

# No Brain Too Small



## Level 1 Science Practice Exam 2

### 90944 Demonstrate understanding of aspects of acids and bases

Credits: Four

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
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

You should attempt all the questions in this booklet.

A table of ions (page 2) and periodic table (page 14) are included.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

### Table of ions

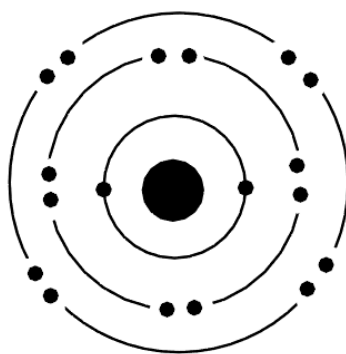
+1	+2	+3	-3	-2	-1
$\text{NH}_4^+$	$\text{Ca}^{2+}$	$\text{Al}^{3+}$		$\text{O}^{2-}$	$\text{OH}^-$
$\text{Na}^+$	$\text{Mg}^{2+}$	$\text{Fe}^{3+}$		$\text{S}^{2-}$	$\text{Cl}^-$
$\text{K}^+$	$\text{Cu}^{2+}$			$\text{CO}_3^{2-}$	$\text{NO}_3^-$
$\text{Ag}^+$	$\text{Pb}^{2+}$			$\text{SO}_4^{2-}$	$\text{HCO}_3^-$
$\text{H}^+$	$\text{Fe}^{2+}$				
$\text{Li}^+$	$\text{Ba}^{2+}$				
	$\text{Zn}^{2+}$				

**Question One: Atoms, Ions and Formulae.**

(a) Write the formulae for the following ionic compounds. Use the Table of Ions to help you.

- (i) aluminium chloride \_\_\_\_\_
- (ii) silver sulfate \_\_\_\_\_
- (iii) lead nitrate \_\_\_\_\_

The diagram shows the electron arrangement of an unknown substance.



(b) Discuss the identity of the substance.

In your answer:

- discuss the number of protons there would be
- identify which group and period of the Periodic table the substance would be found
- identify the substance by name

(i) If it was a neutral atom.

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(ii) If it was a 2+ ion

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(iii) If it was a 1- ion

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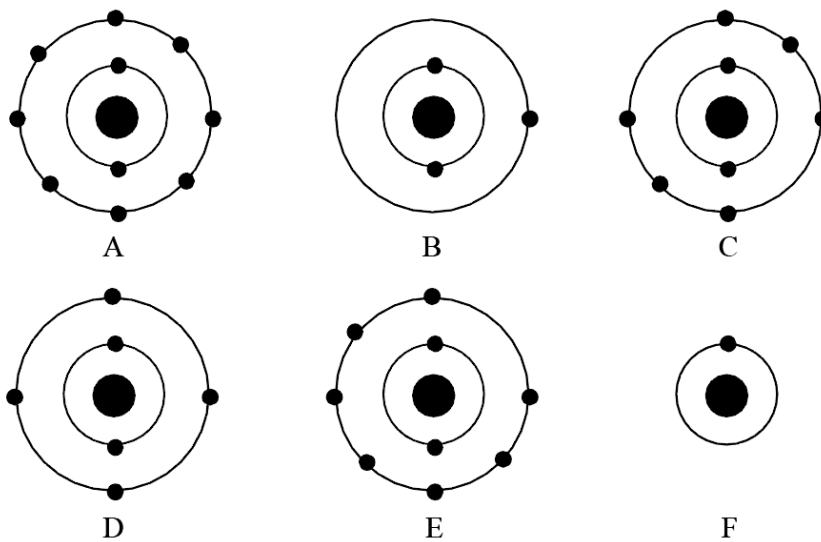
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(c) The diagrams below represent the electron arrangement of some different atoms.



Which two letters represent atoms which will form an ionic compound with a formula similar to  $\text{Na}_2\text{S}$ ?

In your answer:

- consider the ratio of ions in the formula  $\text{Na}_2\text{S}$  and explain how the ratio is related to the charge on the ions
- relate the ratio of ions in the formula to the number of electrons lost or gained by each atom.

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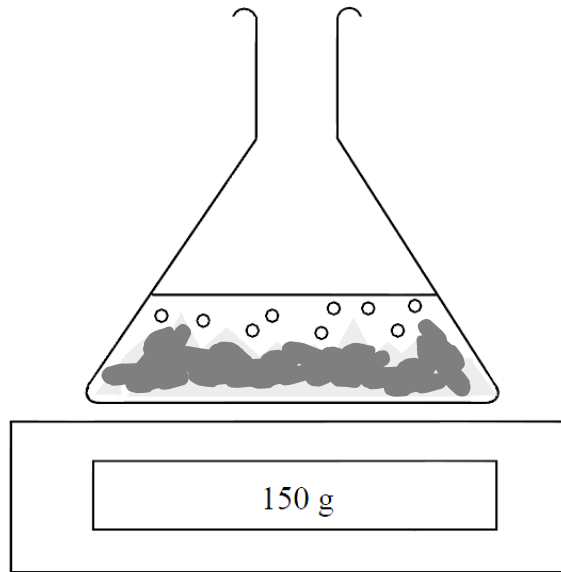
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**Question Two: Rates of reaction**

The diagram shows a flask of zinc metal reacting with sulfuric acid on a chemical balance.



(a) Explain how this apparatus could be used to measure the rate of the reaction?

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(b) What is the gas being produced and how would you test the gas to identify it?

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(c) Write a word equation AND a balanced symbol equation for the reaction between sulfuric acid and zinc.

Word equation:

Balanced symbol equation:

(d) How would you expect the results to change if the zinc was ground into a fine powder? In your answer you should refer to rates of reaction and particle collisions.

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(d) Some students repeated the experiment but this time wrapped some copper wire around the pieces of zinc. They discovered that

- the reaction occurred at a much **faster rate**
- the **mass** of the copper wire was unchanged at the end of the experiment



Explain these observations.

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**Question Three: Indigestion problems**

Antacid tablets are used to treat indigestion, which is caused by excess acid in the stomach. Details of four solids, which are used to neutralise stomach acid, are shown in the table below.

Name of solid	Formula	Reaction with acid
Magnesium carbonate		fizzes
	$\text{CaCO}_3$	
Magnesium hydroxide	$\text{Mg(OH)}_2$	does not fizz
Aluminium hydroxide	$\text{Al(OH)}_3$	does not fizz

- (a) Complete the table.
- (b) Write a word equation AND a balanced symbol equation for the reaction between magnesium hydroxide and hydrochloric acid.

Word equation:

Balanced symbol equation:

An experiment was done to find out how much solid was needed to neutralise 20 mL of hydrochloric acid. The results are shown below.

Solid	Mass of solid to neutralise 20 mL of acid
Magnesium carbonate	0.75 g
CaCO <sub>3</sub>	1.22 g
Magnesium hydroxide	0.60 g
Aluminium hydroxide	0.39 g

(c) (i) Which solid is the most effective at neutralising the hydrochloric acid?

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(ii) How did you decide this?

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(d) Describe how you would know that the acid had been neutralised.

In your answer you should:

- include details of the indicator you would use
- discuss the observations you would expect to make during the neutralisation
- explain the relationship between the changing pH of the solution and the amount of hydrogen and hydroxide ions as the solid is added to the beaker.

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**Question Four: Using Acids in the Laboratory**

Matthew spilt some acid on the floor. He looked at the possibility of treating it with one of four chemicals substances. Their properties are shown in the table below.

Substance	pH	Reaction with acid
A	13.0	Produces a salt and water
B	8.5	Produces a salt and water and carbon dioxide
C	8.0	Produces a salt and water
D	2.5	No reaction

(a) Consider the four substances and discuss which one(s) Matthew should choose.

In your answer you should:

- explain why a substance(s) would be useless for the purpose
- explain why a substance(s) should be avoided
- explain why the substance(s) you chose would be the most effective at telling you when the entire acid spill had been dealt with.

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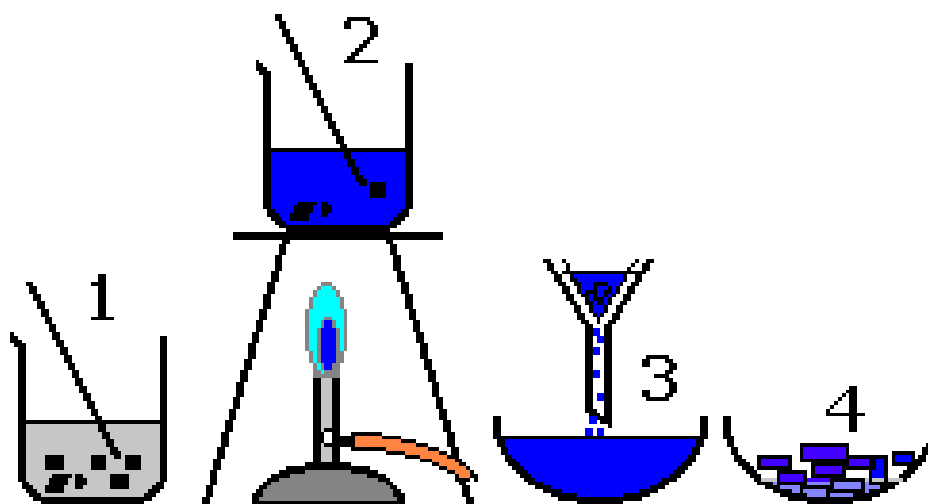
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(b) Describe how to make a sample of pure copper nitrate crystals in the laboratory.  
In your answer you should:

- identify suitable chemicals you would use.
- refer to stages 1-4 in the diagram, explaining their purpose
- write a word equation AND a balanced symbol equation for the reaction you have chosen.



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## PERIODIC TABLE OF THE ELEMENTS

Atomic Number																		1	18																	
3	4																	2																		
<b>Li</b>	<b>Be</b>																	<b>He</b>																		
11	12																	10																		
<b>Na</b>	<b>Mg</b>																	<b>Ne</b>																		
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36																			
<b>K</b>	<b>Ca</b>	<b>Sc</b>	<b>Ti</b>	<b>V</b>	<b>Cr</b>	<b>Mn</b>	<b>Fe</b>	<b>Co</b>	<b>Ni</b>	<b>Cu</b>	<b>Zn</b>	<b>Ga</b>	<b>Ge</b>	<b>As</b>	<b>Se</b>	<b>Br</b>	<b>Kr</b>																			
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54																			
<b>Rb</b>	<b>Sr</b>	<b>Y</b>	<b>Zr</b>	<b>Nb</b>	<b>Mo</b>	<b>Tc</b>	<b>Ru</b>	<b>Rh</b>	<b>Pd</b>	<b>Ag</b>	<b>Cd</b>	<b>In</b>	<b>Sn</b>	<b>Sb</b>	<b>Te</b>	<b>I</b>	<b>Xe</b>																			
55	56	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86																			
<b>Cs</b>	<b>Ba</b>	<b>Lu</b>	<b>Hf</b>	<b>Ta</b>	<b>W</b>	<b>Re</b>	<b>Os</b>	<b>Ir</b>	<b>Pt</b>	<b>Au</b>	<b>Hg</b>	<b>Tl</b>	<b>Pb</b>	<b>Bi</b>	<b>Po</b>	<b>At</b>	<b>Rn</b>																			
87	88	103	104	105	106	107	108	109	110	111																										
<b>Fr</b>	<b>Ra</b>	<b>Lr</b>	<b>Rf</b>	<b>Db</b>	<b>Sg</b>	<b>Bh</b>	<b>Hs</b>	<b>Mt</b>	<b>Ds</b>	<b>Rg</b>																										