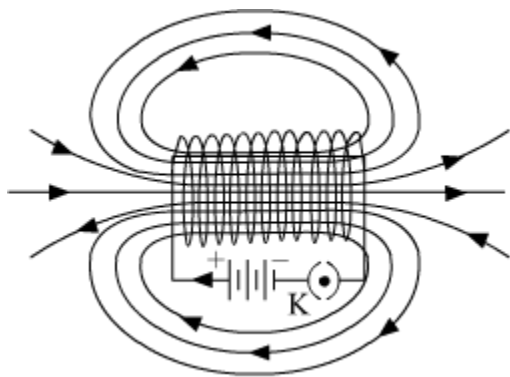
As the image distance v , is positive hence the image is formed behind the mirror at a distance of 40 cm from the pole and It's virtual. Also, the magnification is positive and greater than 1 hence image is erect and enlarged.

Question 4

Draw magnetic field lines in and around a current carrying straight solenoid.

SOLUTION:

Magnetic field lines in and around the current carrying straight solenoid are as follows:



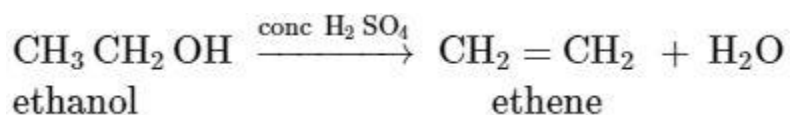
Question 5

Write the name and molecular formula of a carbon compound having its name suffixed with "-ol" and having two carbon atoms in its molecule. With the help of a chemical equation indicate what happens when this compound is heated with excess conc. H_2SO_4 .

SOLUTION:

The name and molecular formula of a carbon compound having its name suffixed with "-ol" and having two carbon atoms in its molecule is ethanol and $\text{CH}_3\text{CH}_2\text{OH}$, respectively.

When ethanol is heated with excess of conc. H_2SO_4 , it leads to dehydration of it giving ethene.



Question 6

Define the term evolution. "Evolution cannot be equated with progress." Give examples to justify this statement.

SOLUTION:

Evolution is simply the generation of diversity and the shaping of diversity by environmental selection. Species adapt to the conditions available in their environment. Some older and simple species live on quite effectively. The progressive trend in evolution seems to be that more and more complex body designs have emerged over time with better distribution of functions. In fact, one of the simplest life forms like bacteria – inhabit the most inhospitable habitats like hot springs, deep-sea thermal vents and the ice in Antarctica. This is the reason why evolution is not equated with progress.

Question 7

(a) Plants do not have any nervous system but yet, if we touch a sensitive plant, some observable changes take place in its leaves. Explain how could this plant respond to the external stimuli and how it is communicated.

(b) Name the hormone that needs to be administered to

- (i)** increase the height of a dwarf plant.
- (ii)** cause rapid cell division in fruits and seeds.

SOLUTION:

(a) Plants do not have a nervous system like animals but are known to respond to a number of external stimuli with the help of receptors and hormones. The receptors help the plants to sense the external stimulus and act accordingly. As a result of these stimuli, various growth hormones are produced which result in the movement or directed growth of the plant. A similar response is observed when the leaves of Touch-me-not plants are touched. They show seismonastic movement due to the presence of receptors for touch stimulus.

(b) (i) Gibberellins are administered to increase the height of the dwarf plant.

(ii) Auxins are administered to cause rapid cell division in fruits and seeds.

Question 8

(a) Write the function of the following in the human alimentary canal:

- (i)** Saliva
- (ii)** HCl in stomach
- (iii)** Bile juice
- (iv)** Villi

(b) Write one function each of the following enzymes:

- (i)** Pepsin
- (ii)** Lipase

SOLUTION:

(a)

- (i)** Saliva contains the enzyme salivary amylase that helps in digestion of starch in the mouth. It also facilitates swallowing by lubricating the food.
- (ii)** HCL in the stomach helps in the activation of the enzyme pepsinogen to form the active pepsin enzyme. It also neutralizes the microbes in the bolus.
- (iii)** Bile juice contains salts that help in emulsification of fats in the small intestine so that fats can be digested by the enzyme lipase.

(iv) Villi increase the surface area of the small intestine to facilitate absorption of the digested food.

(b)

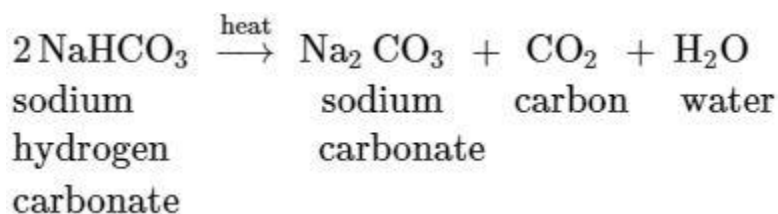
- (i) Pepsin is present in the stomach. It causes break down of proteins to form the peptones and proteoses.
- (ii) Lipase is present in the pancreatic juice. It causes break down of emulsified fats in the small intestine.

Question 9

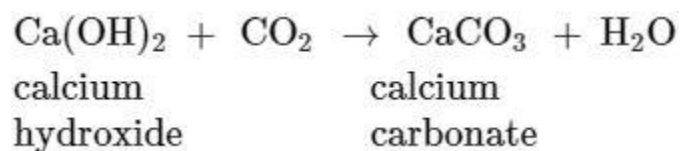
Salt 'P', commonly used in bakery products, on heating gets converted into another salt 'Q' which itself is used for the removal of hardness of water and a gas 'R' is evolved. The gas 'R' when passed through freshly prepared lime water turns milky. Identify 'P', 'Q' and 'R', giving chemical equation for the justification of your answer.

SOLUTION:

Salt 'P', commonly used in bakery products is sodium hydrogen carbonate also known as baking soda. On heating, it gets converted into another salt 'Q' i.e. sodium carbonate which is used for the removal of hardness of water and the gas 'R' evolved is carbon dioxide.

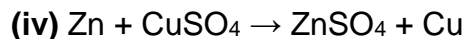
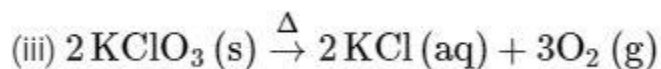
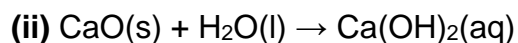
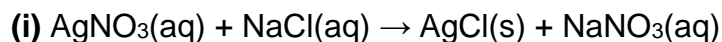


The gas 'R' i.e. CO₂ when passed through freshly prepared lime water turns milky due to the formation of calcium carbonate. The gas 'R' i.e. CO₂ when passed through freshly prepared lime water turns milky due to the formation of calcium carbonate.



Question 10

Classify the following reactions into different types:



(b) Translate the following statement into a balanced chemical equation:

"Barium chloride reacts with aluminium sulphate to give aluminium chloride and barium sulphate."

OR

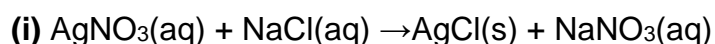
When potassium iodide solution is added to a solution of lead (II) nitrate in a test tube, a precipitate is formed.

(a) What is the colour of this precipitate? Name the compound precipitated.

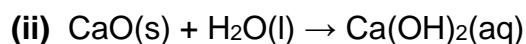
(b) Write the balanced chemical equation for this reaction.

(c) List two types of reactions in which this reaction can be placed.

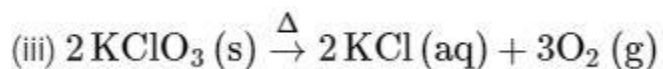
SOLUTION:



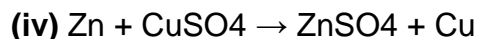
This is an example of double displacement reaction.



This is an example of combination reaction.

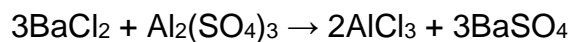


This is an example of photochemical decomposition reaction.



This is an example of displacement reaction.

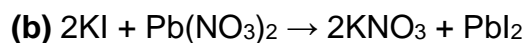
(b) Barium chloride reacts with aluminium sulphate to give aluminium chloride and barium sulphate. This is represented by the equation as:



OR

When potassium iodide solution is added to a solution of lead (II) nitrate in a test tube, a precipitate is formed.

(a) The compound precipitated is lead iodide having a yellow colour.



(c) Two types of reactions in which this reaction can be placed are double displacement reaction and precipitation reaction.

Question 11

How is the method of extraction of metals high up in the reactivity series different from that for metals in the middle? Why can the same process not be applied for them? Name the process used for the extraction of these metals.

SOLUTION:

The metals high up in the reactivity series generally occur in the form of their oxides which are quite stable and cannot be extracted by reducing the oxides with carbon. On the other hand, the metals in the middle of the reactivity series occur in the form of carbonates and sulphides which are first converted into oxides by various methods and then into metals.

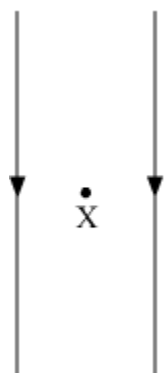
Same process can not be applied for them because of the difference in their reactivity due to which they occur in different forms as ores.

The process used for the extraction of highly reactive metals is electrolytic reduction.

The process used for the extraction of moderately reactive metals is calcination or roasting followed by reduction.

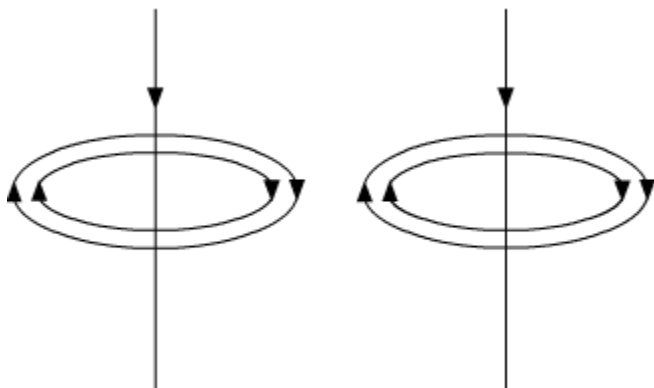
Question 12

The following diagram shows two parallel straight conductors carrying same current. Copy the diagram and draw the pattern of the magnetic field lines around them showing their directions. What is the magnitude of magnetic field at a point 'X' which is equidistant from the conductors? Give justification for your answer.



SOLUTION:

Applying Right-hand thumb rule, we can draw the magnetic field lines around the given wires. As both the wires have a current flowing downward hence the direction of the magnetic field will be clockwise for both of them as shown in figure:



At point X, the magnetic field due to both conductors have opposite direction and as the point is equidistant from the conductors so due to symmetry the magnetic field the net magnitude of the magnetic field at point X is zero.

Question 13

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

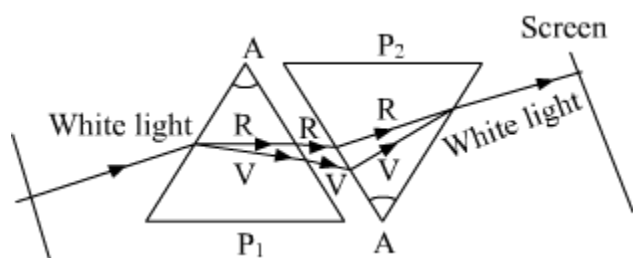
OR

What is the scattering of light? Use this phenomenon to explain why (i) the Sun appears reddish at sun-rise, and (ii) the clear sky appears blue.

SOLUTION:

Dispersion of white light occurs because of the varying speeds of different coloured lights through different media. White light consists of seven colours. The speeds of these coloured lights are the same through air. However, their speeds vary in other media. Therefore, when white light enters from air to a glass prism then its component colors get refracted by different angles. As a result, dispersion occurs.

A ray diagram to show the path of light when two identical glass prisms are arranged together in an inverted position with respect to each other and a narrow beam of white light is allowed to fall obliquely on one of the faces of the prisms is given below:



When white light of the Sun passes through the first prism, it gets dispersed into its seven component colors. When all the seven colors of the spectrum pass through the second prism then a beam of white light emerges from the other side of the second prism.

OR

Scattering of light is a phenomenon in which light moving in a straight line is forced to deviate in different directions by one or more particles present in the medium.

(i) Light from the sun near the horizon passes through thicker layers of air and larger distance in the Earth's atmosphere before reaching out to our eyes. Hence during sunrise, most of the blue light and shorter wavelengths are scattered away by the particles present in the earth's atmosphere. The light that reaches our eyes is of longer wavelengths only. The red light, which has a longer wavelength, is least scattered and is able to reach our eyes. Therefore, the Sun appears reddish during sunrise.

(ii) The sky appears blue because of the scattering of white light that takes place in the atmosphere. As we know there are many air particles and other fine particles suspended in the atmosphere that have the size smaller than the wavelength of visible light. So, the more effective scattering of light is observed for shorter wavelengths (blue light) than longer wavelengths (red light). The red light has a wavelength of about 1.8 times greater than blue light. Thus, when sunlight passes through the atmosphere, the fine particles in the air scatter the blue light (shorter wavelengths) more strongly than red light, that's why the clear sky appears blue.

Question 14

(a) Natural water bodies are not regularly cleaned whereas an aquarium needs regular cleaning. Why?

(b) What are decomposers? What will be the consequence if the decomposers are completely eradicated from an ecosystem? Give justification in support of your answer.

OR

How is ozone formed in the upper atmosphere? State its importance. What is responsible for its depletion? Write one harmful effect of ozone depletion.

SOLUTION:

(a) Lakes and ponds are natural ecosystems and contain bacteria and diverse organisms to decompose organic substances. The waste in these ecosystems is food for some organisms living in it and so it is consumed in the water body itself. This keeps the water of ponds and lakes clean and so they do not need regular manual cleaning. On the other hand, aquariums are artificial ecosystems and do not contain

many aquatic organisms. They are also comparatively small in their area. Hence, they require regular cleaning.

(b) Decomposers include micro-organisms such as bacteria and fungi that obtain nutrients by breaking down the remains of dead plants and animals. They help in the breakdown of organic matter or biomass from the body of dead plants and animals into simple inorganic raw materials, such as carbon dioxide, water, and some nutrients. If decomposers are completely removed from the surface of earth then the remains of dead plant and animals will accumulate. The minerals and organic or inorganic material present in them will not be made again available for use. Thus it will result in the accumulation of wastes and also unavailability of raw materials. This will affect all the biogeochemical cycles and overall life on earth.

OR

Ozone is a gas found in the atmosphere consisting of three oxygen atoms (O_3). Ozone is formed in the atmosphere when energetic ultraviolet (UV) radiation dissociates molecules of oxygen (O_2) into separate oxygen atoms. Free oxygen atoms can recombine to form oxygen molecules but if a free oxygen atom collides with an oxygen molecule, it joins up, forming ozone.

It absorbs the UV radiation emitted from the Sun and prevents them from reaching the surface of the earth. It is depleted when chlorinated compounds reach the stratosphere and are split when exposed to the UV rays. The reactive chlorine then reacts with ozone and cause its break down into oxygen molecules.

This depletion results in exposure of the earth's surface to the UV rays causing skin cancer incidents and harms to the plants.

Question 15

What is exploitation of resources with short term aims? List its four advantages.

SOLUTION:

Exploitation of resources with short-term aims means consumption of resources in such a way that they can help in achieving the short term goals without the concern for future generations.

The advantages of exploiting resources with short term aims will be:

- (a)** Industrial growth will be fast.
- (b)** The percentage of gains will be much higher in comparison to long term aims.
- (c)** The capital rotation will be faster.
- (d)** It will lead to rapid agricultural development.

Question 16

(a) If we cross pure-bred tall (dominant) pea plants with pure-bred dwarf (recessive) pea plants we get pea plants of F_1 generation. If we now self-cross the pea plants of F_1 generation, then we obtain pea plants of F_2 generation.

- (i) What do the plants of F_1 generation look like?
- (ii) What is the ratio of tall plants to dwarf plants in F_2 generation?
- (iii) State the type of plants not found in F_1 generation but appeared in F_2 generation, mentioning the reason for the same.

(b) What are homologous structures? Give an example. Is it necessary that homologous structures always have common ancestors?

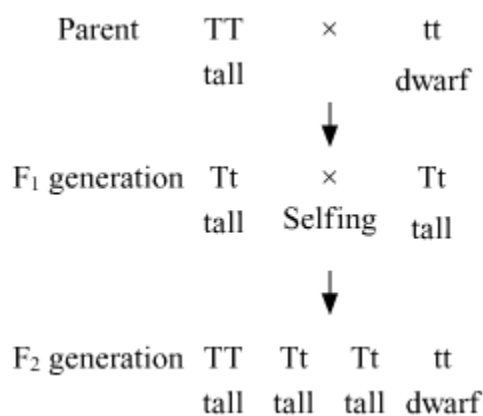
SOLUTION:

(a) When a pure breeding tall pea plant is crossed with a pure-breeding dwarf pea plant:

(i) All the plants in the F_1 generation appear tall.

(ii) The ratio of tall pea plant to dwarf pea plants is 3 (tall) : 1 (dwarf).

(iii) The dwarf plant does not appear in the F_1 generation but appears in the F_2 generation because the progeny produced in the F_1 generation were heterozygous (Tt). Hence, when they were selfed for obtaining the F_2 generation, dwarf plants were also formed in the progeny due to segregation of the allele t . The cross involved is as follows



(b) 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 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.

Yes, homologous structures always have common ancestry. These organs follow the same basic plan of organization during their development but in adult conditions, these are modified to perform different functions as an adaptation to different environments.

Question 17

- (a) Define vegetative propagation. List its two methods.
- (b) Why is this mode practised for growing some types of plants?
- (c) Explain the process of budding in Hydra with the help of labelled diagrams.

OR

What is contraception? List its four different methods. State four reasons for adopting contraceptive methods.

SOLUTION:

(a) Vegetative propagation is a type of asexual reproduction where a new plant is produced from the roots, stem, leaves, and buds of flowers.

Vegetative propagation takes place by following methods:

Through stems – Some plants such as rose propagate through the stem cutting. Stem contains nodes on them. A node is the region of a plant from which leaves arise. The piece of stem bearing node is called cutting. When such cuttings are placed in pot and watered as per requirement, they start giving out roots and leaves. Thus, a new plant can be obtained through stem cutting.

Through buds – A vegetative bud consists of a short stem around which immature overlapping leaves are present in a folded state. A bud can give rise to a new plant.

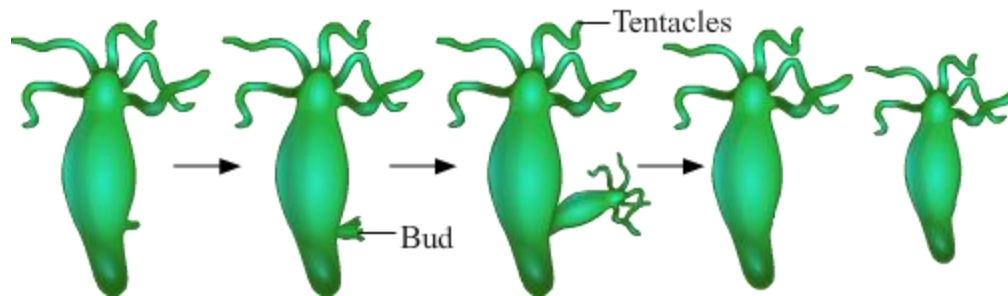
(b) Some plants are vegetatively propagated because of the following reasons:

- They do not produce viable seeds.
- Their seeds take longer time to germinate and mature.
- Certain characteristics present in the parent plant require to be retained in the progeny.

Potato, sugarcane and rose are some plants that are vegetatively propagated.

(c) Budding involves the formation of a new individual from a protrusion called bud. It is very common in plants, yeasts and lower-level animals such as Hydra.

In Hydra, the cells divide rapidly at a specific site and develop as an outgrowth called bud. These buds, while attached to the parent body, develop into small individuals. When this individual becomes large enough, it detaches itself from the parent body to exist as an independent individual.



OR

Contraception includes methods or ways to prevent fertilisation and pregnancy in a fertile female as a result of successful copulation between a fertile male and female.

Following are the four methods of contraception used by humans:

(i) Natural method: It involves avoiding the chances of meeting of the sperm and the ovum. In this method, the sexual act is avoided from day 10th to day 17th of the menstrual cycle because during this period, ovulation is expected; therefore, the chances of fertilisation are very high.

(ii) Barrier method: In this method, fertilisation of the ovum and sperm is prevented with the help of barriers. Barriers are available for both males and females. Condoms, which are made of thin rubber, are used to cover the penis in males and the vagina in females.

(iii) Oral contraceptives: In this method, tablets or drugs are taken orally. These contain small doses of hormones that prevent the release of eggs, thus preventing fertilisation.

(iv) Implants and surgical methods: Contraceptive devices such as the loop or copper-T are placed in the uterus to prevent pregnancy. Some surgical methods can also be used to block the gamete transfer. In vasectomy (males), the vas deferens is blocked to prevent the transfer of sperms. Similarly, in tubectomy, the fallopian tubes of the female can be blocked so that the egg does not reach the uterus.

The reasons for adopting contraceptive methods include are:

(i) They help in preventing unwanted pregnancies.

(ii) They prevent the chances of frequent pregnancies, which otherwise affect the health of females.

(iii) They help in family planning by controlling the number of children in a family, thus reducing the chances of poverty.

(iv) They also reduce the chances of transmission of sexually transmitted diseases such as AIDS.

Question 18

(a) List two limitations of Newlands' Law of Octaves.

(b) Write the electronic configuration of two elements A and B whose atomic numbers are 20 and 17 respectively. Write the molecular formula of the compound formed when element A reacts with element B. State whether this compound is acidic, basic or neutral. Give reason to justify your answer.

SOLUTION:

(a) Two limitations of Newlands' Law of Octaves are:

i. The law was applicable to the classification of elements up to calcium only.

ii. In order to fit elements into the periodic table, Newlands put even two elements together in one slot having different properties.

(b) The electronic configuration of the element A whose atomic number is 20 is 2,8,8,2 and the electronic configuration of the element B whose atomic number is 17 is 2,8,7. The molecular formula of the compound formed when element A reacts with element B is AB_2 . The given compound is $CaCl_2$ formed by the reaction of $Ca(OH)_2$ (strong base) and HCl (strong acid). Since, the reaction between a strong acid and a strong base yields a neutral salt so, $CaCl_2$ is neutral.

Question 19

(a) Distinguish between esterification and saponification reactions with the help of chemical equations for each.

(b) With a labelled diagram describe in brief an activity to show the formation of ester.

OR

What is the difference between soaps and detergents? State in brief the cleansing action of soaps in removing an oily spot from a fabric. Why are soaps not very effective when a fabric is washed in hard water? How is this problem resolved?

SOLUTION:

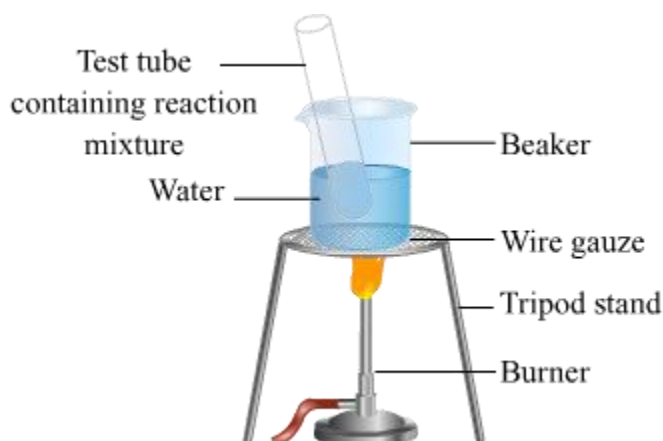
Esterification	Saponification
1. It is a reaction in which carboxylic acids react with alcohols in the presence of conc. H_2SO_4	It is a reaction in which an ester reacts with an alkali.
2. Formation of a fruity smell compound takes place called ester.	Formation of soap takes place.
3. It needs a catalyst for a reaction to occur.	No catalyst is required for the reaction to take place.

<p>4. The chemical equation involved is:</p> $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \xrightarrow{\text{conc. H}_2\text{SO}_4} \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$	$\text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{C}_2\text{H}_5\text{OH}$
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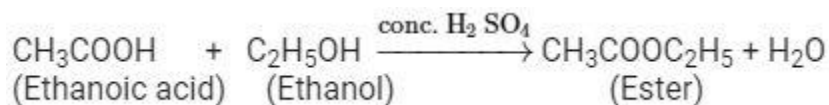
(b)

The activity given below shows the formation of ester :

1. Take 1 mL ethanol (absolute alcohol) and 1 mL glacial acetic acid along with a few drops of concentrated sulphuric acid in a test tube.
2. Warm in a water-bath for at least five minutes as shown in the figure below.
3. Pour into a beaker containing 20-50 mL of water.
4. After some time, there will be the formation of a fruity smell compound. The compound formed is an ester.



The formation of ester can be represented by the chemical reaction as:



OR

The differences between soaps and detergents are:

Soaps	Detergents
1. Soaps are the sodium salts of long chain carboxylic acids.	Detergents are sodium salts of long-chain benzene sulphonic acids.
2. The ionic group in soaps is $-\text{COO}^-\text{Na}^+$.	The ionic group in soaps is SO_3^-Na^+ or SO_4^-Na^+

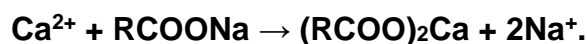
3. Soaps are not useful when water is hard	Detergents can be used for washing purposes even when water is hard
4. Soaps have relatively weak cleansing action.	Detergents have a strong cleansing action

When soap is dissolved in water, its hydrophobic ends attach themselves to dirt and remove it from the cloth.

First, the molecules of soap arrange themselves in micelle formation and trap the dirt at the centre of the cluster. These micelles remain suspended in water like particles in a colloidal solution. The various micelles present in water do not come together to form a precipitate as each micelle repels the other because of the ion-ion repulsion.

Thus, the dust particles remain trapped in micelles (which remain suspended) and are easily rinsed away with water. Hence, soap micelles remove dirt by dissolving it in water.

When soap is added to hard water, the Ca^{2+} and Mg^{2+} ions present in hard water react with soap. The sodium salts present in soaps are converted to their corresponding calcium and magnesium salts which are precipitated as scum. The insoluble scum sticks on the clothes and so the cleaning capacity of soap is reduced.



(Scum)

This problem can be solved by:

- using soft water instead of hard water.
- using detergents instead of soaps.
- treating the hardness of water and then using it for washing purposes.

Question 20

(a) Define electric power. An electrical device of resistance R is connected across a source of voltage V and draws a current I . Derive an expression for power in terms of current and resistance.

(b) Two electric bulbs rated 100 W; 220 V and 60 W; 220 V are connected in parallel to electric mains of 220 V. Find the current drawn by the bulbs from the mains.

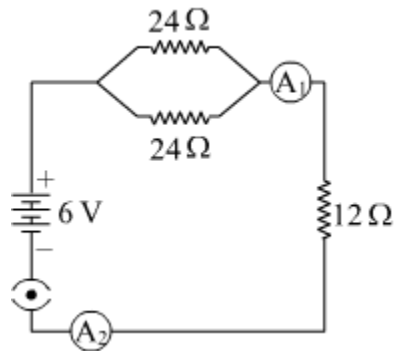
OR

(a) How will you infer with the help of an experiment that the same current flows through every part of the circuit containing three resistors R_1 , R_2 and R_3 in series connected to a battery of V volts?

(b) Study the following circuit and find out:

(i) Current in $12\ \Omega$ resistor.

(ii) The difference in the readings of A_1 and A_2 , if any.



SOLUTION:

(a) Electric power is defined as the rate of consumption of energy or simply the rate of doing work.

$$\text{i.e., Power, } P = \frac{\text{Work done (W)}}{\text{Time}(t)} \dots\dots\dots (i)$$

The work done by current (I) when it flows in a potential (V) for time (t) can be given by

$$W = VIt \dots\dots\dots (ii)$$

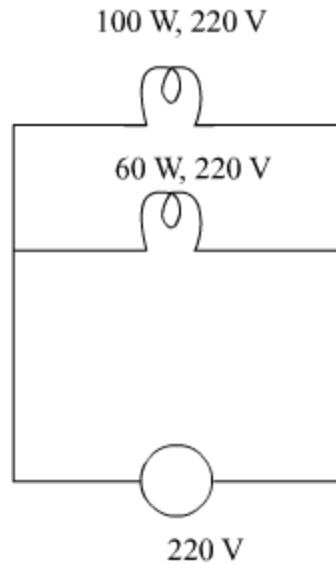
$$\Rightarrow \text{Power, } P = \frac{VIt}{t} = VI$$

$$\therefore \text{Electric power, } P = VI$$

$$\text{From Ohm's law, } V = IR$$

$$\text{Thus, electric power is given by, } P = (IR)I = I^2 R$$

(b)



Firstly calculating the resistance of the electric bulbs,

$$P = \frac{V^2}{R}$$

$$\Rightarrow R = \frac{V^2}{P}$$

$$\Rightarrow R_1 = \frac{220^2}{100} = 484 \, \Omega$$

$$\Rightarrow R_2 = \frac{220^2}{60} = \frac{2420}{3} \, \Omega$$

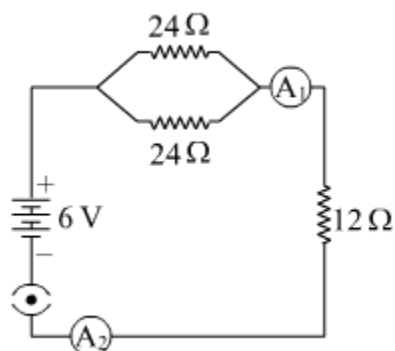
$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2} = \frac{484 \times (2420/3)}{484 + (2420/3)} = 302.5 \, \Omega$$

Total current drawn by the bulbs from the mains supply, $I = \frac{220}{302.5} = 0.73 \, \text{A}$

OR

(a) Consider the given circuit in which a series combination of three resistors of resistances R_1 , R_2 and R_3 are shown to be connected to a battery of V volts. An ammeter is also shown to be connected in the circuit. It can be inferred that the current remains same in the circuit by placing the ammeter at different points in the same circuit i.e. At any point just after R_1 , R_2 and R_3 . It is observed that the value of the current observed in the ammeter comes to be same.

(b)



Firstly calculating the equivalent resistance in the circuit.

$$R_{eq} = \frac{24 \times 24}{24 + 24} + 12 = 24 \Omega$$

The current through the 12Ω resistor is given by:

$$I = \frac{6}{24} = \frac{1}{4} \text{ A}$$

The difference in the readings of A_1 and A_2 is zero, as they are in series connected with the same wire.

Question 21

A person is unable to see objects distinctly placed within 50 cm from his eyes.

(a) Name the defect of vision the person is suffering from and list its two possible causes.

(b) Draw a ray diagram to show the defect in the above case.

(c) Mention the type of lens used by him for the correction of the defect and calculate its power. Assume that the near point for the normal eye is 25 cm.

(d) Draw a labeled diagram for the correction of the defect in the above case.

SOLUTION:

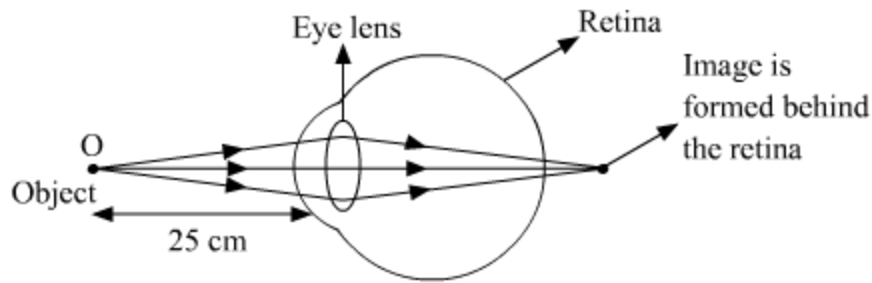
(a) The defect of the vision is hypermetropia

Hypermetropia is caused due to:

(i) reduction in the curvature of the lens

(ii) decrease in the size of the eyeball

(b) Ray diagram:



(c) The corrective lens used for this defect is convex lens.

Given that the near point of the eye is at 50 cm. The convex lens should form the image of the object placed at the distance 25 cm on the near point of the defective eye.

$$v = -50 \text{ cm}$$

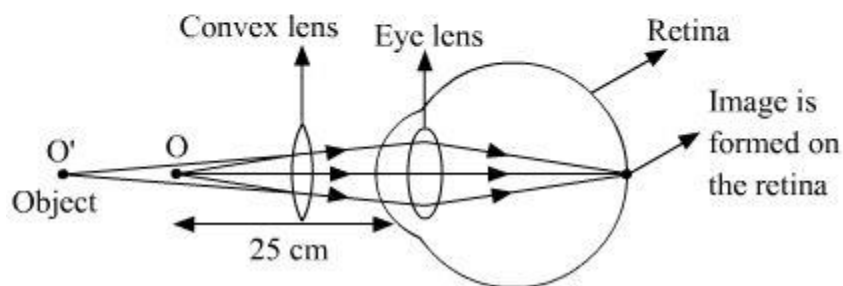
$$u = -25 \text{ cm}$$

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

$$\Rightarrow \frac{1}{f} = \frac{1}{(-50)} - \frac{1}{(-25)} = \frac{1}{50}$$

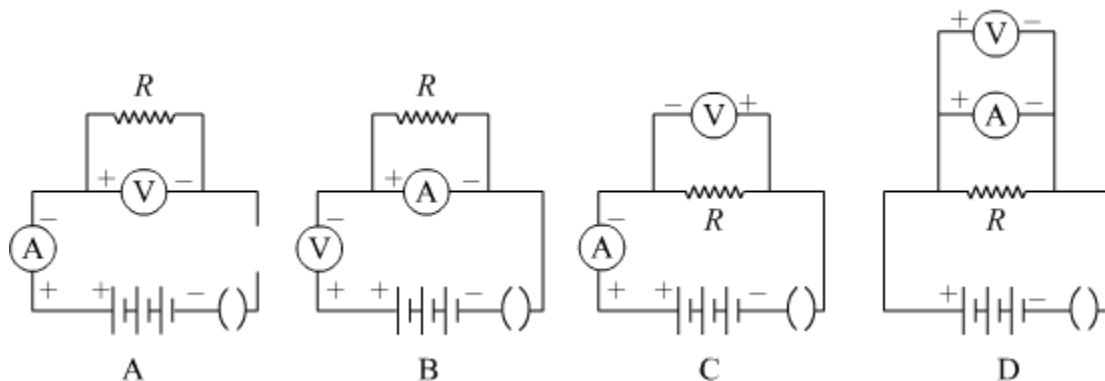
$$\text{Power, } P = \frac{100}{50} = +2 \text{ D}$$

(d) Ray diagram showing the correction of the defect:



Question 22

Which one of the following is the correct set-up for studying the dependence of the current on the potential difference across a resistor and why?

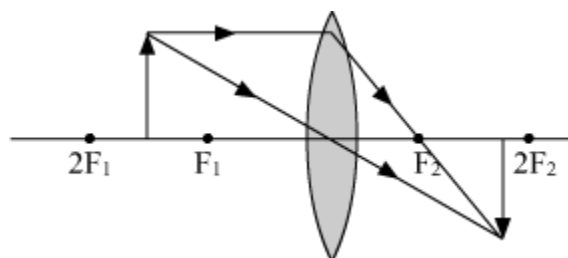


SOLUTION:

In this experiment of determining the dependence of the current on the potential difference across a resistor the voltmeter should be connected in parallel to the resistor and the ammeter should be connected in series with the resistor. So, in the given set-ups, A is the correct one because the voltmeter is in parallel to the resistor and the ammeter is in series with the resistor, and secondly the polarities of ammeter and voltmeter are also correct.

Question 23

Study the following ray diagram and list two mistakes committed by the student while tracing it. Rectify these mistakes by drawing the correct ray diagram to show the real position and size of the image corresponding to the position of the object AB.



OR

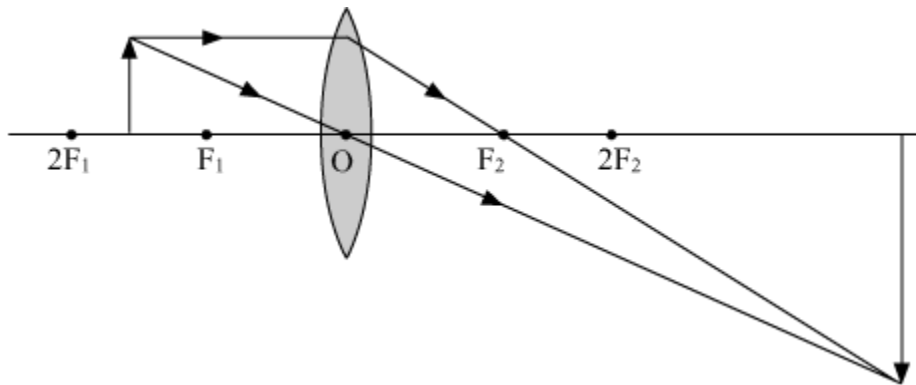
A student has to trace the path of a ray of light through a glass prism. List four precautions he should observe for better results.

SOLUTION:

There are two mistakes in the following ray diagram:

1. The image will be formed beyond $2F_2$ when the object is placed between F_1 and $2F_1$.
2. The image will be larger as compared to the size of the object, it cannot be of the same size as the object.

Correct ray diagram:



OR

Precautions to be observed to trace the path of a ray of light through a glass prism:

1. Make sure the prism taken is polished and not broken.
2. Make sure to look at the image through the proper eye level through the prism.
3. Sharp lines need to be drawn so that proper result can be observed.
4. The angle of incidence ideally should be 45° for a better outcome.

Question 24

List two observations on the basis of which it may be concluded that the given slide shows binary fission in Amoeba.

SOLUTION:

The two observations on the basis of which we can conclude that the given slides show binary fission in Amoeba are -

- (i) we can see the division of nucleus followed by the division of cytoplasm
- (ii) we can see that at the point of fission, constriction appears and deepens which divides the cell into two daughter cells

Question 25

Write four sequential steps of the procedure of the experiment "Preparing a temporary mount of a leaf peel to show stomata."

OR

In the experimental set-up to show that "the germinating seeds give out carbon dioxide", answer the following questions:

- (i) Why do we keep the conical flask airtight?

- (ii) Name the substance kept in the small test tube inside the conical flask. Write its role.
- (iii) Why does water rise in the delivery tube?

SOLUTION:

The steps involved in the preparation of temporary leaf mount to view stomata are:

1. Remove a part of the peel from the lower surface of the leaf and place the peel in a watch glass containing water.
2. Put few drops of safranin stain in the watch glass and after 2-3 minutes, approximately take out the peel and place it on a clean glass slide.
3. Put a drop of glycerin over the peel and place a clean coverslip gently over it with the help of a needle to avoid any kind of air bubbles.
4. Remove the excess stain and glycerin with the help of blotting paper. and observe the slide under the microscope.

OR

- (i) We keep the conical flask air tight so that the carbon dioxide produced by the germinating seeds does not escape out. If this carbon dioxide escapes out of the conical flask, there will be no rise in the level of water in the glass tube.
- (ii) The substance kept in the small tube is KOH (potassium hydroxide). Its role is to absorb the CO₂ produced by the germinating cells which creates partial vacuum in the flask.
- (iii) The rise in water level in the tube indicates the production of CO₂ by the germinating seeds. The KOH absorbs the CO₂ produced by the germinating seeds and thus creates a partial vacuum in the flask. The air present in the glass bent tube moves into the conical flask, as a result of which the water is pulled further up in the bent tube.

Question 26

A student mixes sodium sulphate powder in barium chloride powder. What change would the student observe on mixing the two powders? Justify your answer and explain how he can obtain the desired change.

OR

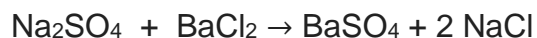
- (a)** Arrange the following metals in the increasing order of their reactivities:

Copper, Zinc, Aluminium and Iron

(b) List two observations you would record in your notebook 30 minutes after adding iron fillings to copper sulphate solution.

SOLUTION:

When sodium sulphate and barium chloride are mixed together in their solid forms, no formation of products takes place. But when sodium sulphate and barium chloride are mixed together in their aqueous form, the formation of barium sulphate takes place. The formed product is white in color. The chemical change is represented by:



Among the following given metals, aluminum is most reactive and copper is least reactive in nature. The reactivity order of the given metals is $\text{Al} > \text{Zn} > \text{Fe} > \text{Cu}$.

After adding iron fillings to the copper sulphate solution, the two observations observed are:

1. The blue color of the copper sulphate changes to pale green as iron displaces copper from copper sulphate solution and forms ferrous sulphate solution.
2. When left undisturbed, the green color changes to reddish-brown due to the deposition of copper.

Question 27

A solution 'X' gives orange colour when a drop of it falls on pH paper, while another solution 'Y' gives bluish colour when a drop of it falls on pH paper. What is the nature of both the solutions? Determine the pH of solutions 'X' and 'Y'.

SOLUTION:

The solution X giving orange colour when a drop of it falls on pH paper is acidic in nature having pH value 4.

The solution Y giving bluish colour when a drop of it falls on pH paper is basic in nature having pH value 9.