



SCHOLARSHIP EXAMINATION

CHEMISTRY

2013

Time: 30 minutes

Name:

School:

Instructions to Candidates

Answer **All** of the questions in the spaces provided in this answer booklet.

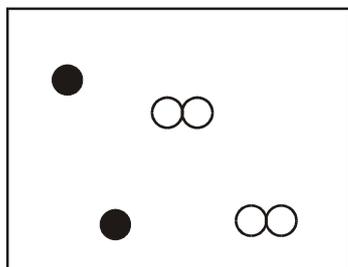
Read the questions carefully.

A Periodic Table is provided.

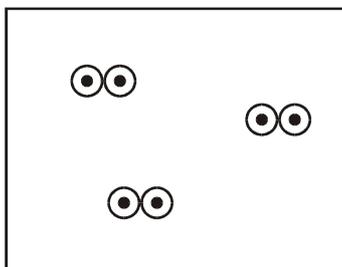
1. In the 19th Century, a scientist called John Dalton used symbols to represent atoms. The symbols he used for atoms of three different elements are shown below.



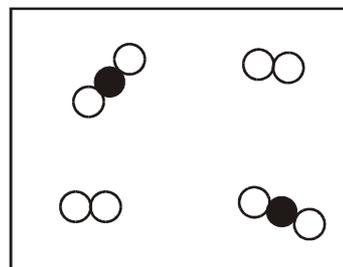
The diagrams below show different combinations of these atoms.



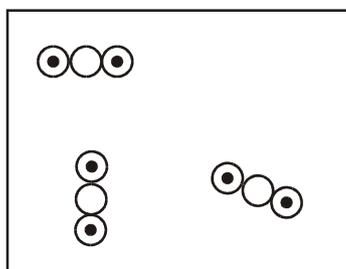
A



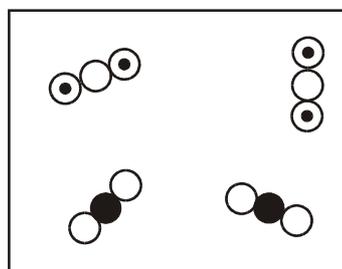
B



C



D



E

- (a) (i) Give the letter of the diagram which shows a mixture of **two** elements.

.....

1 mark

- (ii) Give the letter of the diagram which shows a mixture of **two** compounds.

.....

1 mark

- (iii) Give the letter of the diagram which shows a mixture of an element and a compound.

.....

1 mark

(b) Give **one** difference between a compound and a mixture.

.....
.....
.....

1 mark

(c) (i) Suggest a name and formula for the substance represented in diagram B.

name

formula

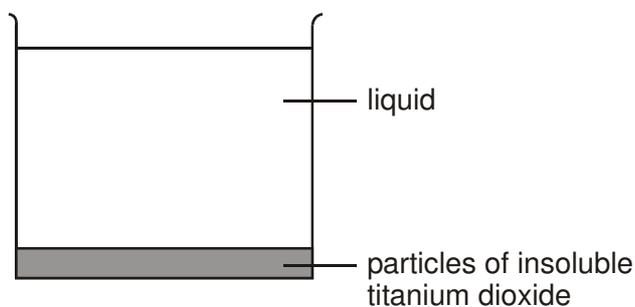
1 mark

(ii) Suggest a name and formula for the substance represented in diagram D.

name

formula

2. (a) Samantha opened a tin of white paint. The paint consisted of a liquid and particles of titanium dioxide that are insoluble in the liquid. The paint had separated into two layers, as shown below.



(i) What type of substance is the paint?
Tick the correct box.

a compound

an element

a mixture

1 mark

(ii) What type of substance is titanium dioxide?
Tick the correct box.

a compound
 an element a mixture

1 mark

(iii) Why did the particles of insoluble titanium dioxide sink to the bottom?

.....
.....

1 mark

(b) Samantha stirred the paint and used it to paint a window frame.
She got some of the paint on the glass.



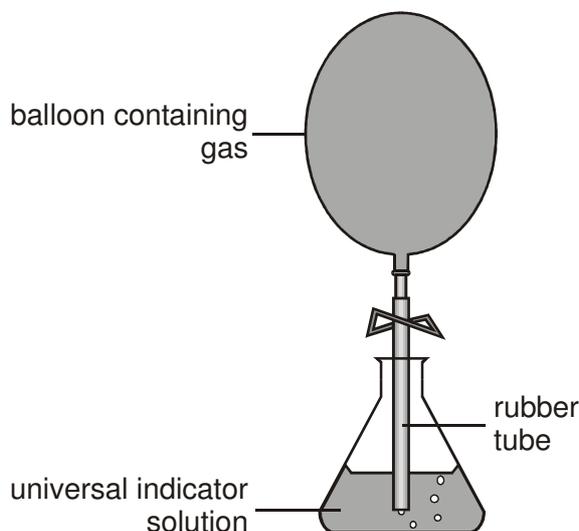
Samantha could **not** get the paint off the glass with water.
When she used a different liquid called white spirit the paint came off.

Why could she remove the paint with white spirit but **not** with water?

.....
.....

1 mark

3. A scientist compared the acidity of four gases to see which gas might cause acid rain. She used four balloons to collect the gases. She then bubbled the gases, in turn, through a fresh sample of green, neutral, universal indicator solution.



- (a) Three of the gases caused the indicator to change colour. The scientist added drops of alkali to the indicator until the indicator changed back to green. Her results are shown in the table below.

gases collected	change in colour of indicator	number of drops of alkali needed to change the indicator back to green
exhaust gases from a car	green to red	31
carbon dioxide	green to red	160
air	no change	0
human breath	green to yellow	10

Use information in the table to answer part (i) and part (ii) below.

- (i) Which gas dissolved to form the most acidic solution?

.....

Explain your choice.

.....

.....

1 mark

(ii) Which gas formed a neutral solution?

.....

Explain your choice.

.....

.....

1 mark

(iii) What effect does an alkali have on an acid?

.....

1 mark

(b) Some metals react with acids in the air.
Complete the word equation for the reaction between zinc and hydrochloric acid.

zinc + hydrochloric acid → +

acid

2 marks

4. Railway lines can be joined together by pouring molten iron into the gap between them.

(a) The molten iron is produced by the reaction between powdered aluminium and iron oxide.
Complete the word equation for the reaction.

aluminium + iron oxide → iron +

1 mark

(b) Iron can be produced from a mixture of aluminium and iron oxide but **not** from a mixture of copper and iron oxide.
Write the names of the **three** metals, in the order of their reactivity.

most reactive

.....

.....

1 mark

(c) The list shows the names and symbols of five metals in order of their reactivity.

name	symbol
sodium	Na
calcium	Ca
magnesium	Mg
zinc	Zn
silver	Ag

(i) What, if anything, would be the result of heating zinc powder with calcium oxide?

.....

1 mark

(ii) Write down the **name** of a metal in the list that will **not** react with a solution of magnesium sulphate.

.....

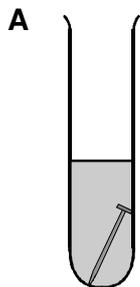
1 mark

(d) The powdered metal with the symbol Zn burns in air.
Write the **word equation** for the reaction.

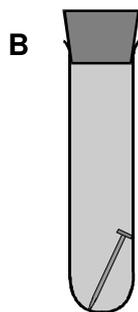
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2 marks

5. Jessica was investigating the rusting of iron. She set up five experiments as shown below, and left the test-tubes for three days.



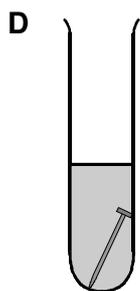
iron nail in distilled water



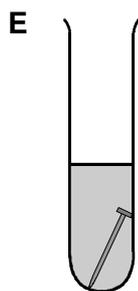
iron nail in tap water
which has been boiled to
remove dissolved gases



iron nail and a chemical
to absorb water vapour



iron nail in sea water



iron nail in vinegar

Jessica wrote the following results in her book.

Test-tube	observation
A	nail slightly rusty
B	nail still shiny
C	nail still shiny
D	nail very rusty
E	nail slightly rusty, bubbles of gas seen

(a) Explain why the nails had **not** rusted in test-tubes B and C.

in test-tube B

.....

in test-tube C

.....

2 marks

(b) In test-tube E the iron nail reacted with the vinegar.

(i) Is vinegar **acidic, alkaline** or **neutral**?

.....

1 mark

(ii) When the iron reacted with the vinegar, bubbles of gas were formed.
What gas was formed?

.....

1 mark

(c) Before putting the iron nail in test-tube D, Jessica weighed the nail.
After three days she dried and weighed the nail **and** the rust which had formed.

(i) How did the total mass of the nail and rust compare to the mass of the nail
at the beginning?

.....

1 mark

(ii) Give the reason for your answer.

.....

.....

1 mark

(d) Jessica concluded that the presence of salt in the water made the nail rust more
quickly.
Explain why she drew that conclusion from her experiments.

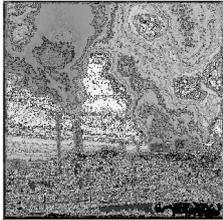
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1 mark

6. A headline from a newspaper is shown below.

<p>British Power Stations cause Acid Rain in Scandanavia</p>	
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Some countries claim that acid rain caused by power stations in Britain damages their forests.

Others argue that coal-burning power stations produce cheap electricity and that plants can stand some level of acid rain.

Imagine you are planning a laboratory investigation of the claim:

'plants can stand some level of acid rain'.

Assume you have access to whatever laboratory equipment you need, including:

- seeds
- acid
- seed trays
- soil

Plan a laboratory investigation to test the claim that **'plants can stand some level of acid rain'**.

(a) Name a factor you would need to vary in your investigation.
(This is the independent variable.)

.....

1 mark

- (b) (i) What factor would you examine to see the effect?
(This is the dependent variable.)

.....
.....

1 mark

- (ii) How could you measure this dependent variable?

.....

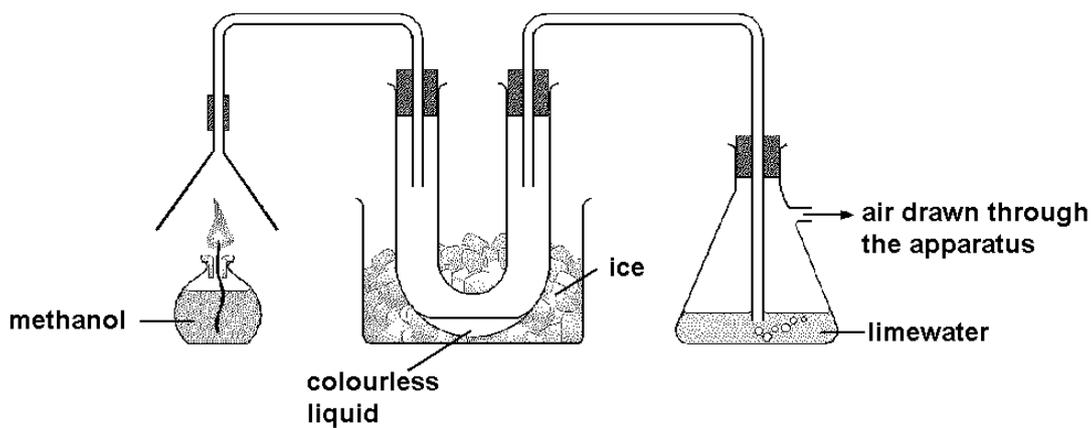
1 mark

- (c) Suggest **one** factor you would control to ensure that your investigation is fair.

.....

1 mark

7. (a) George used the apparatus below to find out what substances are produced when methanol burns.



As the methanol burned, two different gases were produced.

- (i) One of these gases condensed in the U-tube to give a colourless liquid.
Give the name of this liquid.

.....

1 mark

- (ii) The other gas turned the lime water cloudy.
Give the name of this gas.

.....

1 mark

- (b) Methanol is sometimes used in antifreeze. It can be added to water in car windscreen wash-bottles to prevent the water from freezing in cold conditions.



- (i) The label on the bottle of antifreeze has two hazard warning symbols.
What **two** precautions would you need to take when using this antifreeze?

1.

.....

2.

.....

1 mark

- (ii) Water freezes at 0°C . The label on the bottle shows how the freezing point changes when different amounts of antifreeze are added to water.

Terry put a mixture containing 10% antifreeze into the wash-bottle of his car. During the night the temperature dropped to -14°C .

The wash-bottle burst.

Explain why the wash-bottle burst.

.....

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.....

.....

2 marks