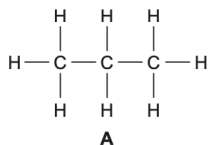
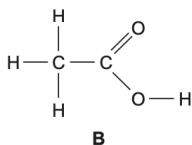
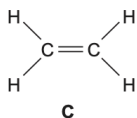
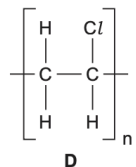


Predicting Chemical Reactions

Q1. (2018)

4 Which displayed formula shows an alkene?



Your answer

[1]

Q2. (2018)

16 The Group 7 elements are called the halogens.

The table shows information about some of the halogens.

Name	Atomic number	Boiling point (°C)	State at room temperature	Molecular formula
Fluorine	9	-188	Gas	F ₂
Chlorine	17	-34	Gas	Cl ₂
Bromine	35	59	Liquid	Br ₂
Iodine	53	184	Solid	I ₂

A)

(a) Which is the **most reactive** halogen in the table?

..... [1]

B)

(b) Astatine is also a halogen. It has the atomic symbol At and an atomic number of 85.

Look at the table.

(i) Predict the **state** of astatine at room temperature.

..... [1]

C)

(ii) Predict the **boiling point** of astatine.

..... [1]

D)

(c) Sodium, Na, reacts with chlorine. A white solid is made.

(i) What is the **name** of this white solid?

..... [1]

E)

(ii) Write down the **balanced symbol** equation for this reaction.

..... [2]

Topic 4: Predicting and Identifying Reactions and Products

Q3. (2019)

2 Which of these elements is a **transition metal**?

- A Calcium
- B Caesium
- C Carbon
- D Cobalt

Your answer

☐

[1]

Q4. (2019)

A)

18 This question is about the extraction of metals.

(a) When iron oxide is heated with carbon, iron is made.

(i) Complete the **word equation** for this reaction.

iron oxide + carbon → +

[1]

B)

(ii) Iron oxide is **reduced** during this reaction.

Explain how you can tell that iron oxide is reduced.

..... [1]

Q5. (2019) – 18b

(b) Look at the reactivity series of some metals. Carbon is also included.

Calcium	Most reactive ↑ Least reactive
Magnesium	
Aluminium	
(Carbon)	
Zinc	
Iron	
Tin	
Copper	

A)

(i) Zinc is usually extracted from zinc oxide by **heating zinc oxide with carbon**.

Explain why. Use the reactivity series to help you.

..... [1]

B)

(ii) Aluminium is extracted from aluminium oxide by **electrolysis**.

Explain why. Use the reactivity series to help you.

..... [1]

Q6. (2020)

6 What happens to the potential difference of a chemical cell once the reactants are used up?

- A It decreases
- B It increases
- C It starts and finishes at 0 V
- D It stays the same

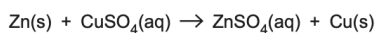
Your answer

☐

[1]

Topic 4: Predicting and Identifying Reactions and Products

Q7. (2020)

13 Zinc, Zn, reacts with copper sulfate solution, CuSO₄.

What type of reaction is this?

- A Combustion
 B Displacement
 C Neutralisation
 D Thermal decomposition

Your answer

☐

[1]

Q8. (2020)

16 This question is about elements in the Periodic Table.

Look at the table. It shows some properties of Group 7 elements.

Element	Molecular formula	State at room temperature	Radius of an atom (nm)	Order of reactivity
Fluorine	F ₂		0.072	<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">most reactive</div> <div style="margin-right: 10px;">↑</div> <div style="margin-right: 10px;">↓</div> <div style="margin-left: 10px;">least reactive</div> </div>
Chlorine	Cl ₂	gas	0.099	
Bromine	Br ₂	liquid	0.114	
Iodine	I ₂	solid	0.133	
Astatine	At ₂	solid		

A)

(a) Complete the table. Use ideas about trends down a Group to help you.

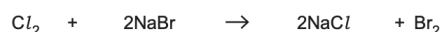
[2]

B)

(b) In the table, the Group 7 elements are listed in order of reactivity.

The equations show a displacement reaction of Group 7 elements.

chlorine + sodium bromide → sodium chloride + bromine



(i) Complete the word equation.

bromine + sodium iodide → + [1]

C)

(ii) There is no reaction between iodine and sodium bromide.

Explain why.

.....
 [1]

D)

(iii) Chlorine reacts with sodium iodide. Sodium chloride and iodine are made.

Write the **balanced symbol** equation for this reaction.

..... [2]

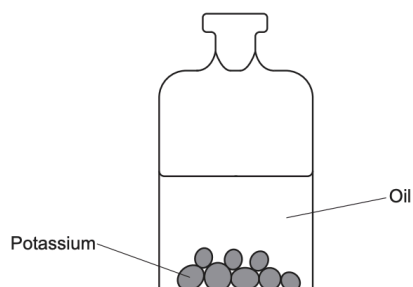
Topic 4: Predicting and Identifying Reactions and Products

E)

(c) Group 1 is another group of elements in the Periodic Table.

(i) Potassium is a Group 1 metal.

Potassium is stored under oil because it is very reactive.



What does the oil stop the potassium reacting with?

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

F)

(ii) Sodium is another Group 1 metal.

Sodium reacts in a similar way to potassium.

Explain why.

Use ideas about atomic structure in your answer.

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

Topic 4: Predicting and Identifying Reactions and Products

Q9. (2020) – 17c (ii, iii)

17 A student investigates a white solid.

Table 17.1 shows some of the results of the tests that the student does.

	Test	Results
Test 1	flame test	a lilac flame
Test 2	dilute hydrochloric acid added	effervescence
	gas given off passed into limewater	?

Table 17.1

(c) The student reacts some metals with different salt solutions.

Table 17.2 shows her results.

	Magnesium	Zinc	Iron	Copper
Copper sulfate	blue solution becomes colourless	blue solution becomes colourless	blue solution becomes green	no reaction
Iron sulfate	green solution becomes colourless	green solution becomes colourless	no reaction	no reaction
Magnesium sulfate	no reaction	no reaction	no reaction	no reaction
Zinc sulfate	black coating on magnesium	no reaction	no reaction	no reaction

Table 17.2

A)

(ii) Write down the order of reactivity of the four metals copper, iron, magnesium and zinc.

Use Table 17.2 to help you.

..... **most reactive**

.....

.....

..... **least reactive**

[2]

B)

(iii) Magnesium reacts with copper sulfate, CuSO_4 .

Magnesium sulfate, MgSO_4 , and copper are made.

Write the **balanced symbol** equation for this reaction.

..... [1]

Q10. (2020) – 23b

(b) Aluminium is a metal.

Aluminium is extracted from an ore called bauxite.

Electrolysis is used to extract the aluminium.

Use the reactivity series to explain why aluminium cannot be extracted from bauxite by heating the bauxite with carbon.

Sodium	↑ Increasing reactivity
Calcium	
Aluminium	
Carbon	
Nickel	
Tin	
Lead	

.....

..... [1]

Topic 4: Predicting and Identifying Reactions and Products

Q11. (2021)

- 9 A chemical cell has a voltage of 1.50 V.

What will the voltage be once the reactants are used up?

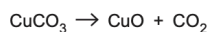
- A 0.00 V
- B 0.75 V
- C 1.50 V
- D 3.00 V

Your answer

[1]

Q12. (2021)

- 10 Copper carbonate, CuCO_3 , decomposes when heated. Copper oxide, CuO , and carbon dioxide gas are made.



12.4 g of copper carbonate decomposes to make 8.0 g of copper oxide.

How much carbon dioxide gas is made?

- A 1.55 g
- B 4.4 g
- C 8.0 g
- D 20.4 g

Your answer

[1]

Q13. (2021)

- 12 Sodium reacts with fluorine to form sodium fluoride.

What is the correctly **balanced symbol** equation for this reaction?

- A $\text{Na} + \text{F} \rightarrow \text{NaF}$
- B $\text{Na} + \text{F}_2 \rightarrow \text{NaF}_2$
- C $2\text{Na} + \text{F} \rightarrow \text{Na}_2\text{F}$
- D $2\text{Na} + \text{F}_2 \rightarrow 2\text{NaF}$

Your answer

[1]

Q14. (2021)

- 16 This question is about the elements in Group 1 of the Periodic Table.

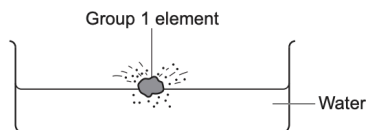
(a) Group 1 elements all react in a similar way.

Explain why.

.....

..... [1]

- They react with water.



Group 1 element	Time for element to react completely (s)	Observations
Lithium	24	fizzes moves slowly on the surface of the water makes an alkaline solution
Potassium	6	fizzes vigorously and gas catches fire melts moves very quickly on the surface of the water makes an alkaline solution
Sodium	14	fizzes vigorously melts moves quickly on the surface of the water makes an alkaline solution

A)

- [1]

B)

- [2]

C)

- Predict what you will **see** and the **reaction time** when rubidium reacts with water.

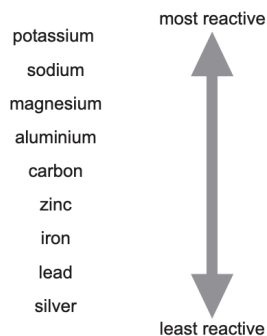
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Topic 4: Predicting and Identifying Reactions and Products

Q16. (2022)

- 11 The list shows the reactivity series of some metals.

The non-metal element carbon is also included.



	Extracted from its ore by electrolysis	Extracted from its ore by heating with carbon
A	magnesium	silver
B	silver	potassium
C	sodium	aluminium
D	zinc	aluminium

Which row in the table is correct?

Your answer ☐

[1]

Q17. (2022)

- 12 Why is magnesium more reactive with dilute acids than zinc?

- A Magnesium forms positive ions more easily than zinc.
- B Magnesium forms negative ions more easily than zinc.
- C Magnesium gains electrons more easily than zinc.
- D Magnesium gains hydrogen more easily than zinc.

Your answer ☐

[1]

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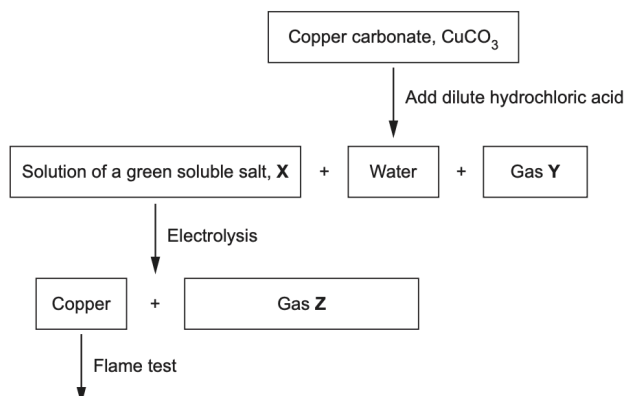
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Topic 4: Predicting and Identifying Reactions and Products

Q20. (2022) – 23e, 23f

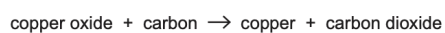
23 A teacher investigates the reactions of copper carbonate, CuCO_3 .

The diagram shows the reactions the teacher does.



A)

- (e) Copper metal is extracted from copper oxide by heating with carbon as shown in the equation.



Explain why copper is extracted.

Use ideas about the reactivity series.

.....
 [1]

B)

- (f) Copper is used to make useful alloys.

The table gives information about some copper alloys.

Alloy	Main metals	Uses
duralumin	copper and	aircraft parts
brass	copper and	musical instruments
bronze	copper and tin	

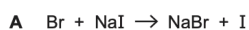
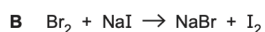
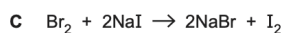
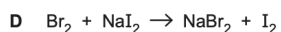
Complete the table.

[2]

Q21. (2023)

10 Bromine reacts with sodium iodide.

What is the **balanced symbol** equation for the reaction?



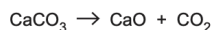
Your answer

[1]

Topic 4: Predicting and Identifying Reactions and Products

Q22. (2023)

- 13 Calcium carbonate, CaCO_3 , thermally decomposes to make calcium oxide, CaO , and carbon dioxide.



5.0g of calcium carbonate makes 2.8g of calcium oxide.

How much carbon dioxide is made?

- A 2.2g
B 2.8g
C 4.4g
D 7.8g

Your answer

[1]

Q23. (2023)

- 15 The Group 7 element fluorine is a gas at room temperature and pressure.

The Group 7 elements show a trend in boiling points going down the group.

Which row shows the boiling points of the Group 7 elements?

Boiling Point ($^{\circ}\text{C}$)				
	Fluorine	Chlorine	Bromine	Iodine
A	-188	59	184	-15
B	-188	-34	59	184
C	188	184	59	-15
D	-15	184	188	59

Your answer

[1]

Q24. (2023)

- 17 The table shows information about the physical properties of four elements, W, X, Y and Z.

	W	X	Y	Z
Density (g/cm^3)	0.97	7.87	0.003	1.74
Melting point ($^{\circ}\text{C}$)	98	1538	-102	650
Conducts electricity?	✓	✓	✗	✓

A)

- (a) Which element is a non-metal?

Give a reason for your answer.

Element

Reason [2]

B)

- (b) One of the elements is sodium in Group 1.

Which element is sodium?

Give a reason for your answer.

Element

Reason [2]

Topic 4: Predicting and Identifying Reactions and Products

C)

- (d) Iron is a transition metal.

The list shows the reactivity series of some metals. The element carbon is also included.

Sodium	Most reactive
Calcium	
Magnesium	
Carbon	
Zinc	
Iron	
Copper	Least reactive

Iron can be extracted from the compound iron oxide.

How is iron extracted from iron oxide? Explain your answer.
Use the information in the list.

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

D)

- (e) Iron reacts with dilute sulfuric acid,
- H_2SO_4
- .

Iron sulfate, FeSO_4 , and hydrogen gas, H_2 , are made.

- (i) Write the
- balanced symbol**
- equation for this reaction.

..... [1]

Q25. (2023) – 18b (iv)

- 18 Propane,
- C_3H_8
- , is an alkane.

Propane undergoes complete combustion in oxygen. Carbon dioxide and water are made.

- (b) The table shows the energy given out when 1 g of different alkanes burn.

Alkane	Number of carbon atoms	Energy given out (kJ)
methane	1	55.6
ethane	2	52.6
propane	3	50.4
butane	4	
pentane	5	48.7
hexane	6	48.4

- (iv) What name is given to the type of reaction that
- gives out energy**
- ?

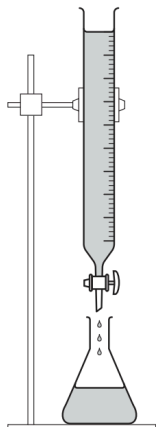
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Topic 4: Predicting and Identifying Reactions and Products

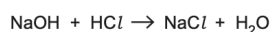
Q26. (2023) – 19b

19 A student plans a titration experiment.

The diagram shows some of the apparatus they use.



(b) This is the equation for the reaction in the experiment.



(i) What type of reaction is this?

Tick (✓) **one** box.

Polymerisation

☐

Neutralisation

☐

Reversible

☐

Thermal decomposition

☐

[1]

Q27. (2023) – 22c

22 A student investigates two solutions, **A** and **B**.

They know that

- one solution contains a halide ion
- the other solution contains a different anion.

They test 2 cm³ of each solution for the halide ion using this method:

- Add a few drops of dilute hydrochloric acid and shake.
- Add a few drops of silver nitrate solution.
- Record the colour of the precipitate.

(c) Solution **A** also contains copper ions, Cu²⁺.

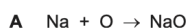
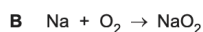
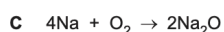
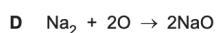
Copper ions react with hydroxide ions, OH⁻, to make a precipitate of copper(II) hydroxide.

Write the **balanced ionic** equation for this reaction. Include the state symbols.

..... [3]

Q28. (2024)

7 What is the balanced equation for the reaction of sodium with oxygen?



Your answer

☐

[1]

Topic 4: Predicting and Identifying Reactions and Products

Q29. (2024)

- 8 Which row describes the three halogens at room temperature?

	Chlorine	Bromine	Iodine
A	green gas	orange-brown gas	grey solid
B	green gas	orange-brown liquid	grey solid
C	green gas	orange-brown liquid	purple gas
D	green liquid	orange-brown liquid	grey solid

Your answer

[1]

Q30. (2024)

- 9 The table shows the results of the reactions between four metals and their metal oxides.

Key: ✓ = reaction X = no reaction

	Metal W oxide	Metal X oxide	Metal Y oxide	Metal Z oxide
Metal W		X	X	X
Metal X	✓		✓	X
Metal Y	✓	X		X
Metal Z	✓	✓	✓	

What is the correct order of reactivity of the metals, from the most reactive to the least reactive?

- A W, Y, X, Z
B W, Z, Y, X
C Z, X, Y, W
D Z, Y, X, W

Your answer

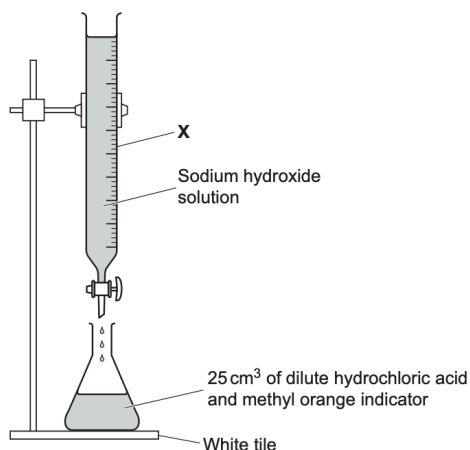
[1]

Q31. (2024) – 19d

- 19 A student investigates the neutralisation reaction between sodium hydroxide solution and dilute hydrochloric acid.

They do a titration experiment.

The diagram shows the apparatus they use.



- (d) The neutralisation reaction between sodium hydroxide solution, NaOH, and dilute hydrochloric acid, HCl, makes a salt and water.

Write the **balanced symbol** equation for the reaction.

..... [2]

Topic 4: Predicting and Identifying Reactions and Products

Q32. (2024)

21

(a) The table shows some properties of four Group 1 elements.

Element	Density (g/cm ³)	Melting Point (°C)	Boiling Point (°C)
Lithium	0.53	180	1342
Sodium	0.97	98	883
Potassium	0.86	63	759
Rubidium	1.53	39	688

A)

(i) State **one** trend in the properties of the Group 1 elements shown in the table.

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

B)

(ii) Caesium is below rubidium in Group 1.

Predict the melting point of caesium using the information in the table.

Melting point of caesium = °C [1]

C)

(b) The Group 1 elements all react with Group 7 elements to form ionic compounds.

(i) Explain why the Group 1 elements all react in the same way.

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

D)

(ii) The Group 1 elements become **more** reactive down the group.

Explain why.

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

E)

(iii) Sodium reacts with bromine, Br₂, to make sodium bromide, NaBr.Write the **balanced symbol** equation for this reaction.

..... [2]