

Group 1, 7, and 0 Trends and Reactions

Q1. (2018) – 8b

- (b) Describe what you would **see** if damp, blue litmus paper is placed into chlorine gas.

(2)

Q2. (2018) – 8d

- (d) When the gas hydrogen chloride, HCl, is dissolved in water, a solution forms. Blue litmus paper dipped in this solution turns red.

State why the litmus paper turns red.

(1)

Q3. (2018) – 8e

A)

- (e) (i) Figure 13 lists the halogens in the order in which they appear in group 7 of the periodic table.

The melting points of four of the halogens are given.

halogen	melting point in °C
fluorine	–220
chlorine	–101
bromine	–7
iodine	
astatine	302

Figure 13

Estimate the melting point of iodine.

(1)

..... °C

B)

- (ii) Bromine reacts with heated iron.

Give the name of one halogen that would react with iron more vigorously than bromine.

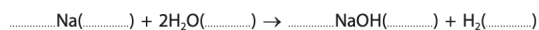
(1)

Q4. (2018) – 9b

- (b) Sodium reacts with water to form sodium hydroxide in solution and hydrogen.

Complete the balancing of the equation for this reaction and add the state symbols for each substance.

(3)



Q5. (2018) – 9c

- (c) In an experiment equal-sized pieces of lithium, sodium and potassium are added to separate samples of water.

A)

- (i) A flame is produced only with potassium because potassium

(1)

- ☐ A is the softest metal
- ☐ B has the lowest melting point
- ☐ C is the most reactive
- ☐ D is the only flammable metal

B)

*(ii) A teacher demonstrated this experiment.

The results are shown in Figure 14.

	lithium	sodium	potassium
position of metal in water	floats	floats	floats
movement of metal	slow	fast	very fast
effervescence / bubbling	slow	fast	very fast

Figure 14

Describe, in detail, how the teacher would demonstrate this experiment safely, showing how the results give the order of reactivity of the metals.

(6)

Q6. (2019)

A)

2 (a) Complete the following sentences.

(i) The name given to group 7 in the periodic table is

(1)

B)

(ii) The name given to group 0 in the periodic table is

(1)

C)

(b) Which of the following rows gives the colours of the group 7 elements chlorine and bromine at room temperature?

(1)

	chlorine	bromine
☐ A	red-brown	purple
☐ B	yellow-green	grey
☐ C	yellow-green	red-brown
☐ D	grey	red-brown

D)

(c) Figure 2 shows the melting and boiling points of bromine and iodine.

element	melting point in °C	boiling point in °C
bromine	-7	59
iodine	114	184

Figure 2

Using the information in Figure 2, which row shows the physical states of these elements at 50 °C?

(1)

	bromine	iodine
☐ A	liquid	gas
☐ B	solid	liquid
☐ C	gas	solid
☐ D	liquid	solid

E)

(d) The densities of some elements in group 0 are shown in Figure 3.

name	density in g cm^{-3}
helium	0.15
neon	1.2
argon	1.4
krypton	
xenon	3.5

Figure 3

Use the information in Figure 3 to suggest the density of krypton.

(1)

density of krypton = ... g cm^{-3}

F)

(e) For many years, argon was used to fill filament light bulbs.

A filament light bulb is shown in Figure 4.

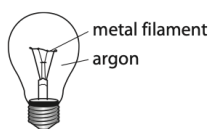


Figure 4

When the bulb is in use the metal filament becomes extremely hot.

Explain why argon, rather than air, was used to fill filament light bulbs.

(2)

Q7. (2019) – 9c

(c) Chlorine reacts with hydrogen to form hydrogen chloride.

Write the balanced equation for this reaction.

(3)

Q8. (2020)

A)

5 Chlorine, bromine and iodine are elements in group 7 of the periodic table.

(a) Chlorine is toxic.

State **one** safety precaution that should be taken when using chlorine in the laboratory.

(1)

B)

(b) Chlorine reacts with hydrogen to form hydrogen chloride.

(i) Write the word equation for this reaction.

(1)

..... →

C)

(ii) Hydrogen chloride dissolves in water to form an acidic solution.

State what is **seen** when blue litmus paper is placed into this solution.

(1)

Q9. (2020) – 8b, 8d, 8f (i, ii)

A)

- (b) Potassium and caesium are in the same group of the periodic table.

Explain, in terms of electrons, why potassium and caesium are in the same group.

(2)

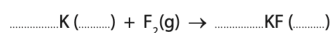
B)

- (d) Potassium reacts with fluorine to form potassium fluoride.

Potassium fluoride is a solid.

Complete the balanced equation for this reaction and add the state symbols.

(3)



C)

- (f) Figure 14 shows the melting points and boiling points of elements in group 7 of the periodic table.

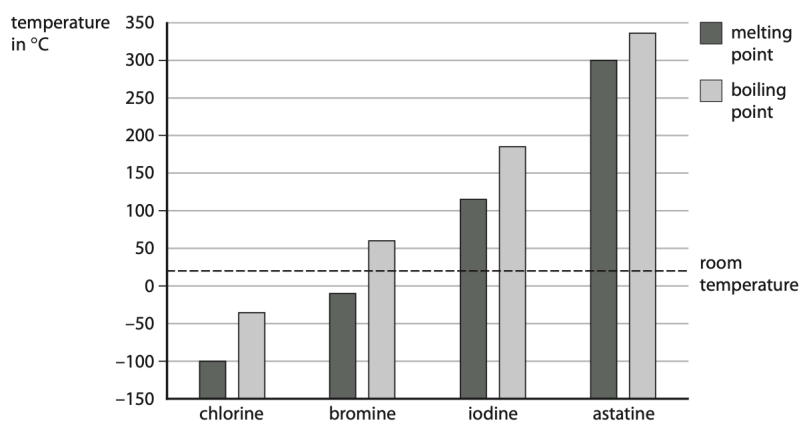


Figure 14

- (i) Give, using Figure 14, the boiling point of bromine.

(1)

boiling point of bromine = ... °C

D)

- (ii) State which **two** elements from Figure 14 are solids at room temperature.

(1)

Q10. (2021)

A)

3 This question is about the noble gases.

- (a) (i) State, in terms of outer shell electrons, why the noble gases are unreactive.

(1)

B)

- (ii) Figure 4 shows an airship, filled with helium, floating above the ground.

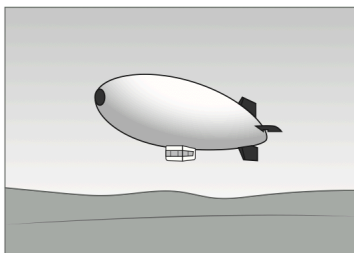


Figure 4

Helium, hydrogen and krypton are gases.

Figure 5 shows the reactivity and density, at room temperature and pressure, of helium, hydrogen and krypton.

gas	reactivity	density in g cm^{-3}
helium	unreactive	0.00018
hydrogen	very reactive	0.00009
krypton	unreactive	0.00380

Figure 5

The density of air is $0.001225 \text{ g cm}^{-3}$.

Helium is used in airships.

Explain why hydrogen and why krypton are **not** used in airships.

(3)

Q11. (2021) – 3c

- (c) Figure 6 shows the boiling points of some of the noble gases.

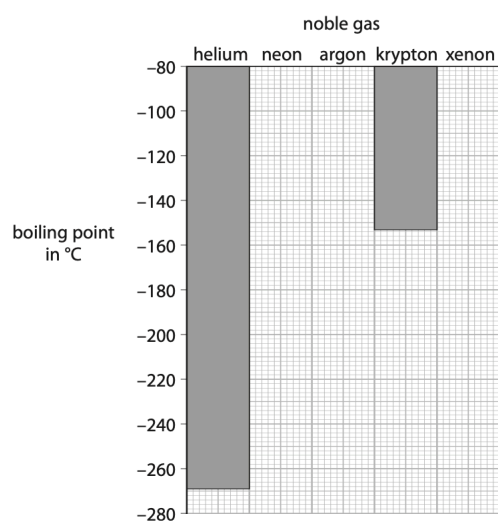
noble gas	boiling point in $^{\circ}\text{C}$
helium	-269
neon	-246
argon	-186
krypton	-153
xenon	

Figure 6

A)

- (i) Complete the bar chart to show the boiling points of neon and argon.

(2)



B)

- (ii) Predict the boiling point of xenon.

(1)

boiling point of xenon = ... °C

Q12. (2021)

A)

- 5 Fluorine, chlorine, bromine and iodine are elements in group 7 of the periodic table.

- (a) (i) State the name given to the group 7 elements.

(1)

B)

- (ii) Name one other element that is in group 7.
-
- Use the periodic table on the back of this exam paper to help you.

(1)

C)

- (iii) Which element is liquid at room temperature and pressure?

(1)

- ☐ A fluorine
- ☐ B chlorine
- ☐ C bromine
- ☐ D iodine

D)

- (iv) Which element is dark-grey in colour at room temperature and pressure?

(1)

- ☐ A fluorine
- ☐ B chlorine
- ☐ C bromine
- ☐ D iodine

Q13. (2021) – 5c

- (c) Tin also reacts with fluorine.
-
- The reaction between fluorine and tin is much more vigorous than the reaction between chlorine and tin.

Figure 8 shows the electronic configurations of fluorine and chlorine.

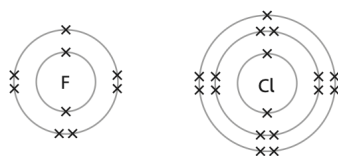


Figure 8

Explain, in terms of their electronic configurations, why fluorine reacts with tin more vigorously than chlorine reacts with tin.

(2)

Q14. (2022) – 2a (i, iii)

2 This question is about elements in group 1 of the periodic table.

- (a) Figure 3 shows the symbols of the first three elements in group 1 of the periodic table and their melting points.

symbol	melting point in °C
Li	181
Na	98
K	64

Figure 3

Use the periodic table to answer these questions.

A)

- (i) Give the symbol of **another** element in group 1.

(1)

B)

- (iii) Describe the trend in the melting points of the elements in Figure 3.

(2)

Q15. (2022) – 2b

- (b) The elements in group 1 react very vigorously with water.

A student suggests this method to see what happens when sodium reacts with water.

- step 1** put on safety glasses and a laboratory coat
step 2 cut a $2\text{ cm} \times 2\text{ cm} \times 2\text{ cm}$ cube of sodium
step 3 put a few drops of water in the container shown in Figure 4
step 4 add the sodium to the water in the container and observe the reaction

A)

- (i) Figure 4 shows a diagram of the container the student suggested for step 3.



Figure 4

Give the name of the container shown in Figure 4.

(1)

B)

- (ii) A teacher says that the method is not safe because the reaction is too vigorous.

Explain changes that could be made to step 2 and to step 3 that would make the method safer.

(3)

step 2: change and explanation

.....

.....

.....

step 3: change and explanation

.....

.....

.....

Q16. (2022) – 5c

- (c) Hydrogen chloride gas and sulfur dioxide gas are dissolved in separate test tubes of water.
Blue litmus paper is dipped into each test tube.

State and explain the colour change you would observe in each test tube.

(3)

Q17. (2022)

A)

- 6 This question is about elements in group 7, the halogens.

- (a) Which halogen is a green gas at room temperature and pressure?

(1)

- ☐ A bromine
- ☐ B chlorine
- ☐ C fluorine
- ☐ D iodine

B)

- (b) Bromine, chlorine and iodine all react with heated iron wool.

Figure 9 shows the speed of these reactions.

halogen	description of reaction with heated iron wool
bromine	reacts quickly
chlorine	reacts very quickly
iodine	reacts slowly

Figure 9

- (i) When iron wool is heated with chlorine, iron chloride is formed.

Write the word equation for this reaction.

(2)

C)

- (ii) Give the name of the halogen in Figure 9 that is the most reactive with iron.

(1)

Q18. (2022)

A)

9 This question is about gases.

(a) When sodium is added to water, hydrogen gas is produced.

Which observation shows that a gas has been produced?

(1)

- ☐ A a white precipitate forms
- ☐ B effervescence is seen
- ☐ C the sodium sinks in the water
- ☐ D the water changes to a pink colour

B)

(b) Some damp litmus paper is placed in a gas.
The litmus paper is bleached.

Which gas bleaches damp litmus paper?

(1)

- ☐ A carbon dioxide
- ☐ B chlorine
- ☐ C hydrogen
- ☐ D oxygen

Q19. (2022) – 9d

(d) A diagram of an atom of helium is shown in Figure 15.

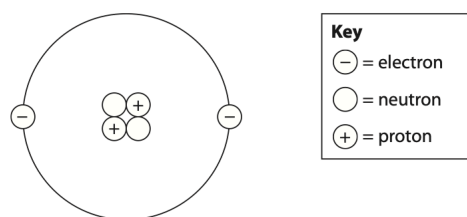


Figure 15

A)

(i) Explain, using Figure 15, why helium is inert.

(2)

B)

(ii) Helium is used to fill balloons.

State one property of helium, apart from it being inert, that makes it suitable for filling balloons.

(1)

Q20. (2023)

A)

6 Chlorine is an element in group 7 of the periodic table.

(a) What name is given to group 7 of the periodic table?

(1)

- ☐ A alkali metals
- ☐ B halogens
- ☐ C noble gases
- ☐ D transition metals

B)

(b) Chlorine reacts with sodium to form sodium chloride.

(i) Write the word equation for this reaction.

(2)

..... →

Q21. (2023) – 6c

(c) Figure 12 shows a flow diagram of how hydrochloric acid can be made.

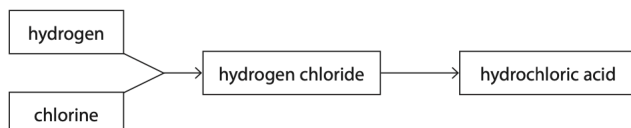


Figure 12

A)

(i) Balance the equation for the reaction between hydrogen and chlorine to form hydrogen chloride.

(1)



B)

(ii) State how hydrogen chloride can be converted into hydrochloric acid.

(1)

Q22. (2023) – 9a, 9b, 9c, 9e

9 Figure 18 shows some information about some group 1 metals.

group 1 metal	atomic number	relative atomic mass
lithium	3	7
sodium	11	23
potassium	19	39
rubidium	37	85
caesium	55	133

Figure 18

A)

(a) Explain, in terms of their electronic configurations, why these metals are placed in group 1 of the periodic table.

(2)

B)

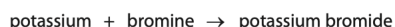
(b) Which row shows two correct properties of group 1 metals?

(1)

properties of group 1 metals		
☐ A	compounds are white in colour	high density
☐ B	low melting points	compounds are blue in colour
☐ C	soft enough to be cut by a knife	low melting points
☐ D	high density	conduct electricity

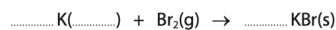
C)

- (c) The word equation for the reaction of potassium with bromine is



Add the missing state symbol and balance the equation for this reaction.

(2)



D)

- *(e) The reactivity of the group 1 metals increases from lithium to caesium.

Often, teachers demonstrate the reactions of lithium, sodium and potassium with water.

These reactions can be used to predict the behaviour and reactions of rubidium and caesium with water.

Describe the reactions of each of the group 1 metals with water including the predicted behaviour and reactions of rubidium and caesium.

You may use word equations in your answer.

(6)

Q23. (2024) – 2b

- (b) Alkali metals react with water to produce an alkaline solution and hydrogen gas.

A test tube of gas can be tested to see if the gas is hydrogen by putting a lighted splint at the top of the test tube.

A student suggests the following method to show that an alkaline solution and hydrogen gas are produced in this reaction.

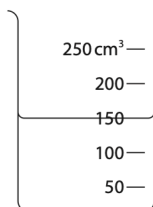
step 1 pour 150 cm³ water into the container shown in Figure 4**step 2** add a small piece of lithium to the water in the container shown in Figure 4**step 3** hold a lighted splint above the container**step 4** hold some damp red litmus paper above the mixture in the container.

Figure 4

A)

- (i) Give the name of the container shown in Figure 4.

(1)

B)

- (ii) A teacher says that step 3 and step 4 will
- not**
- work to show that hydrogen gas and an alkaline solution are produced in the reaction.

Explain **one** change that could be made in each step to make the method work.

(3)

step 3

.....

step 4

.....

Q24. (2024)

A)

6 This question is about bromine.

- (a) Give the colour and physical state of bromine at room temperature.

(2)

colour

physical state

B)

- (b) Bromine reacts with hydrogen to form hydrogen bromide.

- (i) Write the word equation for this reaction.

(2)

..... + ... →

C)

- (ii) Hydrogen bromide dissolves in water to form a solution.

This solution of hydrogen bromide reacts with alkalis.

State the type of reaction that occurs when a solution of hydrogen bromide reacts with an alkali.

(1)

D)

- (c) Bromine and the other halogens react with hot iron wool.

Figure 11 shows the relative speed of some of these reactions.

halogen	relative speed of reaction
fluorine	
chlorine	reacts very quickly
bromine	reacts quickly
iodine	reacts slowly

Figure 11

Fluorine also reacts with hot iron wool.

Use Figure 11 to predict the relative speed of this reaction.

(1)

Q25. (2024) – 9c

A)

- (c) Helium, neon and argon are all inert.

- (i) Explain, in terms of electrons, why these gases are inert.

(2)

B)

- (ii) Two pieces of steel can be joined by heating the metal pieces with a very hot flame.

This process is often carried out in an argon atmosphere rather than in air.

Which property makes argon gas suitable for this use?

(1)

- ☐ A argon has a low density
- ☐ B argon has a low melting point
- ☐ C argon is colourless
- ☐ D argon is unreactive