

[Alkenes]

Q1.(2018)

Fluorine is the most reactive element in Group 7 (Group 17).

Why?

- A** Fluorine atoms gain an electron more readily than the other Group 7 elements.
- B** Fluorine is a gas.
- C** Fluorine exists as diatomic molecules.
- D** Fluorine atoms lose electrons more readily than the other Group 7 elements.

Your answer

Q2.(2018)

Which of these solutions will react with each other?

- A** Sodium bromide and iodine
- B** Sodium chloride and bromine
- C** Sodium chloride and iodine
- D** Sodium iodide and bromine

Your answer

Q3.(2018)

Which statement about the halogens (Group 7 elements) is correct?

- A** Astatine is the most reactive halogen.
- B** Chlorine has the electronic structure 2.8.7.
- C** Fluorine is the element with the darkest colour.
- D** The halogens have the molecular formula X_3 .

Your answer

Q4.a).(2018)

Look at the information about three elements **X**, **Y** and **Z** in the Periodic Table.

Element	X	Y	Z
Atomic number	Less than 11	11	More than 11
Melting point (°C)	181	98	63
Density (g/cm ³)	0.53	0.97	0.86
Reaction with water	Reacts quickly making hydrogen	Reacts vigorously making hydrogen	Reacts explosively making hydrogen
Energy needed to remove 1 electron from an atom (kJ/mol)	520	496	419
Atomic radius (nm)	0.134	0.154	0.196
Formula of chloride	XCl	YCl	ZCl
Action of heat on carbonates	Breaks down and makes carbon dioxide	No reaction	No reaction

Student A thinks that elements **X**, **Y** and **Z** are in the same Group of the Periodic Table.

Student B thinks they are in different Groups of the Periodic Table.

Analyse and explain the information in the table that supports **both** Student A's and Student B's conclusions.

Who do you think is correct?

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Q4.b).(2018)

Write a **balanced symbol equation** for the reaction of element **Y** with water.

Use '**Y**' to represent element **Y**.

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Q5.(2019)

Which row of the table is correct for cracking?

	Description	Source of raw material
A	heating large molecules to make smaller molecules	crude oil
B	heating large molecules to make smaller molecules	nylon, poly(ethene)
C	joining small molecules to make larger molecules	crude oil
D	joining small molecules to make larger molecules	ethene, propene

Your answer

Q6.(2019)

This question is about the elements in Group 1.

Which row of the table is correct?

	Reactivity	Reason
A	decreases down the group	it is easier to form positive ions
B	decreases down the group	it is easier to form negative ions
C	increases down the group	it is easier to form positive ions
D	increases down the group	it is easier to form negative ions

Your answer

☐

Q7.(2019)

The elements neon and argon in Group 0 are unreactive.

Which statement explains why?

- A** They all have eight electrons in their outer shells.
- B** They all have full outer electron shells.
- C** They are all gases at room temperature and pressure.
- D** They are all monatomic.

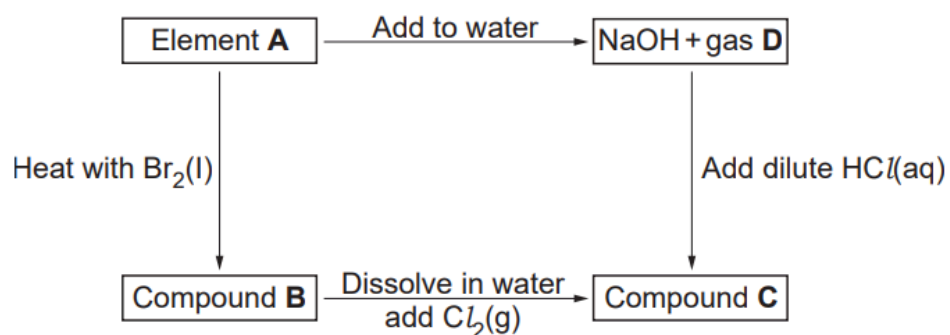
Your answer

☐

Q8.a).(2019)

Some Group 1 and Group 7 elements are very reactive.

Look at the reaction cycle.



Identify element **A**.

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Q8.b).i).(2019)

Identify compound **B**.

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Q8.b).ii).(2019)

Write a balanced equation for the reaction of element **A** with $\text{Br}_2(\text{l})$.

Include state symbols in your answer.

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Q8.c).i).(2019)

Identify compound **C**.

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Q8.c).ii).(2019)

Give a reason for your answer to **(c)(i)**.

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.....

Q8.d).(2019)

D is a colourless gas.

How can you show if the gas is carbon dioxide, hydrogen or oxygen?

Describe the tests for carbon dioxide, hydrogen and oxygen and the results you would expect with gas **D**.

test for carbon dioxide

result with gas **D**

test for hydrogen.....

result with gas **D**

test for oxygen

result with gas **D**

Q9.(2020)

The table shows the boiling points of the first five Group 0 elements.

Element	Boiling point (°C)
Helium	-269
Neon	-246
Argon	-186
Krypton	-152
Xenon	-107

Which statement describes the trend in the boiling points?

- A** The boiling points decrease as the molecules get larger.
- B** The boiling points decrease as the molecules get smaller.
- C** The boiling points increase as the atoms get larger.
- D** The boiling points increase as the atoms get smaller.

Your answer

Q10.(2020)

The table shows the melting and boiling points of bromine.

Melting point (°C)	Boiling point (°C)
-7	59

Which change of state happens when bromine is cooled from 65 °C to -5 °C?

- A** Condensation
- B** Evaporation
- C** Freezing
- D** Melting

Your answer

Look at the diagram of the Periodic Table.

[illegible]

Your answer

1

Look at the flowchart. It shows how crude oil is changed into useful substances.

Process 1. Fractional distillation	Crude oil is separated into fractions of similar hydrocarbons.
↓	
Process 2.	Some long chain hydrocarbons are turned into short chain hydrocarbons.
↓	
Process 3. Polymerisation	Some of the short chain hydrocarbons are used to make plastics.

Complete the flowchart with the name of **Process 2**.

Q12.b).(2020)

Table 11.1 shows the supply and demand of two fractions of crude oil.

Fraction	Millions of barrels per day	
	Supply	Demand
Petrol	26	39
Fuel oil	19	11

Table 11.1

Explain the importance of **Process 2**.

Use information from **Table 11.1** in your answer.

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Q12.c.i).(2020)

The hydrocarbon fractions from **Process 1** contain different alkanes.

Table 11.2 shows the boiling point of different alkanes produced in **Process 1**.

Number of carbon atoms in a molecule of the alkane	Boiling point (°C)
1	-162
2	-89
3	
4	-1
5	36

Table 11.2

Complete **Table 11.2** with an estimate of the missing boiling point for an alkane molecule with **3 carbon atoms**.

Q12.c).ii).(2020)

Write the formula for an alkane with **7 carbon atoms**.

.....

Q13.a).i).(2020)

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

Plot the data in **Table 14.1** on the grid in **Fig. 14.1**.

Draw a line of best fit.

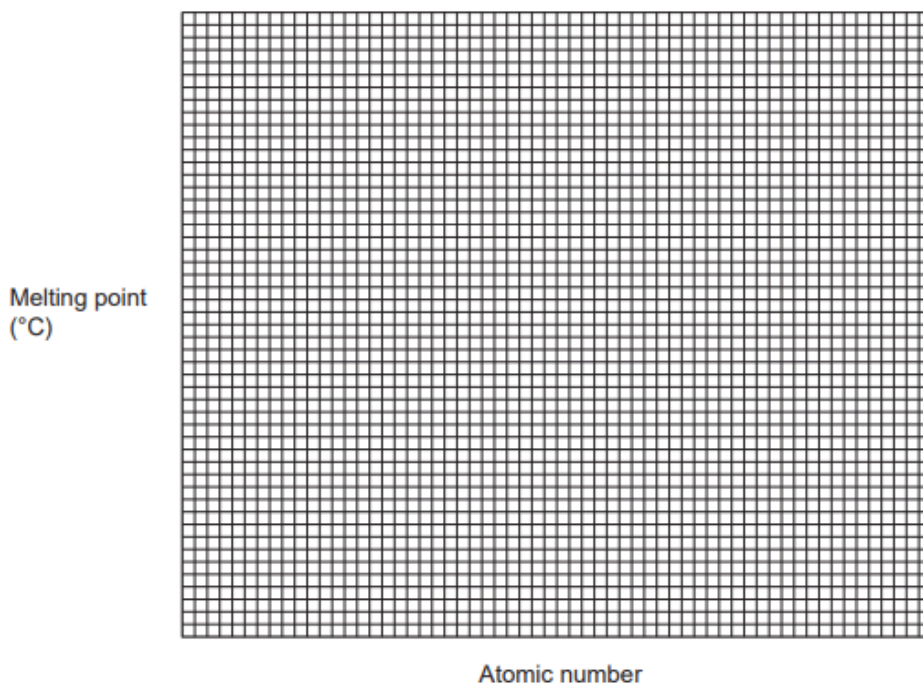


Fig. 14.1

Q13.a).ii).(2020)

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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Q13.b).i).(2020)

Fig. 14.2 shows the structure of sodium.

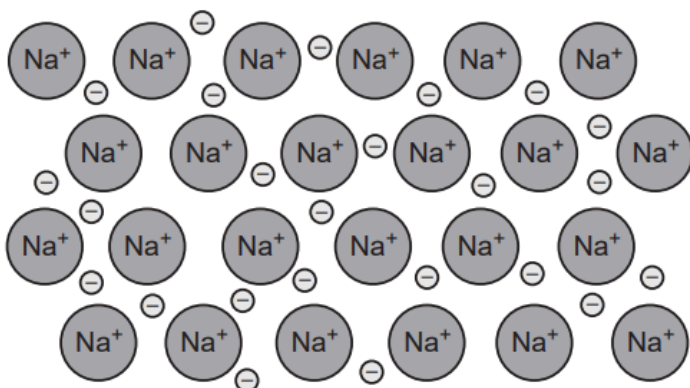


Fig. 14.2

Describe the metallic bonding in sodium.

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

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Q13.b).ii).(2020)

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

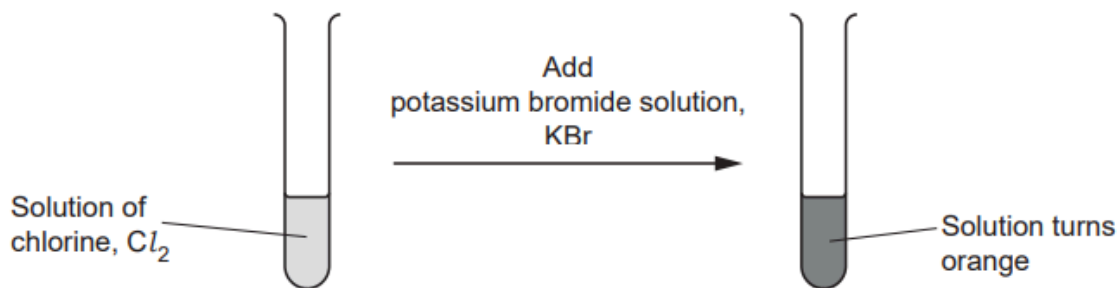
Suggest a reason for the difference in their melting points.

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Q14.a).(2020)

The diagram shows what happens when a small amount of potassium bromide solution, KBr, is added to a solution of chlorine, Cl_2 .



Write the **balanced symbol** equation for the reaction between potassium bromide, KBr, and chlorine, Cl_2 .

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Q14.b).(2020)

Write down the name of the chemical which makes the solution orange.

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Q14.c.i).(2020)

Write the **half equation** for the formation of chloride ions, Cl^- , from chlorine, Cl_2 .

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Q14.c.ii).(2020)

In this reaction is chlorine oxidised or reduced?

Explain your answer.

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Q14.d).(2020)

Explain why chlorine is **more** reactive than bromine.

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Q15.(2021)

An aqueous solution of sodium chloride, NaCl , is electrolysed using inert electrodes.

Which product is formed at the cathode?

- A** Chlorine
- B** Hydrogen
- C** Oxygen
- D** Sodium

Your answer

Q16.(2021)

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

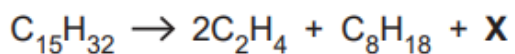
How many Group 7 elements are liquid at -40 °C?

- A 0
- B 1
- C 2
- D 3

Your answer

Q17.(2021)

The equation shows the reaction for the cracking of the alkane $C_{15}H_{32}$.



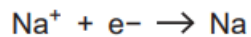
What is the formula of **X**?

- A C_3H_6
- B C_3H_8
- C C_5H_{10}
- D C_5H_{12}

Your answer

Q18.(2021)

Look at the equations.



They show the two half equations that happen during the electrolysis of molten sodium chloride

What is the correctly balanced equation for the electrolysis of molten sodium chloride?

- A** $\text{Na}^+ + 2\text{Cl}^- \rightarrow \text{Na} + \text{Cl}_2$
- B** $\text{Na}^+ + 2\text{Cl}^- \rightarrow \text{NaCl}_2$
- C** $2\text{Na}^+ + 2\text{Cl}^- \rightarrow 2\text{Na} + \text{Cl}_2$
- D** $2\text{Na}^+ + 2\text{Cl}^- \rightarrow 2\text{NaCl}$

Your answer

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Q19.a).(2021)

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

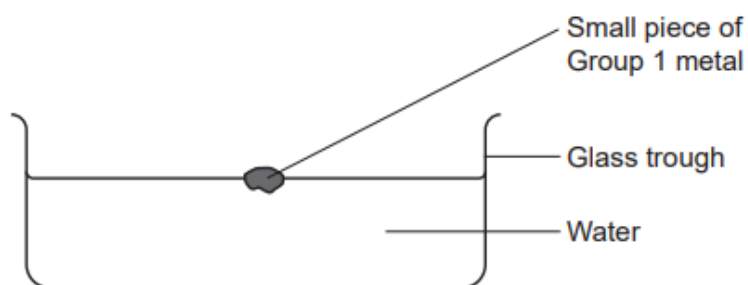


Table 13.1 shows information about how the first four elements in Group 1 react with water.

Element	Observations with cold water	Formulae of products
Lithium	Fizzes and moves slowly across the surface of the water.	LiOH(aq) $\text{H}_2(\text{g})$
Sodium	Fizzes, melts into a silvery ball and moves quickly across the surface of the water.	NaOH(aq) $\text{H}_2(\text{g})$
Potassium		KOH(aq) $\text{H}_2(\text{g})$
Rubidium	Explodes with a white flame.	

Table 13.1

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.

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Q19.b).(2021)

Complete **Table 13.1** for rubidium.

Q19.c).(2021)

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

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Q19.d).(2021)

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**.

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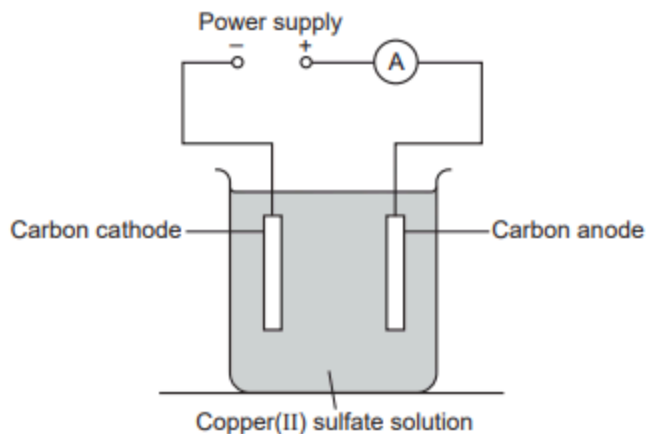
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Q20.a).(2021)

Copper can be produced from a copper(II) sulfate solution by electrolysis.

A student investigates how the mass of copper produced changes with the size of the current used during the electrolysis. The student varies the current used during electrolysis and investigates the mass of copper produced at the cathode.

The diagram shows the apparatus they use.

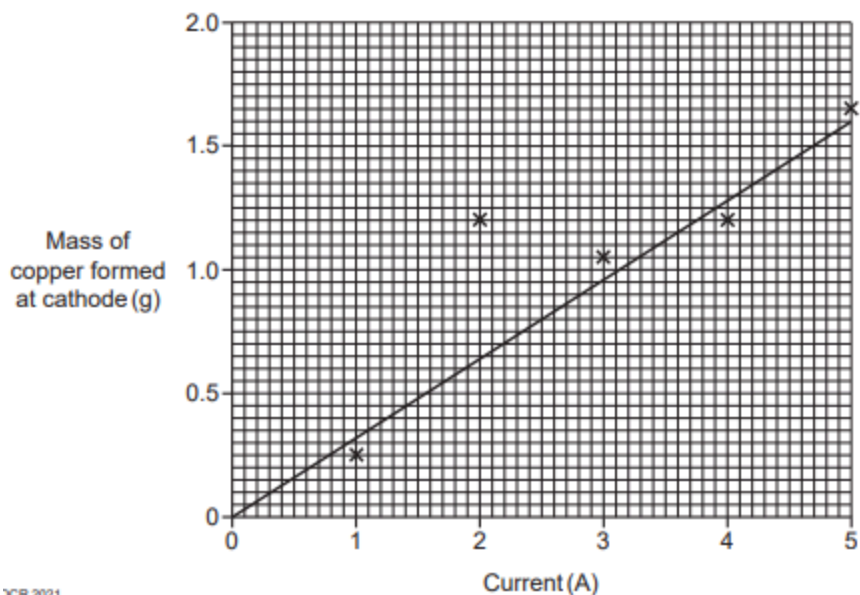


The student:

- Measures the mass of the dry cathode at the start of the experiment.
- Switches the power pack on for 10 minutes.
- Removes the cathode and washes it with water.
- Dries the cathode.
- Measures the mass of the cathode again.
- Calculates the mass of copper formed at the cathode.

The student repeats the experiment at different currents.

They plot a graph of their results.



The copper(II) sulfate solution contains copper ions, Cu^{2+} .

Write the balanced **half equation** for the formation of copper at the cathode.

Include state symbols in the equation.

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Q20.b).i).(2021)

Look at the graph.

The student decides that the result for the mass of copper formed at the cathode at 2A is incorrect.

Give a reason for this result.

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Q20.b).ii).(2021)

Has the student drawn the correct line of best fit?

Give a reason for your answer.

.....

.....

Q20.b).iii).(2021)

Explain how **repeating** the experiment could improve the accuracy of the results.

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.....

Q20.c).(2021)

Use the graph to calculate the mass of copper produced by a current of 15A.

Give your answer to **1** significant figure.

Mass of copper = ... g

Q21.a).(2022)

This question is about the Group 7 elements.

Table 11.1 shows some information about the Group 7 elements.

Table 11.1

Element	Molecular formula	Appearance at room temperature	Size of molecule (pm)	Boiling point (°C)
Fluorine	F ₂	pale-yellow gas	128	−188
Chlorine	Cl ₂	green gas	204	−34
Bromine	Br ₂	orange-brown liquid	240	
Iodine	I ₂	grey-black solid	278	184
Astatine	At ₂		300	350

Complete the table by predicting the appearance of astatine at room temperature.

Write your answer in the box in **Table 11.1**.

Q21.b).(2022)

The sizes of the molecules are measured in picometres (pm).

$$1 \text{ picometre} = \frac{1}{1\,000\,000\,000\,000} \text{ metre}$$

What is the size of a fluorine molecule in metres (m)?

Tick (✓) **one** box.

$1.28 \times 10^{-12} \text{ m}$ ☐

$1.28 \times 10^{-10} \text{ m}$ ☐

$1.28 \times 10^{10} \text{ m}$ ☐

$1.28 \times 10^{12} \text{ m}$ ☐

Q21.c).(2022)

Which element has a molecule that is **closest** to twice the size of a molecule of fluorine?

Tick (✓) **one** box.

Chlorine ☐

Bromine ☐

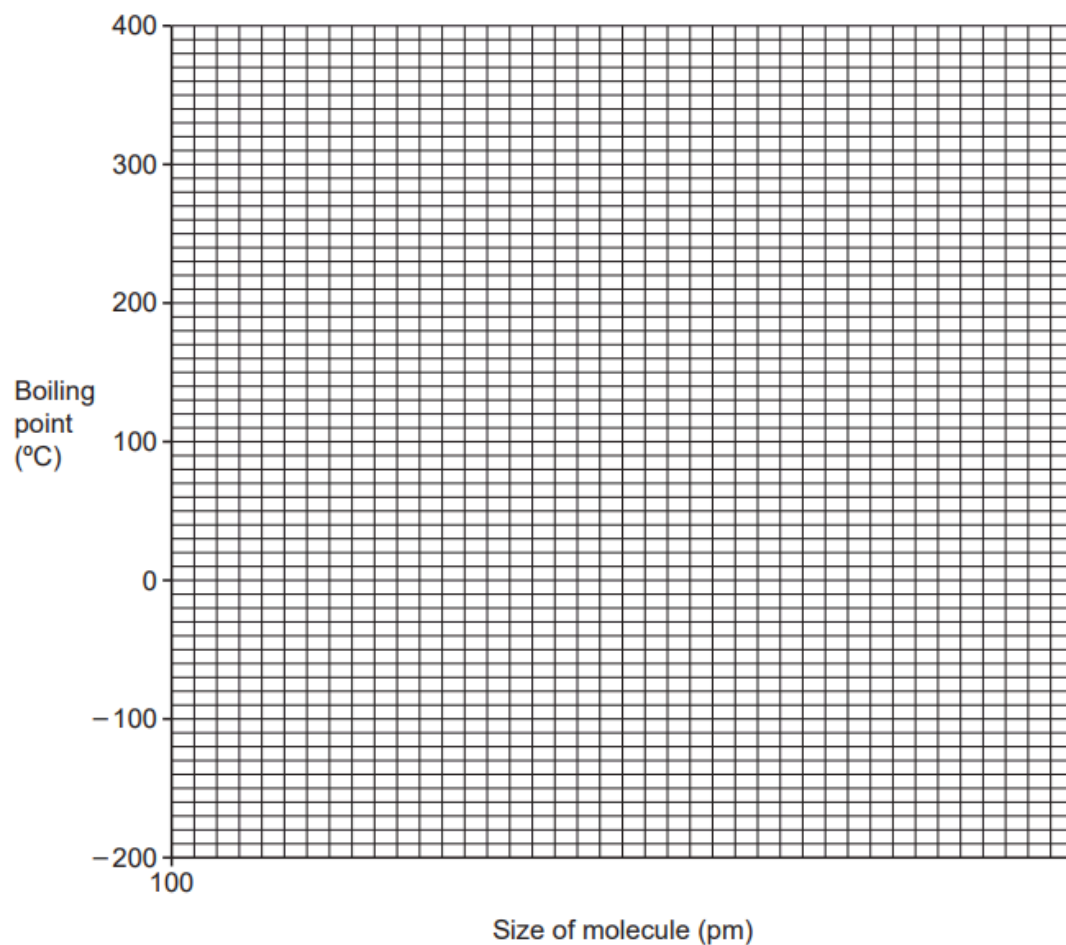
Iodine ☐

Astatine ☐

Q21.d).i).(2022)

Use **Table 11.1** to complete the x axis and plot a **line graph** of the boiling points of fluorine, chlorine, iodine and astatine against the size of their molecules.

Draw a line of best fit.



Q21.d).ii).(2022)

Use your graph to predict the boiling point of bromine.

Boiling point of bromine = ... °C

Q21.e).(2022)

Table 11.1 is repeated below.

Table 11.1

Element	Molecular formula	Appearance at room temperature	Size of molecule (pm)	Boiling point (°C)
Fluorine	F ₂	pale-yellow gas	128	-188
Chlorine	Cl ₂	green gas	204	-34
Bromine	Br ₂	orange-brown liquid	240	
Iodine	I ₂	grey-black solid	278	184
Astatine	At ₂		300	350

A student thinks that fluorine molecules have the **weakest** intermolecular forces.

Give **two** reasons why they are correct.

Use data from **Table 11.1**.

- 1
-
- 2

Q21.f).(2022)

Describe **one** similarity and **one** difference in the arrangement of electrons in **atoms** of fluorine and chlorine.

Similarity

.....

Difference

Q22.a).(2022)

For many years it was thought that the Group 0 elements were completely unreactive.

However, more recently, scientists have been able to react some of the Group 0 elements with fluorine.

The table shows information about some of the compounds Group 0 elements make with fluorine.

Group 0 element	Year compound first made	Formula of compound
Helium	no compounds yet made	
Neon	no compounds yet made	
Argon	2003	ArF_2
Krypton	1963	KrF_2
Xenon	1962	XeF_2

Give a reason why the Group 0 elements are usually described as unreactive.

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Q22.b).(2022)

Give a reason why scientists have used **fluorine** to make compounds of the Group 0 elements.

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.....

Q22.c.i).(2022)

Xenon difluoride, XeF_2 , is a solid at room temperature. It melts at 129°C and boils at 155°C . It does **not** conduct electricity in any state.

Suggest the structure of xenon difluoride, XeF_2 .

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Q22.c.ii).(2022)

Give **two** reasons for your answer in (c)(i).

1

.....

2

.....

Q22.d).(2022)

Describe how the trend in reactivity of the Group 0 elements is linked to the size of the atoms.

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Q23.(2023)

Which row correctly describes the Group 0 elements?

	Physical state at 25 °C	Reactivity
A	gas	very reactive
B	gas	very unreactive
C	liquid	very reactive
D	liquid	very unreactive

Your answer

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Q24.(2023)

A small piece of a Group 1 metal is added to a trough of water.

The metal floats, fizzes vigorously and melts to form a silvery ball.

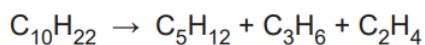
Which Group 1 metal was added to the water?

- A** Lithium
- B** Potassium
- C** Rubidium
- D** Sodium

Your answer

Q25.(2023)

The equation shows a reaction of decane, $C_{10}H_{22}$, when it is heated with a catalyst.



What is the name of this process?

- A** Cracking
- B** Displacement
- C** Electrolysis
- D** Reduction

Your answer

Q26.(2023)

When a solution of bromine, $\text{Br}_2(\text{aq})$, is mixed with a solution of sodium chloride, $\text{NaCl}(\text{aq})$, there is **no** reaction.

Why is there **no** reaction?

- A** Bromine gains electrons more easily than chlorine.
- B** Bromine loses protons more easily than chlorine.
- C** Chlorine gains electrons more easily than bromine.
- D** Chlorine loses protons more easily than bromine.

Your answer

[1]

Q27.(2023)

Magnesium, calcium and strontium are metals in Group 2 of the Periodic Table.

Tables 14.1 and **14.2** show some information about these metals.

Table 14.1

Reactions of the metals with cold water

Metal	Observations
Magnesium	- metal disappears very slowly - fizzes very slowly - forms a white solid
Calcium	- metal disappears slowly - fizzes slowly - forms a cloudy solution
Strontium	- metal disappears quickly - fizzes quickly - forms a colourless solution

Table 14.2

Energy required to form a 2+ ion

Metal	Energy required (kJ/mol)
Magnesium	2189
Calcium	1735
Strontium	1614

Barium is below strontium in Group 2.

Describe and explain the reactivity of barium.

Include observations of the reaction of barium with water.

Use information from **Tables 14.1** and **14.2**.

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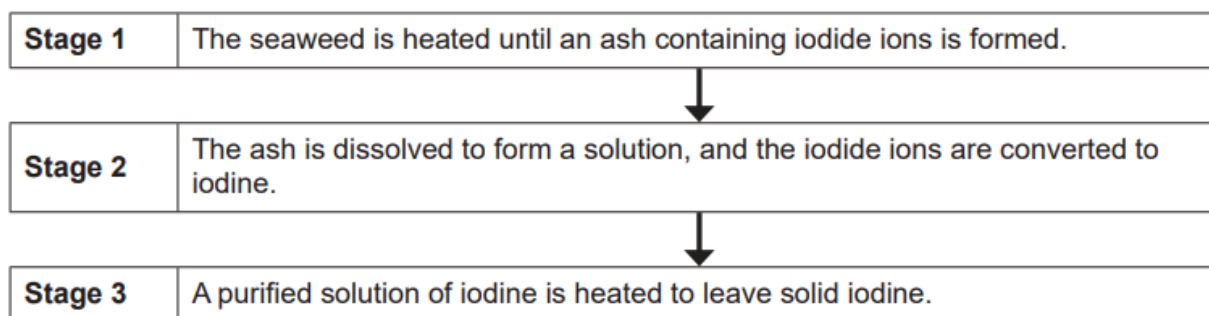
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Q28.a).(2023)

Iodine is an element in Group 7 of the Periodic Table.

Seaweed has small amounts of compounds containing iodine. It is possible to extract iodine from seaweed.

The diagram shows the stages in the extraction of iodine.



In **Stage 1** iodide ions are produced by reduction.

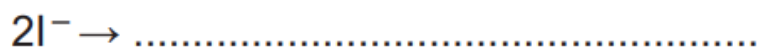
Explain reduction in terms of electrons.

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Q28.b).(2023)

In **Stage 2** iodide ions are oxidised to iodine.

Complete the **half-equation** for the oxidation of iodide ions into iodine.



Q28.c).(2023)

In **Stage 3** if the solution is heated for too long, iodine vapour is formed.

What colour is iodine vapour?

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Q28.d).(2023)

0.13 g of iodine is produced from 5.0 g of seaweed.

Calculate the percentage mass of iodine in the seaweed.

Percentage mass of iodine = ... %

Q29.(2024)

A teacher investigates some reactions of chlorine.

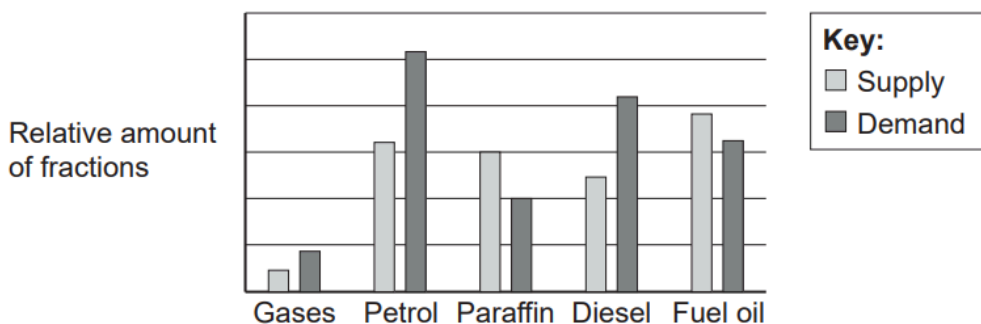
Why is it important that the teacher does **not** breathe in chlorine?

- A** Chlorine is highly flammable.
- B** Chlorine is inert.
- C** Chlorine is strongly alkaline.
- D** Chlorine is toxic.

Your answer

Q30.(2024)

The graph shows the supply and demand of different fractions of crude oil.



Which fractions are most likely to be cracked to make the supply match the demand?

- A** Diesel and fuel oil
- B** Gases and petrol
- C** Paraffin and fuel oil
- D** Petrol and diesel

Your answer

Q31.(2024)

Fluorine gas reacts with sodium to form sodium fluoride.

What is the **balanced half equation** for the reaction of fluorine when it reacts with sodium?

- A** $F + e^{-} \rightarrow F^{-}$
- B** $F \rightarrow F^{-} + e^{-}$
- C** $F_2 + 2e^{-} \rightarrow 2F^{-}$
- D** $F_2 \rightarrow 2F^{-} + 2e^{-}$

Your answer

Q32.a).(2024)

The elements in Group 1 of the Periodic Table show trends in their properties.

The table shows the diameter of atoms and arrangement of electrons for the first three elements in Group 1.

Element	Diameter of atoms (m)	Arrangement of electrons
Lithium	3.04×10^{-10}	2, 1
Sodium	3.72×10^{-10}	2, 8, 1
Potassium	4.54×10^{-10}	2, 8, 8, 1

Describe and explain the trend in the diameter of atoms of the elements in Group 1.

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Q32.b).(2024)

Rubidium is the element below potassium in Group 1.

Predict the diameter of atoms of rubidium.

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Q32.c).(2024)

Describe and explain how the diameter of the atoms affects the reactivity of the elements in Group 1.

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