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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

CHEMISTRY

Tuesday 8 November 2011

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 gas which relights a glowing splint is

carbon dioxide **hydrogen** **nitrogen** **oxygen**

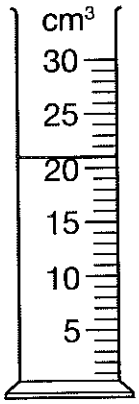
(b) Air is an example of

a compound **an element** **a mixture** **a solution**

(c) An example of a fossil fuel is

alcohol **coal** **paper** **wood**

(d) In the measuring cylinder



the volume of liquid is

18 cm³ **19 cm³** **21 cm³** **22 cm³**

(e) Thomas wrote, 'If an iron nail were put into vinegar, bubbles of hydrogen gas would be formed.'

Thomas' statement is best described as

a conclusion **a method** **an observation** **a prediction** (5)

2. The gas burnt in the Bunsen burner is the compound methane, a hydrocarbon.

(a) (i) Explain what you understand by the word *compound*.

.....

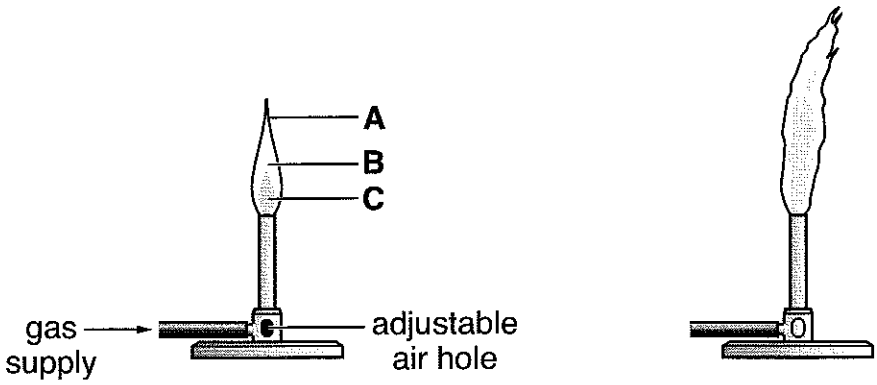
..... (2)

(ii) Name the two products when a hydrocarbon is burnt completely in air.

1: .....

2: ..... (2)

Here are two diagrams of Bunsen burner flames:



air hole completely open: blue, roaring flame

air hole completely closed: yellow, sooty flame

(b) (i) Which arrow, **A**, **B** or **C**, is pointing to the hottest part of the roaring flame?

..... (1)

(ii) Suggest and explain why the yellow flame is also sooty.

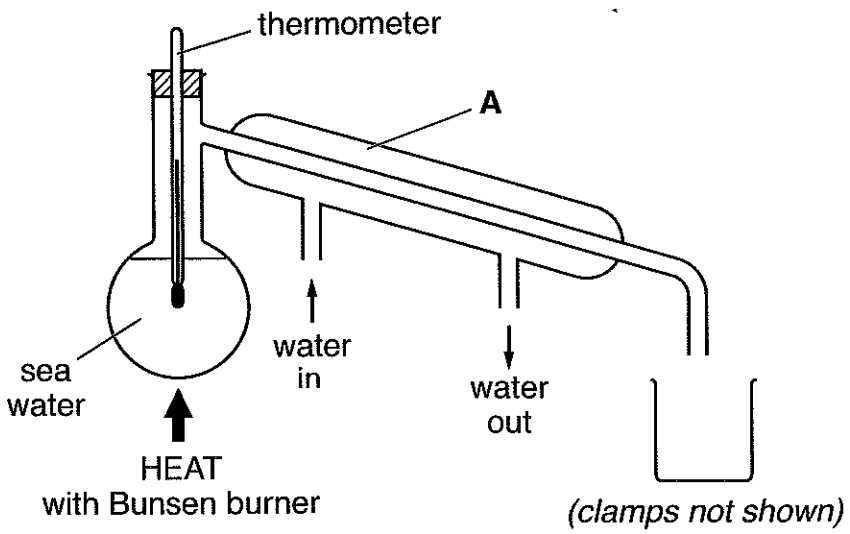
.....

..... (2)

(iii) Explain why the yellow flame should be used when the Bunsen burner is not being used for heating.

..... (1)

3. Paul has set up this apparatus in order to separate pure water from sea water.



(a) What name is given to this method of separation?

..... (1)

(b) Name the piece of apparatus labelled **A**.

..... (1)

(c) Paul has made three mistakes in the way in which he has set up the apparatus. State the three mistakes he has made.

1: .....

2: .....

3: ..... (3)

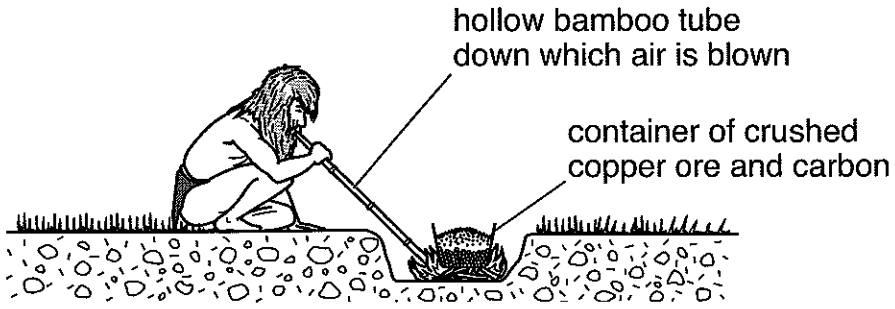
(d) Using ideas about boiling points, explain why pure water is formed in the beaker and salt is left behind in the flask.

.....

.....

..... (2)

4. 6000 years ago man learned to convert copper ore into copper.
The diagram below shows how this was done.



(a) Why does blowing into a fire make it burn better?

..... (1)

(b) The copper ore contains copper carbonate.
Copper carbonate breaks down when heated into

- copper oxide
  and
- a gas which turns limewater milky

(i) Write the word equation for the breakdown of copper carbonate.

..... → ..... + ... (2)

(ii) What type of reaction is this?

..... (1)

(c) Carbon then reacts with the copper oxide to form copper.
What does this tell you about the reactivity of copper compared with the reactivity of carbon?

.....

..... (1)

5. Sam was investigating the pH of different soil samples.



A B C D E

First, she put a little of the soil with some distilled water in a test tube.
Next, she shook the test tube.
Then she filtered the mixture before adding a few drops of Universal Indicator.

(a) (i) Explain why she used the distilled water.

..... (1)

(ii) Explain why she shook the mixture.

..... (1)

(b) (i) Draw a labelled diagram below to show how she could have filtered the mixture.

(4)

(ii) Explain why she filtered the mixture.

..... (1)

Next, she added a few drops of Universal Indicator and noted its colour.
Here are her results:

soil sample	colour	pH
A	light green	6.5
B	yellow	5.5
C	green	7.0
D	blue/green	8.0
E	green	7.0

(c) Which soil sample is the most acidic? ..... (1)

Here is some information about the pH values in which some plants prefer to grow:

plant	potato	apple	onion	asparagus	strawberry
preferred pH range	5.5–6.0	5.0–6.5	6.0–7.0	6.0–8.0	5.0–7.0

(d) Which plant would probably grow best in soil D? ..... (1)

In some parts of the world, soils can be affected by acid rain.

(e) (i) Describe one way in which acid rain is made.

..... (1)

(ii) Suggest what effect this can have on plants growing in this soil.

..... (1)

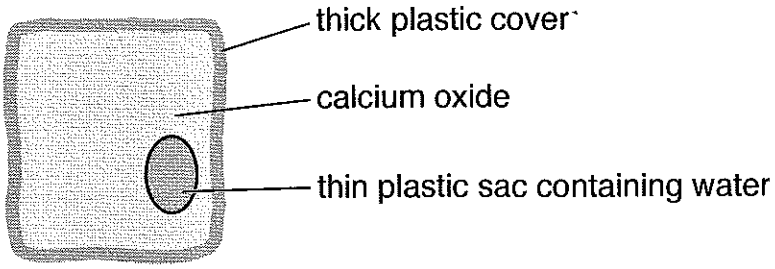
(iii) Suggest what a farmer could add to his soil to combat the effect of acid rain.

..... (1)

(iv) Name the type of reaction which occurs.

..... (1)

6. The diagram below shows a hand warmer.



When the hand warmer is twisted, the thin sac of water breaks and mixes with the calcium oxide.

The water reacts with the calcium oxide, forming calcium hydroxide.

This reaction also produces heat.

(a) Write the word equation for this reaction.

..... (2)

(b) When the reaction has finished, would you expect the mass of the hand warmer to have increased, decreased or remained the same?

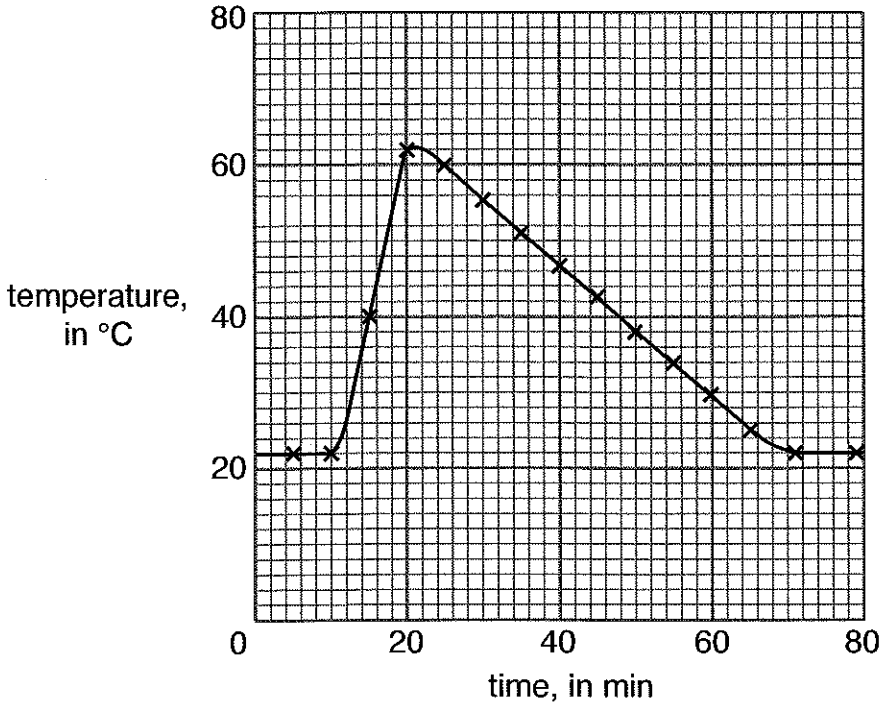
..... (1)

Explain your answer: .....

..... (1)

Ruby decided to measure the temperature changes in the hand warmer and to measure for how long it could be used.

She took a number of temperature measurements at 5-minute intervals and plotted them on a graph.



(c) (i) What was the room temperature on the day of the experiment?

..... (1)

(ii) After what length of time did Ruby start the reaction in the hand warmer?

..... (1)

(iii) What was the maximum temperature reached by the hand warmer?

..... (1)

(iv) For how long did the hand warmer stay warm?

..... (1)

(d) Suggest ways in which the makers of the hand warmer could

(i) make it achieve a higher temperature; .....

..... (1)

(ii) make it keep its heat longer. .....

..... (1)

(e) After the hand warmer had cooled down, Ruby carefully cut open the plastic cover to test its contents.

She carried out the two tests shown in the table below.

Fill in the conclusions she could make from these tests.

test carried out on contents	conclusions
when Universal Indicator was added, it turned purple	
when anhydrous copper sulphate was added, it turned blue	

(2)

7. This question is about the rusting of iron.

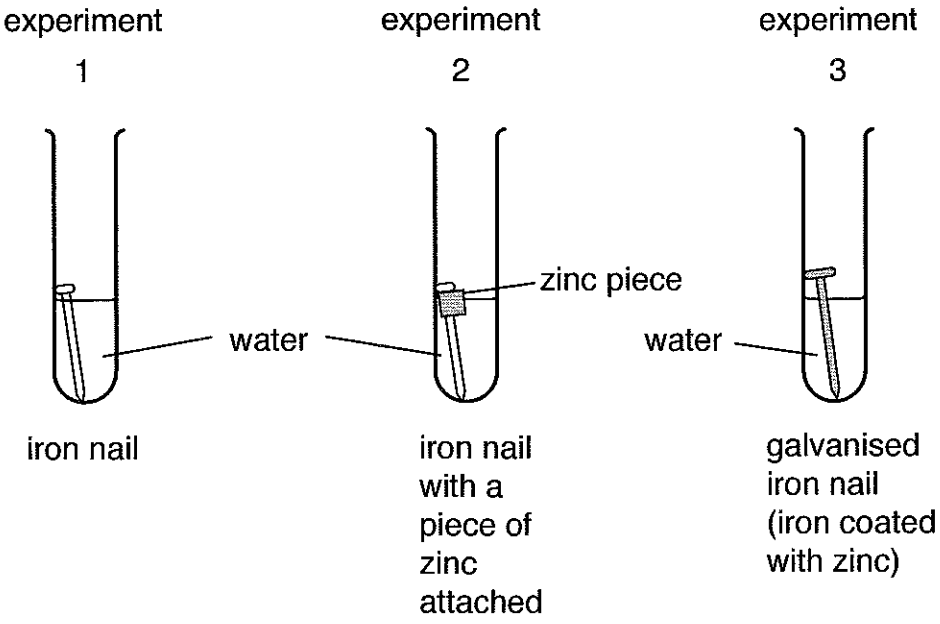
(a) (i) Which two substances must be present for an iron object to rust?

..... (1)

(ii) What is the chemical name for rust?

..... (1)

There are a number of ways in which iron objects can be protected from rusting.
The following three experiments were set up to illustrate two of them.



results after a week	nail covered in rust – a brown solid	no rust, a white solid formed	no rust, a white solid formed

(b) (i) Using ideas about the reactivity of metals, explain why the piece of zinc in experiment 2 protects the iron from rusting.

.....

..... (2)

(ii) What is the name of the white solid which formed?

..... (1)

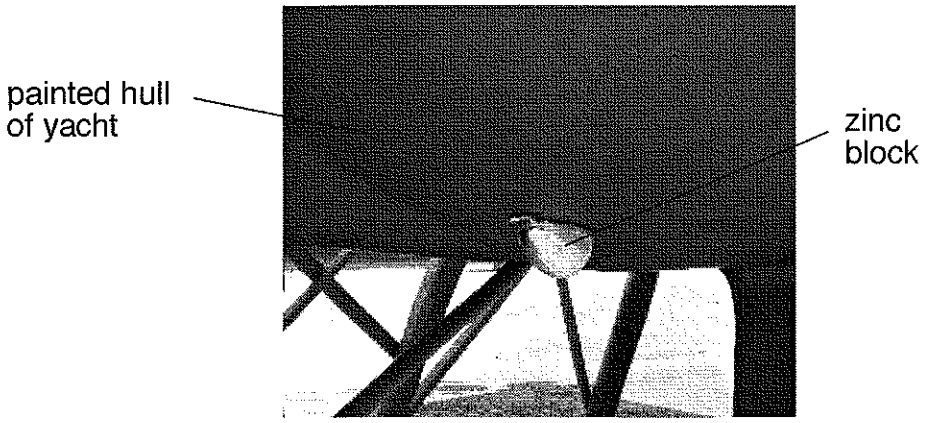
(c) Describe and explain the extra protection which coating the nail in zinc gives to the galvanised iron nail in experiment 3.

.....

..... (2)

TURN OVER FOR THE REST OF THIS QUESTION

The photograph below shows the underneath of a yacht used for sea-racing.



(d) (i) Suggest why yachts which are sailed at sea rust more rapidly than those sailed on fresh water.

..... (1)

(ii) Why is it necessary to replace the zinc block from time to time?

..... (1)

(e) Suggest a different method which would protect an underwater iron cable from rusting.

..... (1)

(Total marks: 60)