



Write your details here

Surname

Other names

Scholarship Examination

Subject: Science

Paper: Chemistry C1

Time: 45 minutes

You must have:

Ruler
Calculator

Total Marks

/45
%

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions.
- Answer the questions in the spaces provided
 - *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is **45**
- The marks for **each** question are shown in brackets
 - *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Q1.

A student planned an experiment to find the temperature rise in a neutralisation reaction. This is their method.

- Use a measuring cylinder to add 25 cm³ of an alkali to a 100 cm³ beaker
- Record the temperature of the alkali
- Use a burette to add an acid to the alkali in 5.0 cm³ portions
- Record the temperature of the mixture after adding each portion of acid
- Stop the experiment when the neutralisation is complete

(a) The teacher asked the students about their method. Suggest an answer to each of his questions.

(i) Why would it be better to use a pipette instead of a measuring cylinder?

(1)

.....

(ii) What vessel would be better than a beaker?

(1)

.....

(iii) What extra step should there be between adding each portion of acid and measuring the temperature?

(1)

.....

(iv) How would you know when the neutralisation was complete?

(1)

.....

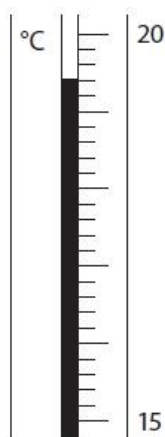
(b) The diagrams show the readings on the thermometer before and after the student added a portion of acid. Write down the thermometer readings and calculate the temperature change.

(3)

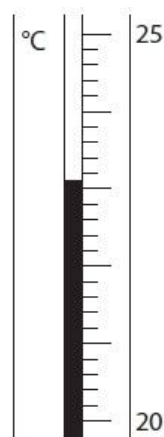
Temperature before adding acid °C

Temperature after adding acid °C

Temperature change °C



before adding acid

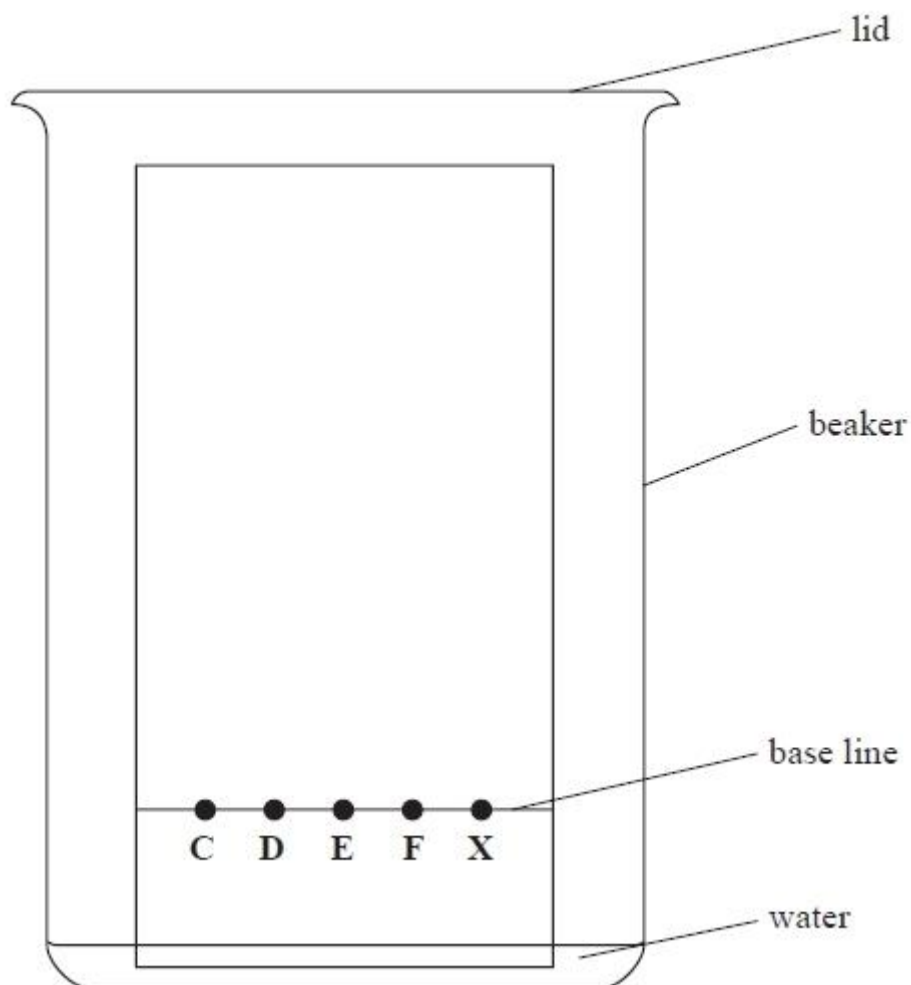


after adding acid

(Total for question = 7 marks)

Q2.

Four separate food dyes (**C**, **D**, **E** and **F**) and a mixture of food dyes (**X**) were investigated using paper chromatography. The diagram shows the apparatus used.



(a) Why should the water level be below the food dyes?

(1)

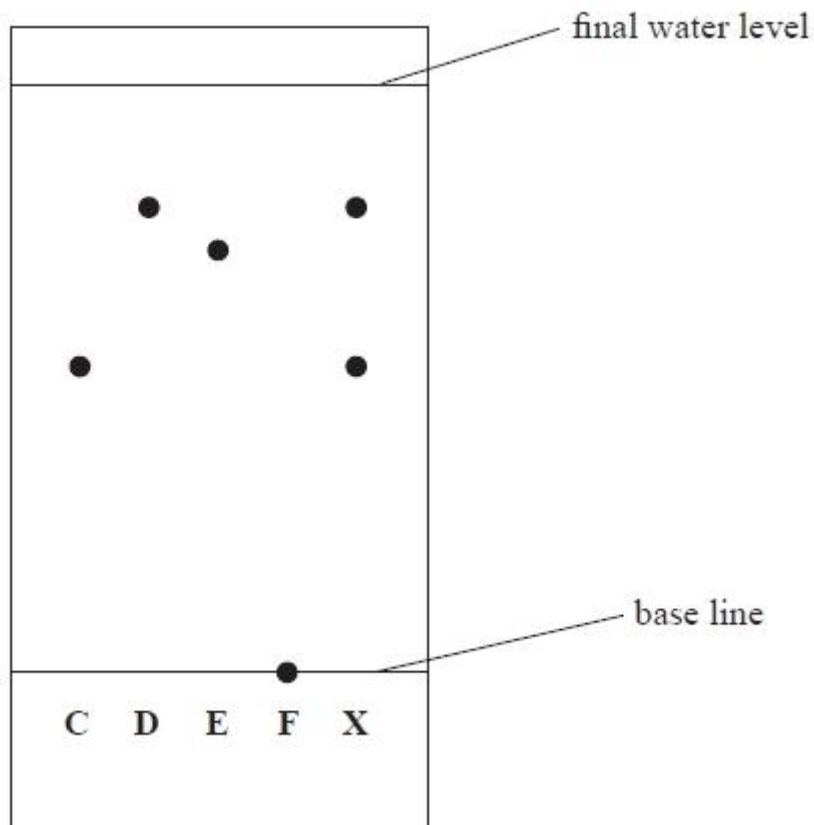
.....

.....

.....

(b) During the experiment the water rises up the paper. The experiment is stopped just before the water reaches the top of the paper.

The diagram shows the paper after it has been removed from the beaker and dried.



(i) Which of the food dyes **C**, **D**, **E** and **F** does **X** contain?

(1)

.....

(ii) Suggest why food dye **F** did not move up the paper during the experiment.

(1)

.....

(c) Each food dye has an R_f value that can be calculated using this expression:

$$R_f = \frac{\text{distance moved by food dye from base line}}{\text{distance moved by solvent from base line}}$$

Record the distances for food dye **D** in the table below and calculate its R_f value.

(3)

Distance moved by food dye D from base line in mm	
Distance moved by solvent from base line in mm	
R_f value	

(Total for question = 6 marks)

Q3.

This question is about the separation of mixtures.

(a) The table shows some methods used to separate mixtures.

- (i) Place a tick (✓) in one box in each row of the table to show the best method of separation for each mixture.

Separation		Method of separation			
		Chromatography	Simple distillation	Filtration	Fractional distillation
P	red ink from a mixture of coloured inks				
Q	ethanol from a mixture of ethanol and water				
R	sand from a mixture of sand and water				
S	water from copper(II) sulfate solution				

(4)

- (ii) Which of the mixtures P, Q, R or S contains an undissolved solid?

(1)

.....

(b) Pure dry crystals of magnesium nitrate can be obtained from magnesium nitrate solution by crystallization.

These steps describe the method, but the steps are in the wrong order.

- A allow the solution to cool to room temperature
- B heat the solution to evaporate some of the water
- C pour the mixture of crystals and solution through filter paper
- D put the crystals in a warm place to dry
- E dip a glass rod into the solution to see if crystals form

Write a letter in each box to show the correct order.

One has been done for you.

(2)

	E			
--	---	--	--	--

(Total for question = 7 marks)

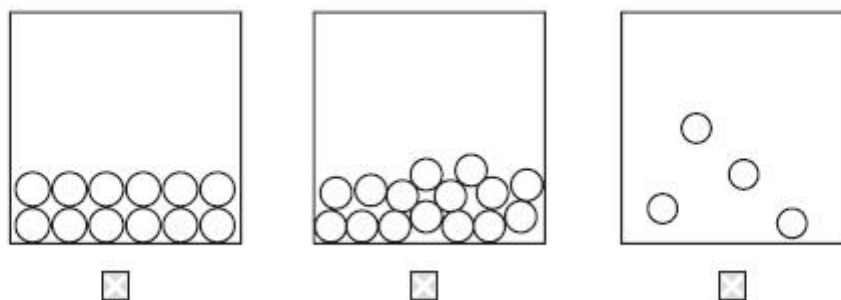
Q4.

This question is about the elements hydrogen and oxygen.

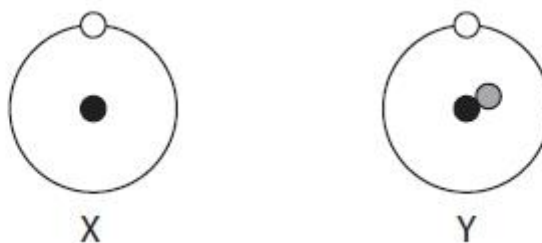
(a) The circles in the diagrams represent molecules of hydrogen.

Place a cross in the box under the diagram that represents hydrogen gas.

(1)



(b) The diagram below shows two different atoms of hydrogen.



(i) The particle furthest from the centre of each atom is

(1)

- A** an electron
 B a neutron
 C a nucleus
 D a proton

(ii) The particle present in atom Y but not in atom X is

(1)

- A** an electron
 B a neutron
 C a nucleus
 D a proton

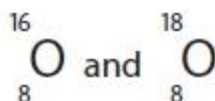
(iii) Both atoms are neutral because they have the same number of

(1)

- A** electrons and neutrons
 B electrons and protons
 C electrons, neutrons and protons

D neutrons and protons

(c) Different atoms of oxygen can be represented as



Select words or phrases from the box to complete the sentence about these atoms of oxygen. You may use each word or phrase once, more than once or not at all.

atomic numbers	isotopes	mass numbers	numbers of electrons
----------------	----------	--------------	----------------------

(3)

These atoms of oxygen are called.....

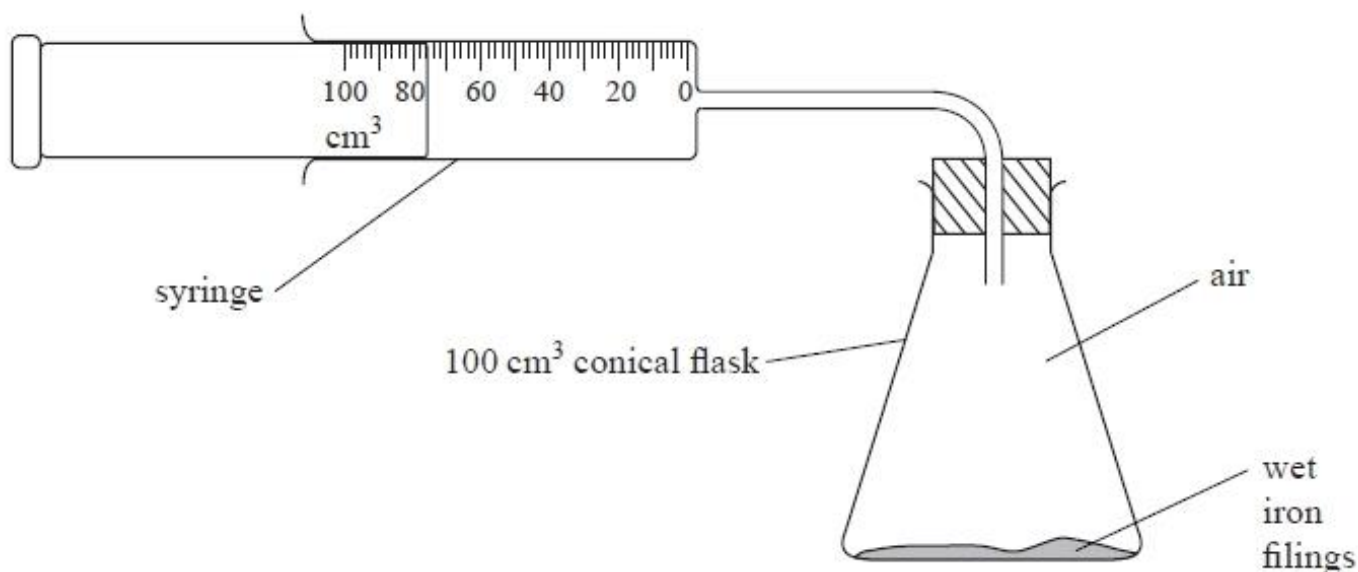
because their are the same

but their are different.

(Total for question = 7 marks)

Q5.

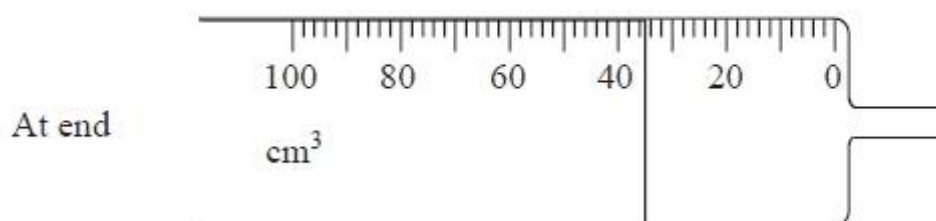
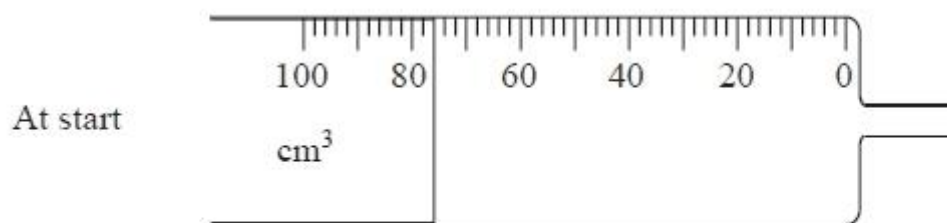
Rusting occurs when iron is exposed to air and water. During rusting, iron reacts with oxygen from the air to form an oxide. Some students set up this apparatus to measure the volume of oxygen in a sample of air.



Each student used an excess of wet iron filings.

At the start of the experiment the reading on the syringe was recorded and the apparatus was then left for a week until the reaction was completed.

At the end of the experiment the reading on the syringe was recorded again.



(a) The syringes used in one student's experiment are shown below.

Record the syringe readings at the start and at the end of the experiment in the table below, and calculate the volume of oxygen used up.

(3)

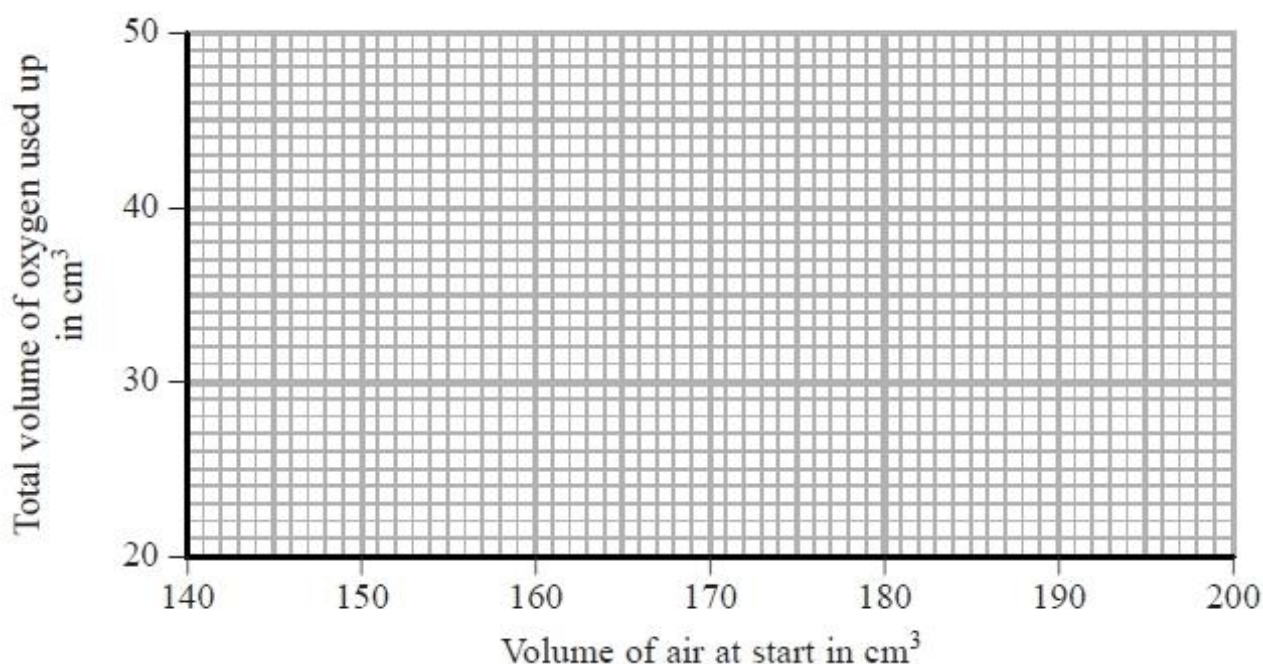
Syringe reading at start in cm ³	
Syringe reading at end in cm ³	
Volume of oxygen used up in cm ³	

(b) The results of the other students are shown in the table.

Total volume of air at start in cm^3	Total volume of gas at end in cm^3	Volume of oxygen used up in cm^3
200	160	40
180	144	36
165	140	25
150	120	30
185	148	37

(i) Use the results in the table to plot a graph of volume of oxygen used up against volume of air at start. Draw a straight line of best fit.

(3)



(ii) One of the results is anomalous. Identify this result by circling it on the graph.

(1)

(c) Another group of students did experiments that gave several anomalous results. The teacher discussed possible errors that could have caused these anomalous results.

Complete the table by choosing words from the following list to show what effect each error would have on the volume of oxygen used up.

(3)

decreased

increased

no change

Possible error causing anomalous result	Effect on volume of oxygen used up
iron filings not in excess	
experiment left for 1 day instead of 1 week	
apparatus left in warmer place for 1 week	

- (d) Use the following results to calculate the percentage of oxygen in air.
Give your answer to one decimal place.

(2)

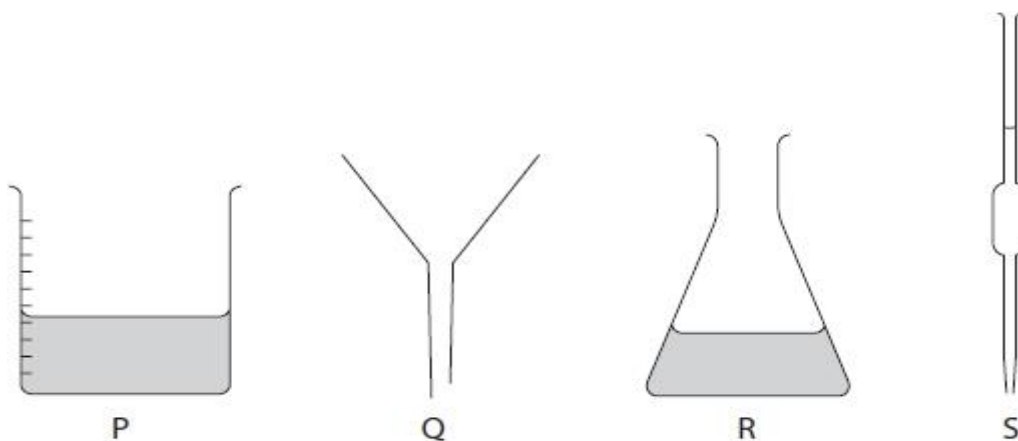
Total volume of air at start in cm^3	140
Volume of gas at end in cm^3	111

..... %

(Total for question = 12 marks)

Q6.

These pieces of apparatus are used in chemistry experiments.



- (a) Name these pieces of apparatus.

(4)

P

Q

R

S

- (b) Apparatus P contains dilute hydrochloric acid.

Litmus indicator is added to this acid.
What is the final colour of the litmus?

(1)

- A blue B green C orange D red

- (c) Apparatus R contains potassium hydroxide solution.

Litmus indicator is added to this alkaline solution.
What is the final colour of the litmus?

(1)

- A blue B green C orange D red

(Total for question = 6 marks)