SCIENCE AND TECHNOLOGY (212)

TUTOR MAKED ASSIGNMENT

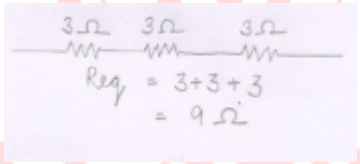
1. Answer any one of the following questions in about 40 to 60 words.

A) You can join resistances in different ways to obtain resistances of different values. You are given three resistances of 3 ohm each. Draw diagrams to show their different combinations. Also, calculate the equivalent resistance of each combination.

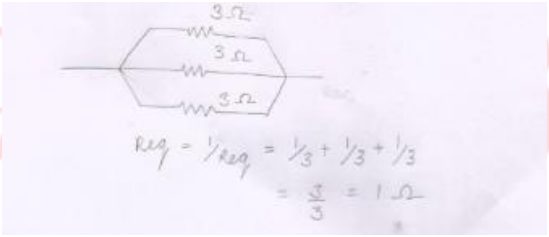
Answer:-

We can connect the resistances in three different combinations:

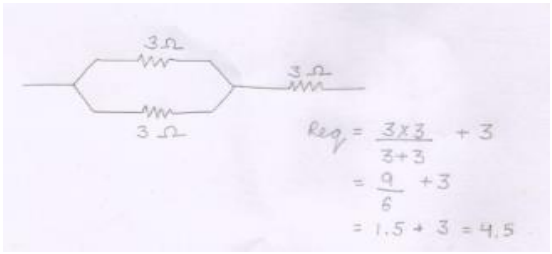
i. **Series Combination:** In this, resistors are connected one after another. The entire current path is through a single resistor, and their sum is the total resistance.



ii. **Parallel Combination:** In this, all resistors are connected to a single point. The entire voltage path is through all resistors, and their reciprocal sum is the total resistance.



iii. **Mixed Combination:** In this, some resistors are connected in series, and some in parallel. The total resistance is a combination of series and parallel resistances.



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2. Answer any one of the following questions in about 40 to 60 words.

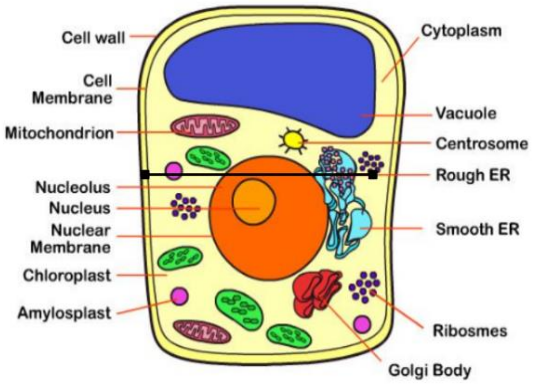
B) Hydrogen and oxygen combine in the ratio of 1: 8 by mass to form water. What mass of oxygen gas would be required to react completely with 3 g of hydrogen gas ?

Answer:- The ratio 1:8 by mass for the combination of hydrogen and oxygen indicates that for every gram of hydrogen, 8 grams of oxygen are needed to form water. Given that you have 3 grams of hydrogen, you'll require $3\ g \times 8 = 24\ g$ of oxygen to react completely and form water.

3. Answer anyone of the following questions in about 40-60 words.

A) Draw a labelled Diagram of a plant cell. Mention any three differences between a plant cell and an animal cell.

Answer:-



PLANT CELL

Three differences between a plant cell and an animal cell:

FEATURE	PLANT CELL	ANIMAL CELL
Size and Shape	Larger in size and rectangular in shape.	Smaller in size and oval in shape
Cell wall	Cell wall is made up of cellulose	Cell wall absent.
Vacuoles	Vacuoles are large. In a mature plant cell, usually a single large central vacuole is present.	Vacuoles are mostly absent or if present are small in size and scattered.

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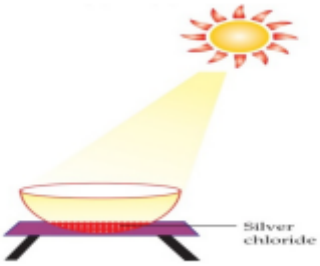
4. Answer any one of the following questions in about 100 to 150 words.

B) The following diagram displays a chemical reaction. Observe carefully and answer the following questions :

i. Identify the type of chemical reaction that will take place and define it. How will the colour of the salt change?

ii. Write the chemical equation of the reaction that takes place



Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it, as shown in the figure.

Answer:-

i. Photochemical decomposition reaction will take place. Photochemical decomposition reaction is the reaction in which compound decomposes in the presence of light to form simple substances. the color of salt (i.e., silver chloride) will change from white to gray.

ii.

$$\underset{\text{White}}{2AgCl_{(s)}} \xrightarrow{\text{Sunlight}} \underset{\text{Grey}}{2Ag_{(s)}} + Cl_2(g)$$

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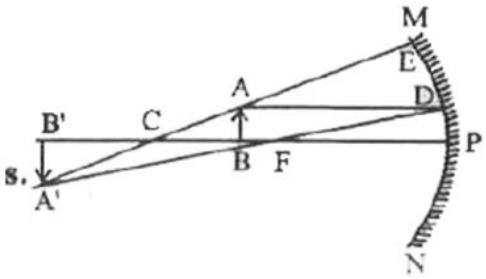
5. Answer any one of the following questions in about 100 to 150 words.

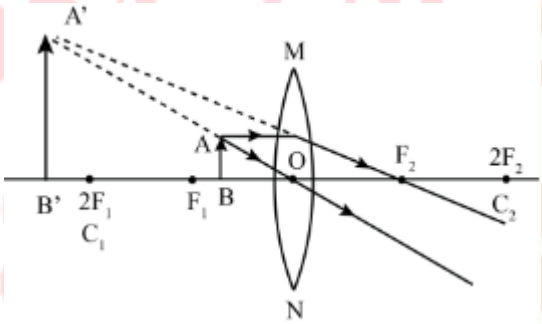
A) Draw ray diagrams showing image foundation by (i) a concave lens (ii) convex lens, in case the object is placed between focus and optical centre. Describe the characteristics of the image formed in each case.

Answer:-

i) **Concave lens**



ii) **Convex lens**



The characteristics of the image formed in each case:

i)

a) In concave lens reflection, the object and its image are on the same side of the lens.
b) The object and image are at different distances from the central axis but on the same line.

ii)

a) In convex lens reflection, the object and its image are on opposite sides of the lens.
b) The object and image are equidistant from the central axis.

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6. Prepare any one Project given below:

A) Answer the following:

A man went door-to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty repeat. Can you play the detective to find out the nature of the solution he has used?

1. **Gold is a very precious metal. Pure gold is very soft it is therefore not suitable for making jewellery. It is alloyed with either Silver or Copper to make it hard. But sometimes jewellers mix a large quantity of copper and silver in gold to earn more profit.**

   a) **What precautions should you take while purchasing gold jewellery?**
   b) **Why does Government insist on purchasing Hall Marked jewellery?**

2. **Corrosion is a serious problem. Every year an enormous amount of money is spend to replace damaged iron. What steps can be taken to prevent this damage.**

3. **Mercury is the only metal found in the liquid state. It is largely used in thermometers to measure the temperature. But mercury is a very dangerous metal as its density is very high. What two precautions you would take while handling the equipments containing Mercury ?**

Answer:-

1. **The Goldsmith Scenario**:

The man likely used an **aqua regia** solution, a mixture of concentrated hydrochloric acid (HCl) and nitric acid (HNO3), which is known for its ability to dissolve gold and other metals. When the gold bangles were dipped in this solution, the gold alloy on the surface dissolved slightly, making the bangles appear shinier. However, this also reduced their weight because some of the gold was removed.

a) Precautions When Purchasing Gold Jewelry:

- **Check for Hallmark Certification**: Ensure that the jewelry is hallmarked, which guarantees the purity of gold.
- **Buy from Reputable Jewelers**: Purchase from well-known and trusted jewelers to avoid being cheated.
- **Weigh the Jewelry Before and After Purchase**: Confirm the weight of the jewelry and ensure it matches the quoted price and purity.
- **Inquire About the Purity**: Ask about the karatage (e.g., 18K, 22K, 24K) to understand the gold content.

b) Importance of Hallmarked Jewelry:

The government insists on purchasing hallmarked jewelry to ensure that consumers are getting the purity of gold they are paying for. The hallmark is a certification of the gold's purity and assures the buyer that the gold content is as advertised.

2. Preventing Corrosion:

Corrosion, especially of iron, can be mitigated by:

- **Applying Protective Coatings**: Painting, galvanizing (coating with zinc), or applying other protective coatings can prevent exposure to air and moisture.
- **Using Rust-Resistant Alloys**: Alloys like stainless steel are less prone to corrosion.
- **Cathodic Protection**: This technique involves attaching a more reactive metal to the iron, which acts as a sacrificial anode and corrodes instead of the iron.
- **Regular Maintenance**: Regular inspection and maintenance, such as cleaning and recoating, help in preventing corrosion.

3. Precautions When Handling Mercury:

Mercury is hazardous, so when handling equipment containing it, consider the following precautions:

- **Work in a Well-Ventilated Area**: Ensure that the area is well-ventilated to avoid inhaling mercury vapors, which are toxic.
- **Use Protective Equipment**: Wear gloves and safety goggles to prevent direct contact with mercury, and use tools to handle any spills to avoid direct skin contact.