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90944



## Level 1 Science, 2019

# 90944 Demonstrate understanding of aspects of acids and bases

9.30 a.m. Thursday 14 November 2019 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

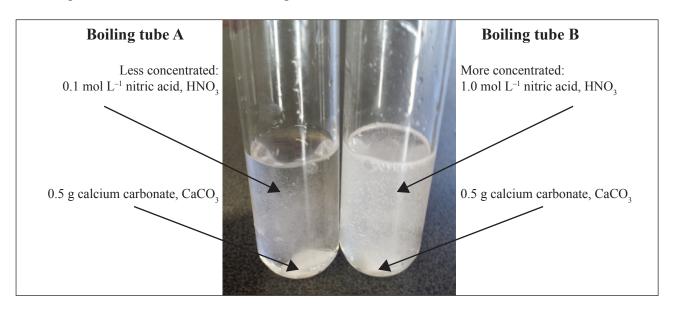
#### **QUESTION ONE**

Word equation

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Two boiling tubes both contain 10 mL of nitric acid,  $HNO_3$ . Boiling tube A contains a 0.1 mol  $L^{-1}$  solution of nitric acid and boiling tube B contains a more concentrated 1.0 mol  $L^{-1}$  solution of nitric acid. A piece of marble chip (calcium carbonate,  $CaCO_3$ ) with a mass of 0.5 g is added to each boiling tube and the reaction is observed and photographed.

The temperature of the acid in both boiling tubes is 20°C.



(a) Write the word equation AND the balanced symbol equation for the reaction between the nitric acid and calcium carbonate.

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Balanced symbol equation	

(b) Explain the effect of using a higher concentration of nitric acid on the **rate** of this reaction, compared to using a lower concentration of acid.

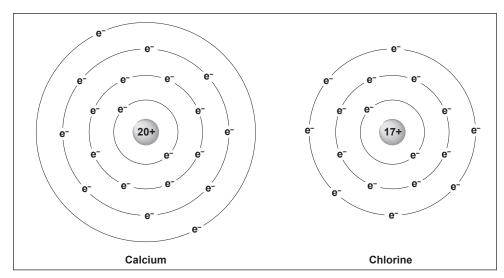
Your answer should refer to particle collisions.

c n	n a second investigation, two different boiling tubes each contain 10 mL of the same oncentration 1 mol $L^{-1}$ nitric acid, HNO <sub>3</sub> . The nitric acid in boiling tube A is at 20°C and the itric acid in boiling tube B is at 40°C. A piece of marble chip (calcium carbonate, CaCO <sub>3</sub> ) with a mass of 0.5 g is added to each boiling tube, and the reaction is observed.
	explain the effect of increasing the temperature of the nitric acid from 20°C to 40°C on the <b>ate</b> of reaction.
Y	our answer should refer to particle collisions.
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#### **QUESTION TWO**

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The diagram shows models of two atoms.



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(a)	Write the	electronic	arrangemen	t of the	two atoms

Calcium atom, Ca:

Chlorine atom, Cl:

### (b) Calcium and chlorine atoms both form ions with the same **electron arrangement**.

(i) Write the electronic arrangement of the two ions.

Calcium ion, Ca<sup>2+</sup>:

Chloride ion, Cl<sup>-</sup>:

(ii) Explain how each ion, Ca<sup>2+</sup> and Cl<sup>-</sup>, is formed.

In your answer you should:

- explain why these elements form ions
- explain the charges on both **ions** in terms of electron arrangement of atoms and ions, number of protons and number of electrons, and charge.

Calcium ion, Ca<sup>2+</sup>:

	Chloride ion, Cl <sup>-</sup> :	_
		_
		_
		_
		_
Calc	ium reacts with chlorine, forming the ionic compound calcium chloride, CaCl <sub>2</sub> .	
Expl	ain the ratio of calcium ions to chloride ions in CaCl <sub>2</sub> .	
n yo	our answer you should explain:	
,	how the ratio is related to the charge on the ions	
,	the number of electrons gained or lost by each atom as it forms the ionic compound.	
	the number of electrons gamed of lost by each atom as it forms the forme compound.	
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#### **QUESTION THREE**

(ii)

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- (a) Three unlabelled bottles containing different colourless solutions are known to be:
  - hydrochloric acid, HCl
  - sodium chloride, NaCl
  - sodium hydroxide, NaOH.

These unlabelled solutions can be identified using red litmus paper and baking soda, NaHCO<sub>3</sub>.

(i) Complete the table

Unlabelled solution	Observation (if any)		
Unlabelled solution	with red litmus paper	with baking soda, NaHCO <sub>3</sub>	
hydrochloric acid, HCl			
sodium chloride, NaCl			
sodium hydroxide, NaOH			

Explain how the observations allow you to identify each solution, giving reasons for any changes or reactions occurring.				

uIIU	ric acid, H <sub>2</sub> SO <sub>4</sub> .	
i)	Name the type of reaction occurring.	
ii)	Write the word and the balanced symbol equation for this reaction.	_
	Word equation	
	Balanced symbol equation	
iii)	Describe how you could make <b>solid</b> copper sulfate crystals in a school laboratory.  In your answer, include how you would know the reaction had been completed.	
	in your answer, incrude now you would know the reaction had been completed.	_
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	Extra paper if required.	
QUESTION	Write the question number(s) if applicable.	
QUESTION NUMBER		