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Level 1 Science, 2016

90944 Demonstrate understanding of aspects of acids and bases

9.30 a.m. Monday 14 November 2016
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of acids and bases.	Demonstrate in-depth understanding of aspects of acids and bases.	Demonstrate comprehensive understanding of aspects of acids and bases.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Pull out Resource Booklet 90944R from the centre of this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

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QUESTION ONE

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(a) Complete the table below.

Element	Atomic number	Electron arrangement of atom	Electron arrangement of ion
F	9		
S	16		
Ca	20		

(b) Write the formulae for the following ionic compounds.

Use the table of ions in your resource booklet to help you.

(i) Silver fluoride _____

(ii) Potassium sulfate _____

(iii) Calcium nitrate _____

(c) Sodium burns in oxygen gas, O_2, to form sodium oxide, Na_2O.

(i) Explain how the Na and O atoms form Na^+ and O^{2-} ions, in terms of their groups in the periodic table, electron arrangement, AND number of protons.

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(ii) Justify the ratio of Na^+ and O^{2-} ions in the formula Na_2O, in terms of the **electrons** lost or gained, and the **charge** on each ion.

Include an explanation of the **type of bonding** between the Na^+ and O^{2-} ions.

(d) Write a word equation AND a balanced symbol equation for the reaction between **sodium hydroxide** and **sulfuric acid**.

Word equation:

Balanced symbol equation:

QUESTION TWO

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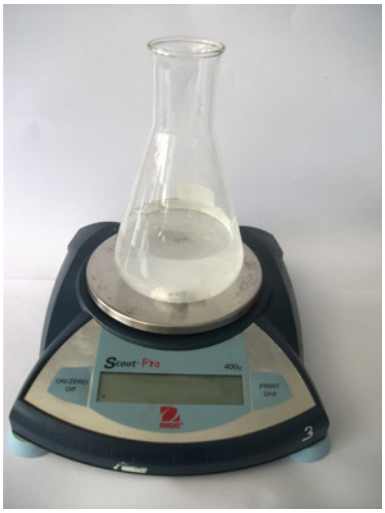
A sample of calcium carbonate is added to dilute hydrochloric acid in an open conical flask. The total mass of the flask and contents is measured over time.

Three experiments are carried out at 25°C using the same mass of calcium carbonate, and the same volume of acid:

	Calcium carbonate pieces	pH of acid
Experiment 1	Chips	1
Experiment 2	Powdered	1
Experiment 3	Powdered	5



(a) For each of the experiments reacting calcium carbonate and dilute acid together, the mass of the flask and its contents decreases over time.

Describe why this happens.

(b) (i) Identify the factor affecting the reaction rate being investigated in **Experiments 1 and 2**.

(ii) Explain how this factor affects the rate of reaction in the two flasks, with reference to particle collisions.

Explain any observations, including changes in mass, over the course of **Experiments 1 and 2** until the reactions are finished.

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(c) Compare and contrast the rate of reaction of **Experiments 2 and 3**, with reference to particle collisions and the concentration of hydrogen ions in the solution.

QUESTION THREE

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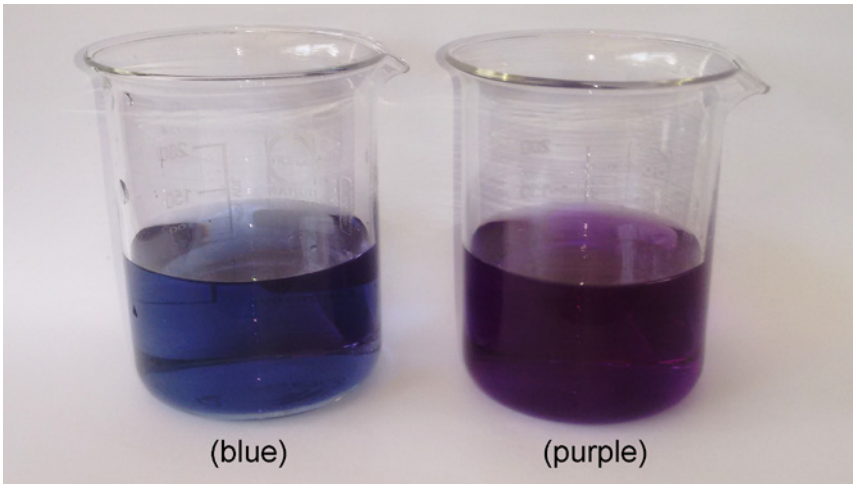
A student added universal indicator to the solutions in two beakers as shown below.



Beaker 1
Potassium carbonate

Beaker 2
Potassium hydroxide

(a) Explain why the solutions are different colours.

The student then adds hydrochloric acid to each of the beakers until there are no more changes in colour.

(b) Write a word equation AND a balanced symbol equation for the reaction between **hydrochloric acid** and **potassium carbonate** in Beaker 1.

Word equation:

Balanced symbol equation:

(c) Explain what will happen to the indicator colour in **Beaker 2 (potassium hydroxide)** as the hydrochloric acid is added.

Relate this to the changing pH, the ions present in the beaker, and the type of reaction occurring.

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Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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