SURNAME ..... FIRST NAME .....
(Block capitals, please)
JUNIOR SCHOOL ..... SENIOR SCHOOL .....

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

CHEMISTRY

Tuesday 28 February 2006

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 word, phrase or number which best completes each of the following sentences.

(a) The element iron contains

iron and oxygen atoms **iron and oxygen molecules**

only iron atoms **only iron molecules.**

(b) The compound iron sulphide contains

a mixture of iron atoms and sulphur atoms

a mixture of iron atoms and sulphur molecules

iron and sulphur atoms which have reacted together

iron sulphide atoms.

(c) The number of chemical elements is

about 10 **about 100** **about 1000** **many millions.**

(d) An element which is an insulator is

copper **lead** **sulphur** **tin.**

(e) An element which is malleable is

carbon **nitrogen** **sulphur** **zinc.**

(f) An element which forms an acidic oxide is

copper **iron** **sodium** **sulphur.**

(g) 24 g of magnesium combine with 16 g of oxygen to form 40 g of magnesium oxide.

120 g of magnesium oxide is a combination of

64 g of magnesium and 56 g of oxygen

72 g of magnesium and 48 g of oxygen

80 g of magnesium and 40 g of oxygen

100 g of magnesium and 20 g of oxygen.

(h) A liquid which is a compound and not a mixture is

ethanol **milk** **petrol** **sea water.** (8)

2. Fill in the blanks in the passage below, using each of these words only once.

boils **condenses** **dissolves**

evaporates **freezes** **melts**

When ice is warmed, it ..... and becomes water; on further heating, the water ..... and becomes steam. When the steam is cooled, it ..... to form water again; when really cold, the water ..... and becomes ice again.

If salt is stirred into water, the salt ..... to form a solution.

Salt crystals form when the water ..... .

(6)

3. (a) When sulphur burns, oxygen is used up and the sulphur disappears. What has happened?

..... (2)

(b) We use up oxygen when we breathe. Which two compounds are formed?

1 ..... (1)

2 ..... (1)

(c) What percentage of normal air is oxygen?

..... (1)

(d) How would you test for oxygen?

.....

..... (2)

(e) Give the name of the process which restores oxygen to the atmosphere.

..... (1)

4. Many foodstuffs are acidic (lemon pH = 2.5; apple pH = 3.5), but the process of digestion in the stomach involves even more acidic conditions. Indigestion is usually the result of too much acid, which can be treated using a suitable alkali, such as milk of magnesia (magnesium hydroxide suspension; pH = 8.5).

(a) Suggest a pH value for the acid in the stomach.

..... (1)

(b) What name is given to reactions in which an acid reacts with an alkali?

..... (1)

(c) Assuming that stomach acid is hydrochloric acid, complete the word equation for its reaction with magnesium hydroxide.

hydrochloric acid ..... + ... ⟶ ..... + ...

magnesium hydroxide (3)

(d) Suggest why limewater (pH = 12) is not used for treating indigestion.

.....

..... (2)

(e) Solid calcium carbonate can be used to treat indigestion. Which gas forms when it reacts with the stomach acid?

..... (1)

(f) Explain what is meant by a **suspension** of magnesium hydroxide.

.....

..... (2)

(g) What would you expect to happen to the temperature when an acid reacts with an alkali? Explain your answer.

.....

..... (2)

(h) When an acid reacts with an alkali, what would you expect to happen to the total mass? Explain your answer.

.....

..... (2)

5. Acids, such as sulphuric acid, will react with some metals to give hydrogen gas.

(a) Draw a diagram of the apparatus you could use to collect a sample of hydrogen, labelling the acid, the metal and the hydrogen.

(5)

The following data apply to five different metals which might be used in (a).

name	description	volume of hydrogen produced from 1 kilogram of metal, in m^3	price of metal, in £ per kilogram
aluminium	thick foil	1.3	55
copper	small turnings	none	18
iron	powder	0.4	3
magnesium	ribbon	1.0	230
zinc	small lumps	0.4	11

(b) Why does copper give no hydrogen?

.....

..... (2)

(c) The aluminium releases the hydrogen very slowly. One way to speed up the rate of reaction would be to increase the concentration of the acid. Give two other ways.

1 ..... (1)

2 ..... (1)

(d) Either of the ways in (c) could result in the reaction becoming hazardous. For one of these ways, explain the hazard and state what you could do to minimise it.

.....

.....

.....

..... (2)

(e) Which metal gives the most hydrogen per kilogram?

..... (1)

(f) You wish to make hydrogen as cheaply as possible. Explain which metal you would choose.

.....

.....

..... (2)

(g) Why do you think that magnesium is the most expensive metal?

.....

..... (2)

6. Here is some information about four colourless liquids, **A**, **B**, **C** and **D**.
What can you deduce about each of them?

(a) **A** boiled at 100 °C and turned blue cobalt chloride pink.

.....

.....

..... (2)

(b) **B** boiled at 104 °C and turned blue cobalt chloride pink.

.....

.....

..... (2)

(c) **C** boiled at 100 °C and did not turn blue cobalt chloride pink.

.....

.....

..... (2)

(d) **D** froze at 0 °C and turned white copper sulphate blue.

.....

.....

..... (2)

(Total marks: 60)