



**SCHOLARSHIP EXAMINATION**

**CHEMISTRY**

**2014**

Time: 30 minutes

Total: 35 marks available

Name: .....

School: .....

**Instructions to Candidates**

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

Read the questions carefully.

1. (a) The list below gives six substances.

- aluminium
- beer
- copper
- milk
- pure water
- sodium chloride

Put each substance in the correct column of the table.

| ELEMENTS | COMPOUNDS | MIXTURES |
|----------|-----------|----------|
|          |           |          |
|          |           |          |

(3)

(b) Elements can be divided into two groups, metals and non-metals.  
The list below gives some properties of elements.

- brittle
- can be hammered into shape
- dull
- good conductors of electricity
- poor conductors of electricity
- shiny

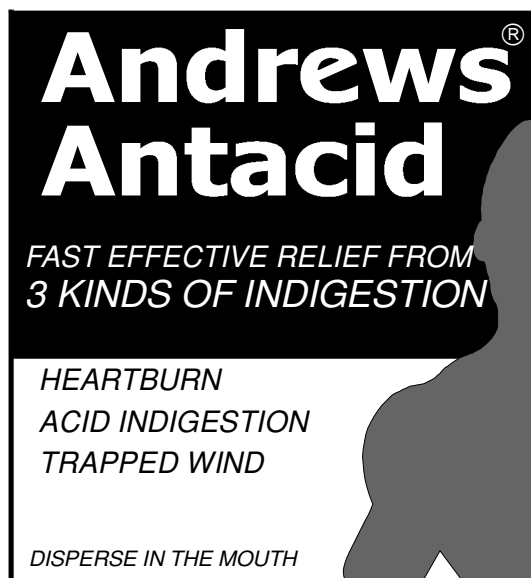
Put each property into the correct column.

| PROPERTIES OF METALS | PROPERTIES OF NON-METALS |
|----------------------|--------------------------|
|                      |                          |
|                      |                          |
|                      |                          |

(3)

2. This label has been taken from a packet of indigestion tablets.

The back of the packet tells you that the tablets work by neutralising some of the acid in your stomach.



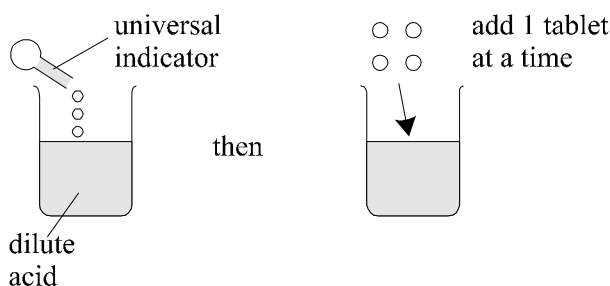
- (a) What happens to the pH inside your stomach as the tablets neutralise some of the acid?

.....  
.....

(2)

- (b) Some students decide to find out how many tablets are needed to neutralise some acid in a beaker.

The diagrams show what they did. How would the students know when the acid had been neutralised?



.....  
.....

(2)

3. Use the Reactivity Series of Metals on the Data Sheet to help you to answer this question.

The table gives information about the extraction of some metals.

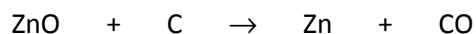
| Metal  | Date of discovery              | Main source                      | Main extraction method                                   |
|--------|--------------------------------|----------------------------------|--|
| Gold   | Known to ancient civilisations | In the Earth as the metal itself | Physically separating it from the rocks it is mixed with |
| Zinc   | 1500                           | Zinc carbonate                   | Reduction by carbon                                      |
| Sodium | 1807                           | Sodium chloride                  | Electrolysis   |

(a) Explain why gold is found mainly as the metal itself in the Earth.

.....  
.....

(1)

(b) One of the reactions involved in producing zinc is represented by this equation.



Explain why carbon can be used to extract zinc.

.....  
.....

(1)

(c) Sodium is one of the most abundant metals on Earth.

Explain, as fully as you can, why sodium was not extracted until 1807.

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

(2)

4.

## Why blue sweets are turning white

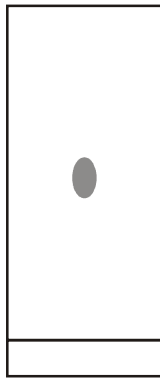
A recent study identified a possible harmful effect on children's nervous systems by some artificial colours. Two of these colours are Brilliant Blue (E133) and Quinoline Yellow (E104). Both are artificial colours because they are made from coal. The company is to stop producing the blue sweets because it is removing all artificial colours and there is no natural blue alternative.

(a) Suggest why it is important to be able to identify the colour additives in food.

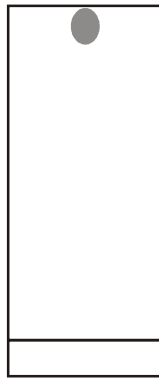
.....  
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(1)

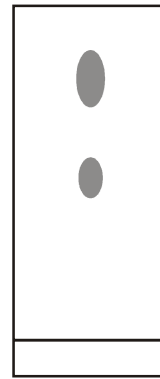
(b) A brown colour used in sweets was analysed using chromatography. The results were compared with those from E104 and E133.



E104



E133



Brown colour

What do the results tell you about the brown colour and its suitability for use in sweets?

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

(3)

- (c) Once all the unsuitable colours are removed, the company claims that its sweets are now 'free from artificial colours'.

Does this mean that the sweets contain no additives? Explain your answer.

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

(2)  
(Total 6 marks)

5. The information in the box is about the preparation of copper sulphate crystals.

|               |   |
|---------------|---|
| <b>Step 1</b> | Add a small amount of black copper oxide to some hot dilute sulphuric acid, and stir.                   |
| <b>Step 2</b> | Keep adding copper oxide until it is in excess.   |
| <b>Step 3</b> | Remove the excess copper oxide to leave blue copper sulphate solution.                                  |
| <b>Step 4</b> | Evaporate the copper sulphate solution until it is saturated.   |
| <b>Step 5</b> | Leave the saturated solution of copper sulphate to cool. Blue copper sulphate crystals form on cooling. |
| <b>Step 6</b> | Remove the crystals from the solution remaining.  |
| <b>Step 7</b> | Dry the blue crystals on a piece of filter paper.   |

- (a) (i) Suggest a reason for using excess copper oxide in Step 2.

.....  
.....

(1)

- (ii) Suggest how the excess copper oxide can be removed from the solution in Step 3.

.....  
.....

(1)

(iii) What is meant by the term *saturated solution*?

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

**(1)**

**6.** Vanadium is a metal you may not have heard of before. It is used to make special steel for tools such as spanners.

**Vanadium comes below aluminium but above zinc in the Reactivity Series**

a) Write a word equation for the following reactions. In some cases there is no reaction – just write “no reaction”

(i) A piece of Vanadium is dipped into copper sulphate solution. **(1)**

(ii) Vanadium is heated with zinc oxide. **(1)**

(iii) A piece of Vanadium is dipped into sodium chloride solution. **(1)**

**(iv)** Vanadium is added to hydrochloric acid. **(1)**

(v) Do you think Vanadium would react with cold water?  
Give reasons for your answer. **(1)**

7. Complete the following general word equations

(a) Acid + Base → \_\_\_\_\_ + \_\_\_\_\_

(b) Acid + metal → \_\_\_\_\_ + \_\_\_\_\_

(c) Acid + metal carbonate → \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ (3)

8. Complete the following word equations

a. Magnesium + sulphuric acid → (1)

b. Calcium carbonate + hydrochloric acid → (1)

c. Sodium hydroxide + nitric acid → (1)

9. What is the formula of sulphuric acid? (1)