SURNAME ..... FIRST NAME .....

JUNIOR SCHOOL ..... SENIOR SCHOOL .....

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

LEVEL 2

CHEMISTRY

Tuesday 29 January 2013

Please read this information before the examination starts.

- This examination is 40 minutes long.
- The answers should be written on the question paper.
- Answer **all** the questions.
- Calculators may be required.

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1. Underline the option which best completes each of the following:

(a) A way of separating a mixture of salt and sand is to

add water, and then filter **distil the mixture**

put it into a filter paper **use chromatography**

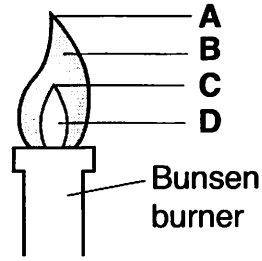
(b) Pure water is best described as

an atom **a compound** **an element** **a mixture**

(c) A pure chemical has a freezing point of 6 °C and a boiling point of 80 °C.
At room temperature (20 °C), it will be a

gas **liquid** **solid** **solution**

(d) In the Bunsen burner flame shown below



the highest temperature will be at the position marked

A **B** **C** **D**

(e) When 6 grams of magnesium is burnt, 10 grams of magnesium oxide are formed.
If 30 grams of magnesium are burnt, the mass of magnesium oxide formed will be

10 grams **30 grams** **34 grams** **50 grams**

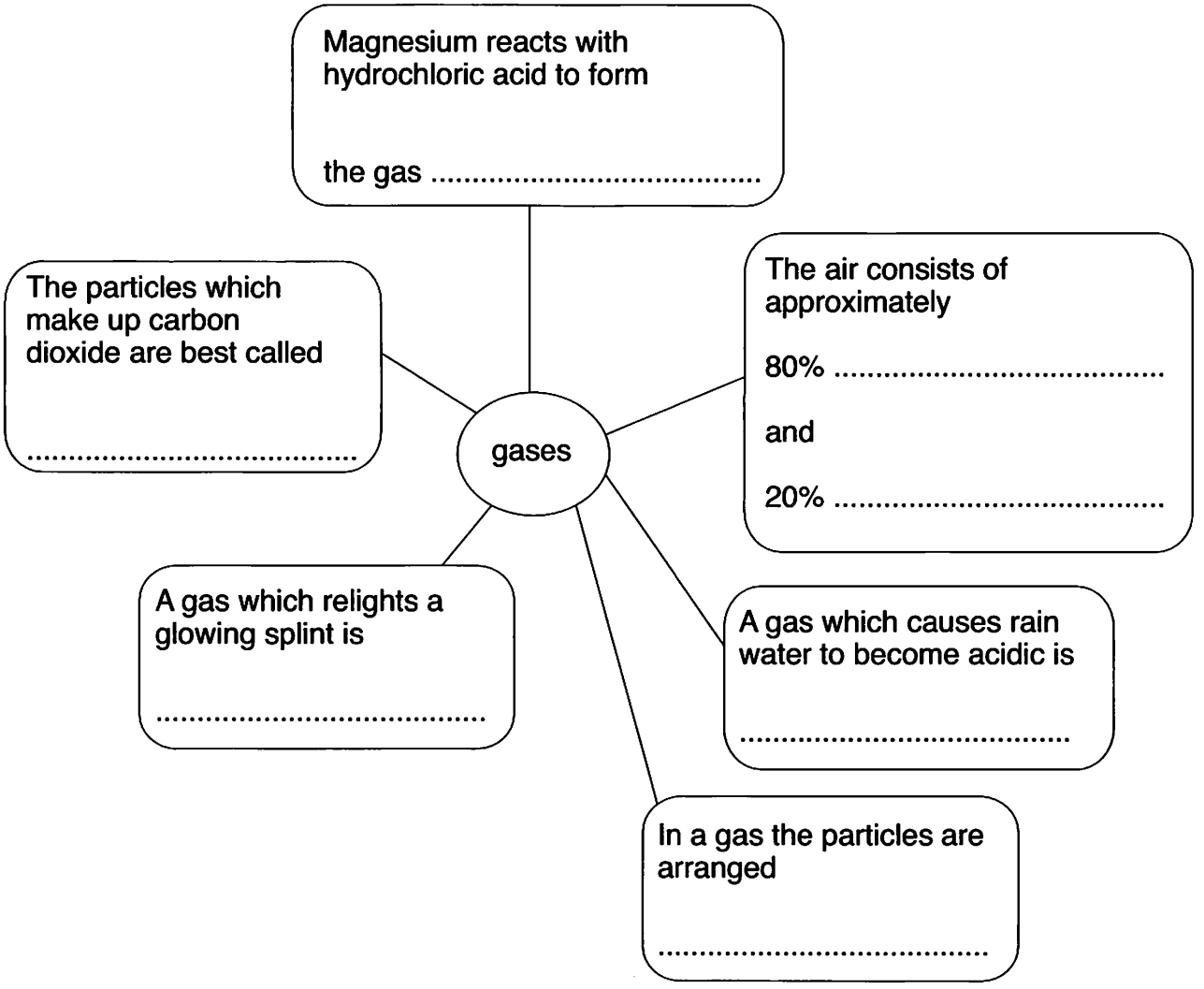
(5)

2. This question is about gases.

hydrogen	**oxygen**	**nitrogen**
carbon dioxide	**sulphur dioxide**	**atoms**
molecules	**regularly**	**randomly**

Using only the words in the box above, fill in the spaces in the diagram below with the words you think are most suitable.

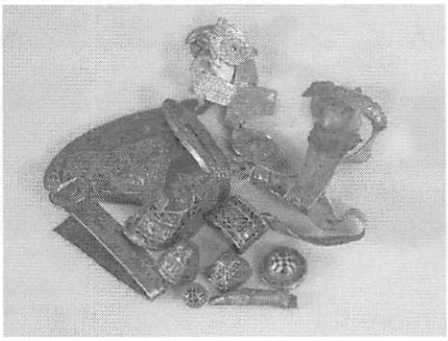
Each word may be used once, more than once or not at all.



(7)

3. In 2009, a large hoard of Anglo-Saxon objects was found in a Staffordshire field using a metal detector.

Some of them are shown below:



Many of the objects were found to be made of pure gold and were still shiny after lying underground for 1300 years.

(a) Underline the word which best describes pure gold:

a compound **an element** **a mixture** **a solution** (1)

The list shows some of the properties of gold:

It is a good conductor of electricity. **It melts at 1064 °C.** **It is yellow.**

It is easily scratched. **It stays shiny.** **It is a good conductor of heat.**

(b) (i) Which ONE of these properties shows that gold does NOT react with oxygen in the air?

..... (1)

(ii) Which TWO of the properties above are properties of ALL metals?

1: .....

2: ..... (2)

Some iron objects were also found in the hoard.

(c) Suggest a way in which the iron and gold objects could have been separated other than just by appearance.

.....

..... (2)

The iron objects had traces of rust present on their surfaces.

(d) (i) Which two substances must be present for an iron object to rust?

1: .....

2: ..... (1)

(ii) Give a possible reason why iron objects found underground do not rust as much as if they had been left above the ground.

.....

..... (1)

(e) Describe the changes in the movement and arrangement of the particles when gold is heated from room temperature to just over 1064 °C.

.....

.....

..... (2)

4. David used an electrical pH probe to test various liquids.
He dipped the probe into each liquid and recorded the pH value in a table.



(a) In the table below, tick one box for each liquid to show whether it is acidic, neutral or alkaline.
(One has been done for you.)

liquid	pH value	acidic	neutral	alkaline
alcohol	7			
drain cleaner	1			
distilled water	7		✓	
vinegar	3			
oven cleaner	13			

(2)

(b) David washed the probe with distilled water between each test.
Why did he do this?

.....

(1)

(c) Which liquid in the table is the strongest acid?

.....

(1)

David added some chalk to the vinegar.
He noticed that bubbles of gas were given off and the pH value rose to 7.
He also noticed that not all the chalk reacted.

(d) (i) How could David have proved the gas formed was carbon dioxide?

test: .....

result: ..... (2)

(ii) What type of reaction occurred?

..... (1)

(iii) Why did not all the chalk react?

..... (1)

(e) Another way to measure pH values is to use pH paper.

Suggest one practical advantage of using

(i) the electrical pH probe .....

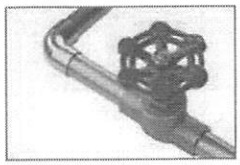
(ii) pH paper ..... (2)

5. The following four metals, arranged in order of decreasing reactivity, are often used in the modern world:

metal	reactivity	density, in grams per cm^3	price, in £ per kg (2011 price)	uses
aluminium	more reactive ↓	2.7	1.46	aircraft frames, soft drink cans, cooking foil, electricity cables, pans
iron		7.9	0.25	building frames, car bodies, bridges
copper		8.9	5.80	electrical wiring, water pipes, pans
silver	less reactive	10.5	800	jewellery, electrical circuits

You can use some of the information in the table and your own knowledge to answer the questions which follow.

(a) Why is copper preferred to iron for water pipes?

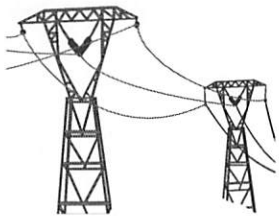


.....

.....

(1)

(b) Why is aluminium used for the electricity cables which carry power across the country, although it is not as good a conductor as copper?



.....

.....

.....

(2)

(c) Give two reasons why iron is the most widely-used metal of all.

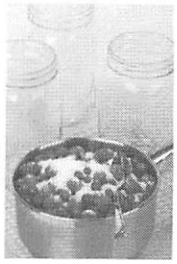
1: .....

.....

2: .....

..... (2)

(d) Jam is made by boiling an acidic mixture of fruit and sugar in a pan for a number of hours.



Give one advantage and one disadvantage of using an aluminium pan for making jam, compared to a copper pan.

advantage: .....

disadvantage: ..... (2)

(e) Describe carefully an experiment you could do to put the metal **zinc** in the correct place in the reactivity series with aluminium, iron, copper and silver.

(i) Describe what you would do.

.....

.....

..... (2)

(ii) Explain how your results would tell you where to put zinc in the reactivity series.

.....

.....

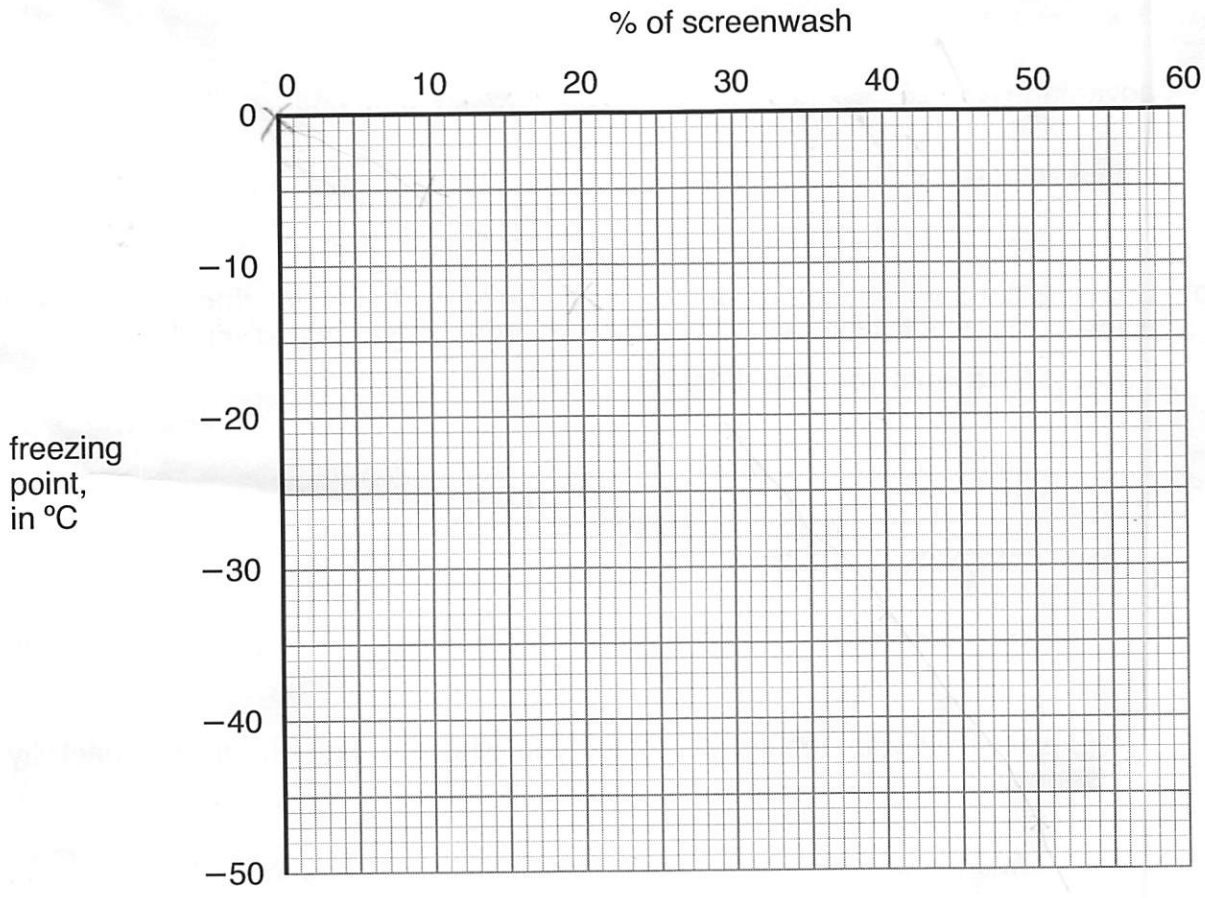
..... (2)

6. Screenwash is a liquid which is sometimes mixed with water in car screenwash bottles in order to prevent the water from freezing in very cold conditions.

The following table tells motorists what percentage of screenwash should be mixed with water to change the freezing point of the wash liquid:

% screenwash, by volume	freezing point, in °C
0	0
10	−5
20	−12
30	−21
40	−33
50	−47

(a) (i) Plot these results on the axes below. (2)



(ii) Draw a best fit curve through the points. (1)

(iii) What percentage of screenwash would produce a liquid with a freezing point of −15 °C?

..... (1)

(b) A motorist made a mixture of 70 cm^3 screenwash and 130 cm^3 water.

(i) Work out the percentage of screenwash in his mixture.

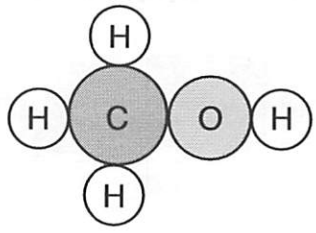
.....

..... (2)

(ii) What is the freezing point of this mixture? .....°C (1)

Screenwash contains a liquid called methanol.

Methanol molecules look like this:



(c) (i) Name the elements present in methanol.

..... (1)

(ii) How many atoms are there in one molecule of methanol? ..... (1)

Methanol is very flammable. When it burns in a good supply of air, two main products are formed.

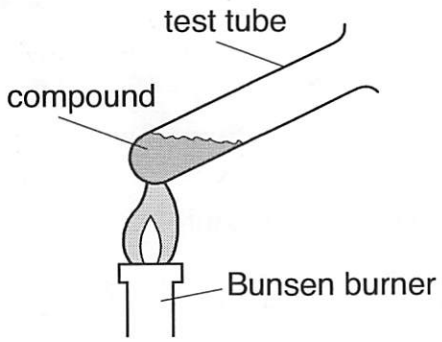
(d) Name the two products formed when methanol burns in a good supply of air.

1: .....

2: ..... (2)

TURN OVER FOR QUESTION 7

7. A teacher investigated the effect of heating three different compounds in test tubes. She weighed each test tube before and after heating.



The observations and results of her experiments are shown below.

compound	colour before heating	colour after heating	mass change?
potassium carbonate	white	white	no
mercury oxide	red	silver	decrease
lead nitrate	white	yellow	decrease

(a) Give two pieces of evidence which showed the potassium carbonate did not react.

1: .....

2: ..... (2)

(b) (i) Suggest a reason why the mass decreased when mercury oxide and lead nitrate were heated.

.....

..... (1)

(ii) What type of reaction is occurring in these two reactions?

..... (1)

(iii) Write the word equation for the reaction when mercury oxide is heated.

..... (2)

(Total marks: 60)