



HEADS-UP

REACH FOR THE STARS

Sample answers for Planning Question of P6 Summer & Winter 2012

0620/61/M/J/12

Stop Rust!

Solutions of chemicals known as corrosion inhibitors are added to the water in steel radiators to reduce rust.

You are provided with three different bottles of liquid corrosion inhibitors, **R**, **S** and **T**, and some steel nails.

Plan an experiment to test if these inhibitors prevent the corrosion and steel and which of these inhibitors is most effective.

Firstly, place 2 steel nails into a test tube. By using a measuring cylinder, pour 10 cm^3 of water into the test tube and add 2 cm^3 of liquid corrosion inhibitor **R** into it. Repeat the experiment using corrosion inhibitor **S** and **T** instead of **R**. Leave the solutions for at least 24 hours then observe the results. The test tube with the least rusted nails has the most effective corrosion inhibitor.

Place 2 steel nails into a test tube with $x\text{ cm}^3$ of water. By using a measuring cylinder, pour $y\text{ cm}^3$ of liquid corrosion inhibitor **R** into it. Repeat the experiment using corrosion inhibitor **S** and **T** instead of **R**. Leave the solutions for at least 24 hours then observe the results. The test tube with the least rusted nails has the most effective corrosion inhibitor.

0620/62/M/J/12**Fizzy drinks**

The bubbles in fizzy drinks are bubbles of carbon dioxide. The carbon dioxide is dissolved in the drink under pressure.

When a bottle of fizzy drink is opened the gas escapes and eventually the drink goes flat. The gas is lost more quickly if the fizzy drink is heated.

Plan an experiment to find the volume of gas in a bottle of fizzy drink. You may use common laboratory apparatus.

Pour a full bottle of fizzy drink into a conical flask. Immediately cover the conical flask with a cork which has a delivery tube attached to it, and connect the delivery tube to a gas syringe. Then heat the solution with a Bunsen Burner until there is no more gas given off; this will be indicated by the constant reading of the gas syringe. Record the volume of the gas in the gas syringe.

0602/63/M/J/12**Fertilisers**

Growwell and Plantstrong are two different granular fertilisers.

Fertilisers improve the growth of plants.

A farmer decides to buy one of these fertilisers to improve the soil on his land.

Plan an investigation to find out which of these fertilisers would be best for the farmer to buy, and use, to grow beans on his land.

Place a green bean in a pot filled with 50 grams of soil and x grams of Growwell fertiliser. Repeat the experiment with Plantstrong fertiliser. Put the plants in the same location to ensure that they receive the same amount of sunlight and water them twice a day. Leave the plants for 5 days. After 5 days, compare the growth of the plants. The plant with the longer stem represents the better fertiliser.

0620/61/O/N/12**Which is the more pure - limestone or marble?**

Calcium carbonate is found in limestone and in marble. All carbonates react with hydrochloric acid to form chlorides. Calcium carbonate is insoluble in water but calcium chloride is water soluble.

Most impurities in limestone and marble are insoluble.

Plan an experiment to find out which of limestone and marble contain most insoluble impurities. You are provided with common laboratory apparatus.

Crush x grams of limestone to increase surface area. Then, put the limestone into a beaker and add excess hydrochloric acid to ensure all the carbonates are reacted with HCl. Stir the solution. Filter the mixture using a pre-weighed filter paper. Dry the residue with filter paper in an oven. Reweigh the dry residue with filter paper. Repeat experiment with marble.

Mass of sample /g	x
Mass of filter paper /g	y
Mass of filter paper with residue /g	z
Mass of residue /g	$z - y = k$
Mass of calcium carbonate /g	$x - k = q$

The sample contains most insoluble impurities is the sample with the larger mass of residue or the lower mass of CaCO_3 .

0620/62/O/N/12

Coal is a fossil fuel. When heated strongly, sulfur dioxide gas is one of the products formed.

Sulfur dioxide changes the colour of acidified potassium manganate(VII) from purple to colourless.

Plan an investigation to show which of the two different types of coal produces the most sulfur dioxide when heated. You are provided with one lump of each type of coal.

Carry out experiment in a fume cupboard because SO_2 is toxic. Crush x grams of **Coal A** with a pestle and mortar to speed up rate of reaction by increase the surface area. Next, place it in a test tube, connect it to another test tube containing known volume of acidified KMnO_4 . Start the stopwatch as soon as the test tube containing **Coal A** is heated. Stop the stopwatch as soon as the acidified potassium manganate(VII) turns from purple to colourless. Record the time taken. Repeat experiment with **Coal B**. The reaction which takes the least time to turn acidified KMnO_4 colourless contains more SO_2 .

0620/63/O/N/12**Fats and oils**

Unsaturated fats and oils contain at least one carbon to carbon double bond. These double bonds react with bromine water which changes colour from orange to colourless.

Plan an experiment that could be carried out to compare samples of sunflower oil, olive oil and butter to find out which of these contains the largest number of carbon to carbon double bonds.

You are provided with common laboratory apparatus and an organic solvent to dissolve the fats and oils.

Add x cm^3 of organic solvent into 10 cm^3 of sunflower oil. Mix and stir the mixture evenly. Then, add bromine water with a dropper until the first orange colour is seen. Record the number of drops needed. Repeat the experiment with olive oil and butter. The sample containing the most number of bromine water droplets is the one with the largest number of carbon to carbon double bonds.