Predicting chemical reactions – 2021/20 GCSE Gateway Chemistry Combined Science A

1. Nov/2021/Paper_J250/04/No.2

The table shows information about four different elements.

	Description of element at room temperature	Description of reactivity
A	colourless gas	reactive
B	pale yellow gas	very reactive
C	silvery liquid	unreactive
D	shiny solid	very reactive

Which element, **A**, **B**, **C** or **D**, is in Group 7 of the Periodic Table?

Your answer ☐ **[1]**

2. Nov/2021/Paper_J250/04/No.5

Which statement about the Group 0 elements is correct?

A They exist as simple molecules.

B They exist as single atoms.

C They react to form giant covalent molecules.

D They react to form ionic compounds.

Your answer ☐ **[1]**

3. Nov/2021/Paper_J250/04/No.11

In 2010, scientists discovered a new Group 7 element called tennessine. Its symbol is Ts.

The diagram shows where tennessine is placed in Group 7 of the Periodic Table.

F fluorine
Cl chlorine
Br bromine
I iodine
At astatine
Ts tennessine

Use your knowledge of the properties and trends of the Group 7 elements to **predict** the answer to the following questions.

(a) How many outer shell electrons are there in an atom of tennessine?

Put a (ring) around the correct answer.

1 **7** **17**

[1]

(b) What is the reactivity of tennessine compared to astatine?

Put a (ring) around the correct answer.

less reactive **more reactive** **the same**

[1]

(c) What is the physical state of tennessine at room temperature?

Put a (ring) around the correct answer.

gas **liquid** **solid**

[1]

(d) What is the melting point of tennessine compared to astatine?

Put a (ring) around the correct answer.

higher **lower** **the same**

[1]

4. Nov/2021/Paper_J250/04/No.12

This question is about the Group 1 metals.

(a) A teacher adds a small piece of a Group 1 metal to a trough of water, as shown in **Fig. 12.1**.

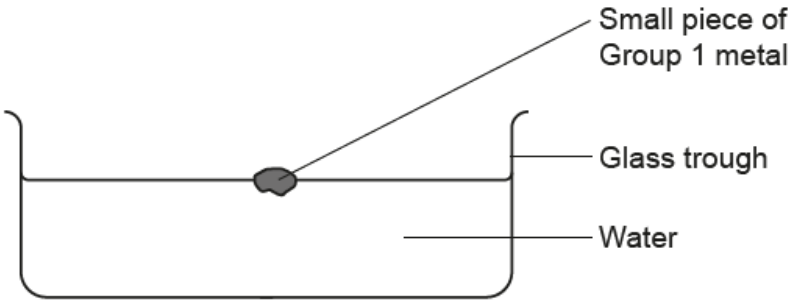

Fig. 12.1

The metal burns with a lilac flame, sparks and explodes.

Which Group 1 metal did the teacher add to the water in **Fig. 12.1**?

Put a (ring) around the correct answer.

lithium **sodium** **potassium** **rubidium** **caesium**

[1]

(b) Sodium is a soft metal with a dull coating.

It is shiny when it is freshly cut.

After several seconds, the shiny surface goes dull.

(i) Which gas in the air reacts with the sodium as it goes dull?

..... **[1]**

(ii) What is the name of the chemical compound made as the sodium goes dull?

..... **[1]**

(iii) How long would it take a piece of freshly cut lithium to go dull compared to sodium?

Give a reason for your answer.

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..... **[2]**

(c) **Fig. 12.2** shows the trend in the density of the Group 1 metals from lithium to caesium.

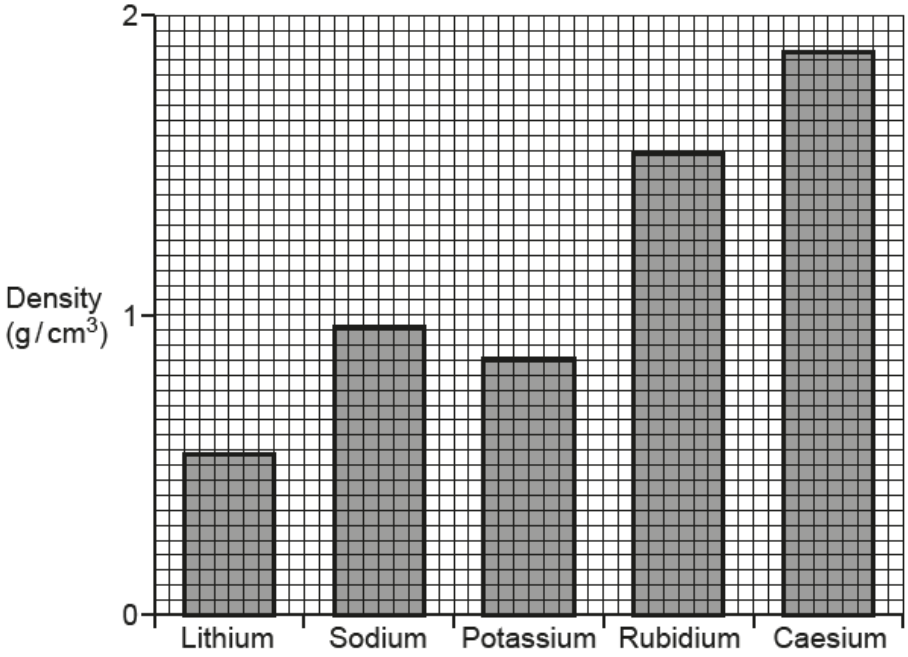


Fig. 12.2

Which Group 1 metal does not fit the general trend?

Give a reason for your answer using information from **Fig. 12.2**.

.....

.....

..... **[2]**

5. Nov/2020/Paper_J250/04/No.12

This question is about different Groups in the Periodic Table.

(a) The elements in Group 7 have different physical properties at room temperature.

Draw a line to connect each **Group 7 element** with its correct **description**.

Group 7 element	Description
Fluorine	Green gas
Chlorine	Grey-black solid
Bromine	Orange-brown liquid
Iodine	Pale-yellow gas

[3]

(b) The Group 7 elements show trends in their chemical properties as you go down the Group.

(i) Use these words to complete the sentences.

You can use each word once, more than once, or not at all.

astatine **bromine** **chlorine** **electrons**

fluorine **ions** **neutrons** **protons**

The most reactive element in Group 7 is ..... .

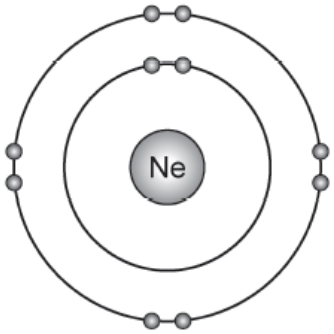
This is because its atoms gain ..... more easily than atoms of the other elements. **[2]**

(ii) State why the elements in Group 7 have similar chemical properties.

.....

..... **[1]**

(c) The diagram shows the arrangement of electrons in an atom of neon.



How reactive is neon? Explain your answer.

Use ideas about electrons in your answer.

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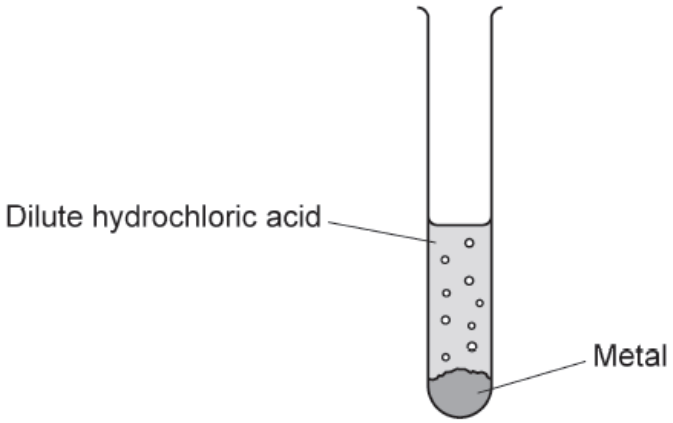
..... **[3]**

6. Nov/2020/Paper_J250/04/No.16

The diagram shows the reaction of a metal with dilute hydrochloric acid.



A student thinks she can use this reaction to place four different metals in their order of reactivity.

Describe a method the student could use to get valid results **and** explain how the student would use the results to place the metals in an order of reactivity.

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.....

..... **[6]**

7. Nov/2021/Paper_J250/10/No.4

The table shows some information about the Group 7 elements.

Group 7 element	Melting point (°C)	Boiling point (°C)
fluorine	−220	−188
chlorine	−101	−34
bromine	−7	59
iodine	114	185

How many Group 7 elements are liquid at −40 °C?

A 0

B 1

C 2

D 3

Your answer ☐ **[1]**

8. Nov/2021/Paper_J250/10/No.9

Silver, Ag, does **not** react with dilute hydrochloric acid, HC*l*.

Which statement is the correct explanation for this?

A Silver forms negative ions less easily than chlorine.

B Silver forms negative ions more easily than chlorine.

C Silver forms positive ions less easily than hydrogen.

D Silver forms positive ions more easily than hydrogen.

Your answer ☐ **[1]**

9. Nov/2021/Paper_J250/10/No.13

A teacher demonstrates the reactions of the Group 1 metals with water.

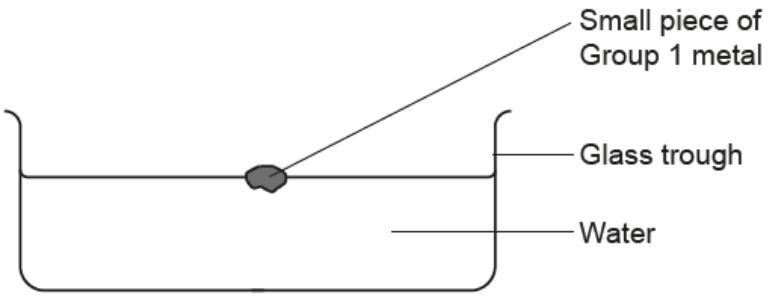


Table 13.1 shows information about how the first four elements in Group 1 react with water.

Element	Observations with cold water	Formulae of products
Lithium	Fizzes and moves slowly across the surface of the water.	LiOH(aq) $H_2(g)$
Sodium	Fizzes, melts into a silvery ball and moves quickly across the surface of the water.	NaOH(aq) $H_2(g)$
Potassium		KOH(aq) $H_2(g)$
Rubidium	Explodes with a white flame.	....

Table 13.1

(a) When potassium is added to cold water it melts and moves very quickly across the surface of the water.

Write down **one** other observation when potassium is added to cold water.

..... **[1]**

(b) Complete **Table 13.1** for rubidium. **[2]**

(c) Explain, in terms of electron loss or gain, the difference between lithium and sodium when they react with cold water.

.....

..... **[1]**

(d) **Table 13.2** shows the density of the Group 1 metals from lithium to caesium.

Group 1 metal	Density (g/cm^3)
lithium	0.53
sodium	0.97
potassium	0.86
rubidium	1.53
caesium	1.88

Table 13.2

Which Group 1 metal does not fit the general trend?

Explain your answer using information from **Table 13.2**.

.....

.....

..... **[2]**

10. Nov/2020/Paper_J250/10/No.14

Table 14.1 shows the melting points of some of the Group 1 metals.

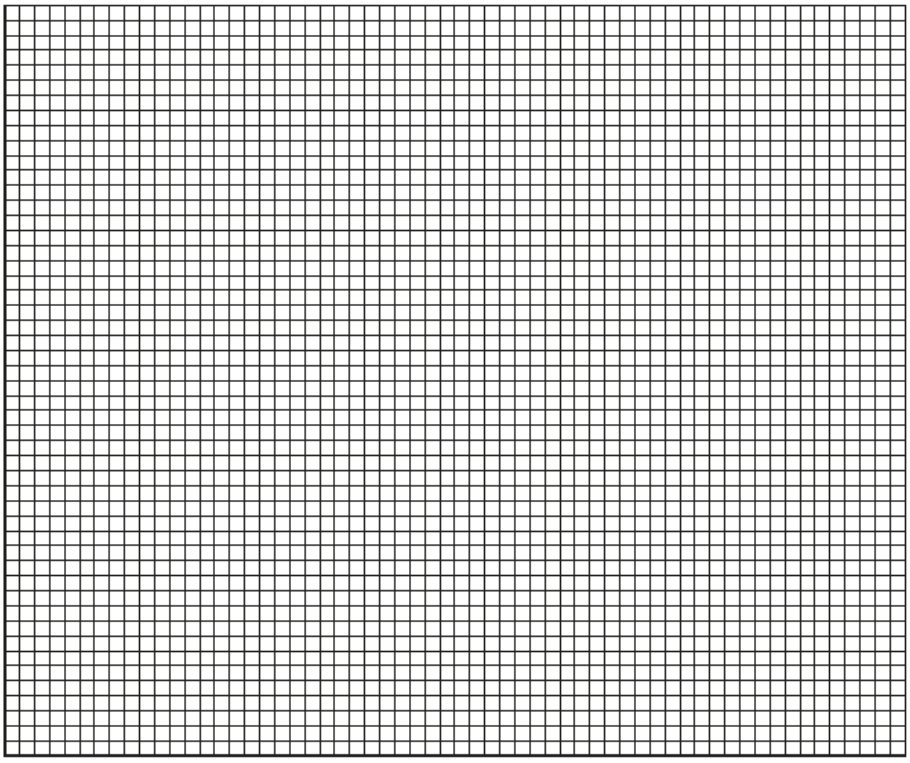
Group 1 metal	Atomic number	Melting point (°C)
Lithium	3	181
Sodium	11	98
Potassium	19	63
Rubidium	37	39
Caesium	55	29

Table 14.1

(a) (i) Plot the data in **Table 14.1** on the grid in **Fig. 14.1**.

Draw a line of best fit.

Melting point (°C)



Atomic number

(ii) Describe the relationship between the atomic number of the Group 1 metals and their melting points shown in **Fig. 14.1**.

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..... **[1]**

(b) **Fig. 14.2** shows the structure of sodium.

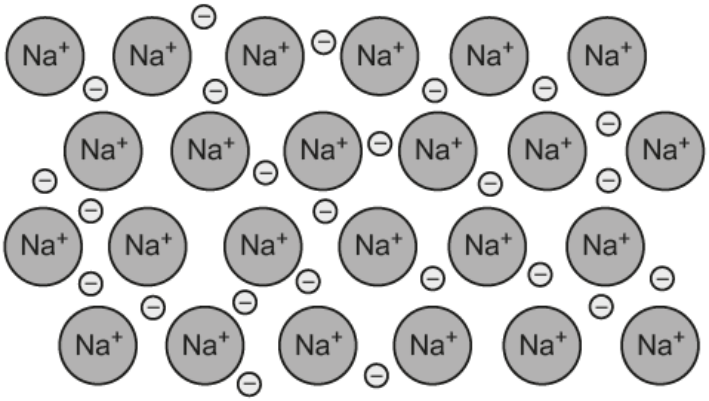

Fig. 14.2

(i) Describe the metallic bonding in sodium.

Use information from **Fig. 14.2** in your answer.

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.....

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..... **[2]**

(ii) Look at the melting points of sodium and lithium in **Table 14.1**.

Suggest a reason for the difference in their melting points.

.....

..... **[1]**