

O Level Combined Chemistry Structured

Periodic Table Test 1.0

Q1

Lithium, sodium and potassium are in Group I of the Periodic Table.

(a) Explain why these metals belong to Group I.

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..... [1]

(b) Describe an experiment to show a trend in the reactivity of these metals with a compound of your choice.

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..... [3]

- (c) Caesium, Cs is also in Group I. How would the reaction of caesium differ with this same compound from (a). Write a full chemical equation for this reaction.

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..... [4]

- (d) Suggest how these metals can be obtained from its ore. Explain your answer.

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..... [2]

DANYAL
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Q2

Students give their own special symbols to five non-metallic elements. All five non-metals are in the same group of the Periodic Table. The special symbols are shown in Fig. 5.1.

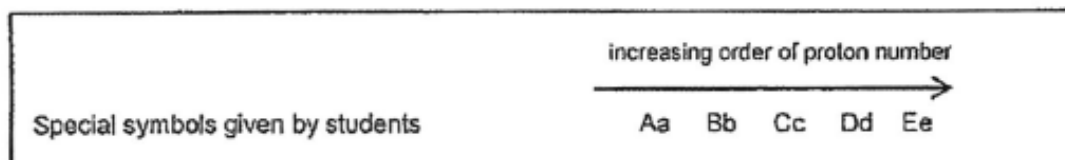


Fig. 5.1

The students know the following:

1. Sodium, Na, reacts with the non-metal of the given symbol, **Bb**.
The compound formed has the chemical formula NaBb.
2. The elements exist as diatomic molecules.

- (a) (i) In which group of the Periodic Table are these non-metallic elements placed?
.....[1]
- (ii) Choose from Fig. 5.1 the special symbol of the element which is most likely to be a solid at room temperature and pressure.
.....[1]
- (b) (i) Suggest the name of the element given the special symbol **Bb** by the students.
.....[1]
- (ii) Write the special symbol of the element most likely to displace **Bb** from a solution containing ions of **Bb**.
.....[1]
- (iii) Use the special symbols to write an ionic equation for the displacement reaction in (b)(ii). State symbols are not required.
.....[2]

Q3

The Periodic Table printed on page 15 lists the elements in increasing proton number. Use the Periodic Table to help you answer these questions.

- (a) (i) An inspection of the electronic structure of an element's atom can give its group and period. Using any element from the first 20 elements in the Periodic Table, explain how the electronic structure can be used to determine which group and period the element is in.

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.....[3]

- (ii) On moving across from Group I to Group VII, the character of the elements changes. Describe and explain the change.

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.....[3]

- (b) Sodium and the element of proton number 12 can undergo similar chemical reactions. '

Describe two of these similar reactions. Write a balanced chemical equation for one of the reactions you have described. Include state symbols.

Reaction 1

Reaction 2

Chemical equation

Q4

The table below describes the reactions of Group II elements when added to cold water.

element	reaction with cold water
beryllium	no reaction
magnesium	very slow reaction
calcium	fairly vigorous reaction
strontium	very fast reaction

(a) Barium lies below strontium in Group II. Predict, giving a reason, how you would expect barium to react with cold water.

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[2]

(b) The table below shows some properties of three elements in the Periodic Table.

element	malleable or brittle	melting point (°C)	boiling point (°C)	appearance	electrical conductivity
aluminium	malleable	660	2519	shiny solid	good
silicon	brittle	1414	3265	shiny solid	semi-conductor
phosphorus	brittle	44	280	white solid	poor

Describe how the information in the table shows that silicon is difficult to be classified as a metal or a non-metal.

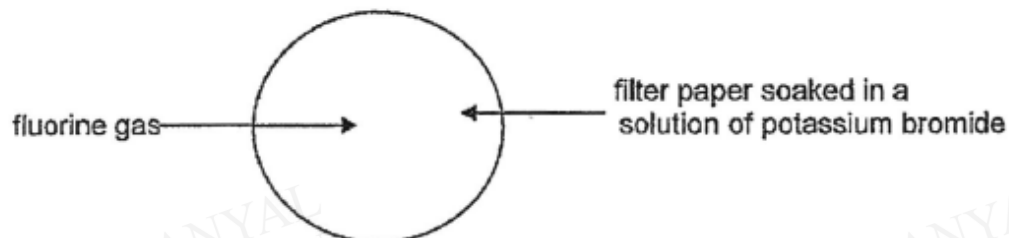
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[2]

Q5

(a) Fluorine is an element in Group VII.

A jet of fluorine is aimed at a filter paper soaked in a solution of potassium bromide.



The solution on the filter paper quickly turns brown.

[5]

(i) Explain why the solution turns brown.
Include an equation to support your answer.

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[2]

(ii) Draw a molecule of fluorine showing all electrons.

[2]

Answers

Periodic Table Test 1.0

Q1

(a)	All the metals have 1 valence electrons Accept : need to lose 1 electron	[1]
(b)	Add the metals in a test tube containing water/acid. A compound used must be stated clearly	[1]
	Observe the reaction / effervescence produced in each of the test tube. Accept : displacement or any other observations stated	[1]
	Lithium will produce least effervescence or slow reaction as it is placed top in the group 1. Sodium will produce the most number of effervescence or fast reaction as it is placed below potassium and lithium in group 1 Accept : comparison is made	[1]
(c)	Cesium will produce an explosion when reacted with water/acid.	[1]
	Cesium is more reactive than lithium, potassium and sodium.	[1]
	Cesium is placed below lithium, potassium and sodium in the periodic table. Accept Easier to lose electrons as the number of shell is more	[1]
	$Cs + H_2O \rightarrow CsOH + H_2$ OR any correct equation	[1]
(d)	These metals are extracted through electrolysis	[1]
	These metals are placed high in the reactivity series.	[1]

Q2

(a)(i) Group VII (reject: Halogens, Group 7)	1m
(a)(ii) Dd or Ee (either one)	Either one – 1m
(b)(i) Chlorine (reject if written chemical symbol, Cl)	1m
(b)(ii) Aa	1m
(b)(iii) $Aa_2 + 2Bb \rightarrow 2Aa + Bb_2$	1m – correct formula of substances 1m – balance

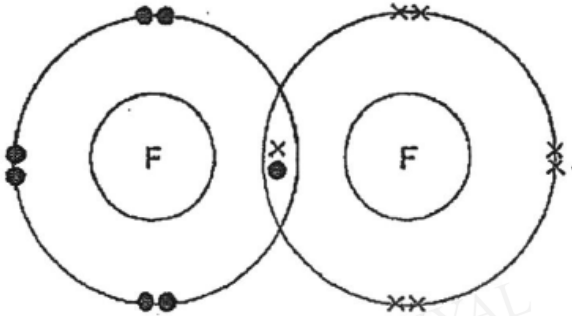
Q3

<p>(a)(i)</p> <p>Name of element: Sodium (example) / Argon (example)</p> <p>The <u>electronic structure of sodium is 2.8.1</u>, which means it has <u>one valence electron and 3 electron shells</u>. Hence, it is placed in Group I, Period 3.</p> <p>The <u>electronic structure of fluorine is 2.7</u>, which means it has <u>seven valence electrons and 2 electron shells</u>. Hence, it is placed in <u>group VII, Period 2</u>.</p>	<p>1m: name a correct element in Period 3</p> <p>1m: write the electronic structure accurately</p> <p>1m: link the number of valence electron to group number and electron shells to period</p>
<p>(a)(ii)</p> <p>Moving across from Group I to VII,</p> <ul style="list-style-type: none"> - there is a <u>decrease in metallic properties and an increase in non-metallic properties</u>; - elements <u>changes from metallic to non-metallic</u> <p>Reason: The <u>number of valence electrons increase</u>. Hence, the <u>elements ability to lose electrons decreases (less metallic) while the ability to gain electrons increase (more non-metallic)</u>.</p>	<p>1m – accurate description of the trend</p> <p>1m: recognise that number of valence electrons increase across period</p> <p>1m: ability to lose/gain electrons change accordingly.</p>
<p>(b)</p> <p>Reaction 1: Both metals can react with <u>dilute acid</u> Both elements react with acid to <u>produce salt and hydrogen gas</u> [1]</p> <p>Reaction 2: Both metals can react with <u>oxygen</u> Both elements react with oxygen to form <u>metal oxides</u>. [1]</p> <p>Chemical equation:</p> <p>$Mg (s) + 2HCl (aq) \rightarrow MgCl_2 (aq) + H_2 (g)$ $2Na (s) + 2HCl (aq) \rightarrow 2NaCl (aq) + H_2 (g)$</p> <p>or</p> <p>$2Mg (s) + O_2 (g) \rightarrow 2MgO (s)$ $4Na (s) + O_2 (g) \rightarrow 2Na_2O (s)$</p>	<p>1m for each reaction described</p> <p>1m: balanced chemical equation</p> <p>1m: state symbols included are accurate</p>

Q4

(a)	Violent/extremely vigorous Reactivity increases down Group	1 1
(b)	It is brittle as non-metal but conducts electricity like metal/ or has high mp like most metals	1 1

Q5

(a)	(i) Fluorine higher than/more reactive than bromine in Group VII. Fluorine displaces bromine from its salt solution $2KBr + F_2 \longrightarrow 2KF + Br_2$	1 1
(ii)		2