PEARSON EDEXCEL GCSE CHEMISTRY · 1CH0

CHEMISTRY



EXAM QUESTION PACK

TOPIC 1: KEY CONCEPTS IN CHEMISTRY (PACK 4)

SCORE	PERCENTAGE
/90	%

STEMUP

These questions belong to Pearson Edexcel, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by Pearson Edexcel. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with Pearson Edexcel and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. Pearson Edexcel has not endorsed, approved or been involved in the production of it. Pearson Edexcel and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

Pearson Edexcel publishes its past papers, mark schemes and examiner reports. Always check the current specification at qualifications.pearson.com before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Q1.

The scientist John Dalton lived over 200 years ago.

John Dalton suggested an early model of atoms.

When Dalton first described atoms he said that

- all elements are made of atoms
- atoms are not formed of any smaller particles
- all atoms of the same element are identical.

Give two differences between Dalton's model of atoms and today's model of atoms.

(2)

1 .....

.....

.....

2 .....

.....

.....

(Total for question = 2 marks)

Q2.

The scientist John Dalton lived over 200 years ago.

John Dalton suggested an early model of atoms.

When Dalton first described atoms he said that

- all elements are made of atoms
- atoms are not formed of any smaller particles
- all atoms of the same element are identical.

Give two differences between Dalton's model of atoms and today's model of atoms.

(2)

1 .....

.....

.....

2 .....

.....

.....

(Total for question = 2 marks)

Q3.

Sulfur and oxygen are both in group 6 of the periodic table.

Explain, in terms of their electronic configurations, why they are both in group 6.

(2)

.....

.....

.....

.....

Q4.

Sulfur and oxygen are both in group 6 of the periodic table.

Explain, in terms of their electronic configurations, why they are both in group 6.

(2)

.....

.....

.....

.....

Q5.

Group 7 elements

(a) A compound of iron and chlorine was formed by reacting 2.80 g of iron with 3.55 g of chlorine.

Calculate the empirical formula of the compound.
(relative atomic masses: Cl = 35.5, Fe = 56.0)

(3)

.....

.....

.....

.....

.....

.....

empirical formula .....

(b) Sodium reacts with chlorine to form sodium chloride.

$$2Na + Cl_2 \rightarrow 2NaCl$$

Calculate the maximum mass of sodium chloride that could be formed by reacting 9.20 g of sodium with excess chlorine.
(relative atomic masses: Na = 23.0, Cl = 35.5)

(3)

.....

.....

.....

.....

.....

.....

mass of sodium chloride ..... g

*(c) Chlorine, bromine and iodine are in group 7 of the periodic table.

The order of reactivity of these three elements can be shown by carrying out displacement experiments.

You are provided with

potassium bromide solution
potassium chloride solution
potassium iodide solution
bromine solution
chlorine solution
iodine solution

Describe how these solutions could be used to carry out experiments to show the order of reactivity of bromine, chlorine and iodine, explaining how the results would show the order of reactivity.
You may use equations if you wish.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 12 marks)

Q6.

Group 7 elements

(a) A compound of iron and chlorine was formed by reacting 2.80 g of iron with 3.55 g of chlorine.

Calculate the empirical formula of the compound.
(relative atomic masses: Cl = 35.5, Fe = 56.0)

(3)

.....

.....

.....

.....

.....

.....

empirical formula .....

(b) Sodium reacts with chlorine to form sodium chloride.

$$2Na + Cl_2 \rightarrow 2NaCl$$

Calculate the maximum mass of sodium chloride that could be formed by reacting 9.20 g of sodium with excess chlorine.
(relative atomic masses: Na = 23.0, Cl = 35.5)

(3)

.....

.....

.....

.....

.....

.....

mass of sodium chloride ..... g

*(c) Chlorine, bromine and iodine are in group 7 of the periodic table.

The order of reactivity of these three elements can be shown by carrying out displacement experiments.

You are provided with

potassium bromide solution
potassium chloride solution
potassium iodide solution
bromine solution
chlorine solution
iodine solution

Describe how these solutions could be used to carry out experiments to show the order of reactivity of bromine, chlorine and iodine, explaining how the results would show the order of reactivity.
You may use equations if you wish.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 12 marks)

Q7.

The periodic table is very useful to chemists.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

The periodic table is a table of

(1)

☒ **A** mixtures

☒ **B** elements

☒ **C** compounds

☒ **D** solutions

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

Group 1 in the periodic table contains

(1)

☒ **A** transition metals

☒ **B** noble gases

☒ **C** halogens

☒ **D** alkali metals

(c) The table shows some of the gases in group 0 and some of their properties.
The gases are shown in the order in which they appear in group 0.

(i) Fill in the three spaces in the table.

gas	atomic symbol	density / g dm^{-3}	reaction with metals
helium	He	0.12	no reaction
neon	Ne	1.44	no reaction
argon	Ar		no reaction
krypton		3.00	no reaction
xenon	Xe	3.56	

(ii) Some light bulbs contain a metal filament.



These light bulbs are filled with argon.

Explain why argon, instead of air, is used inside these light bulbs.

(2)

.....

.....

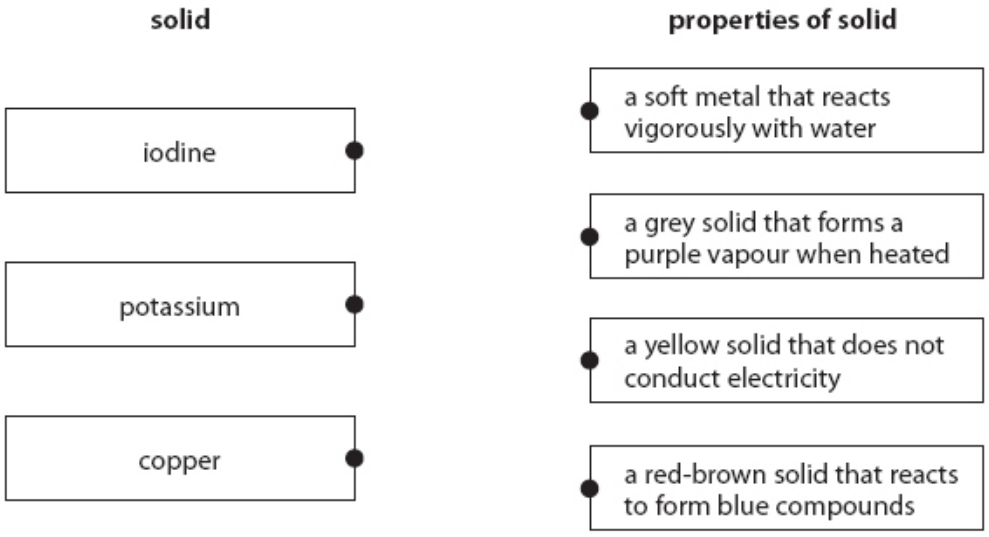
.....

.....

.....

(d) The table shows some solids and some properties of solids.

Draw **one** straight line from each solid to properties of that solid.



(Total for Question = 9 marks)

Q8.

The periodic table is very useful to chemists.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

The periodic table is a table of

(1)

☒ **A** mixtures

☒ **B** elements

☒ **C** compounds

☒ **D** solutions

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

Group 1 in the periodic table contains

(1)

☒ **A** transition metals

☒ **B** noble gases

☒ **C** halogens

☒ **D** alkali metals

(c) The table shows some of the gases in group 0 and some of their properties.
The gases are shown in the order in which they appear in group 0.

(i) Fill in the three spaces in the table.

gas	atomic symbol	density / g dm^{-3}	reaction with metals
helium	He	0.12	no reaction
neon	Ne	1.44	no reaction
argon	Ar		no reaction
krypton		3.00	no reaction
xenon	Xe	3.56	

(ii) Some light bulbs contain a metal filament.



These light bulbs are filled with argon.

Explain why argon, instead of air, is used inside these light bulbs.

(2)

.....

.....

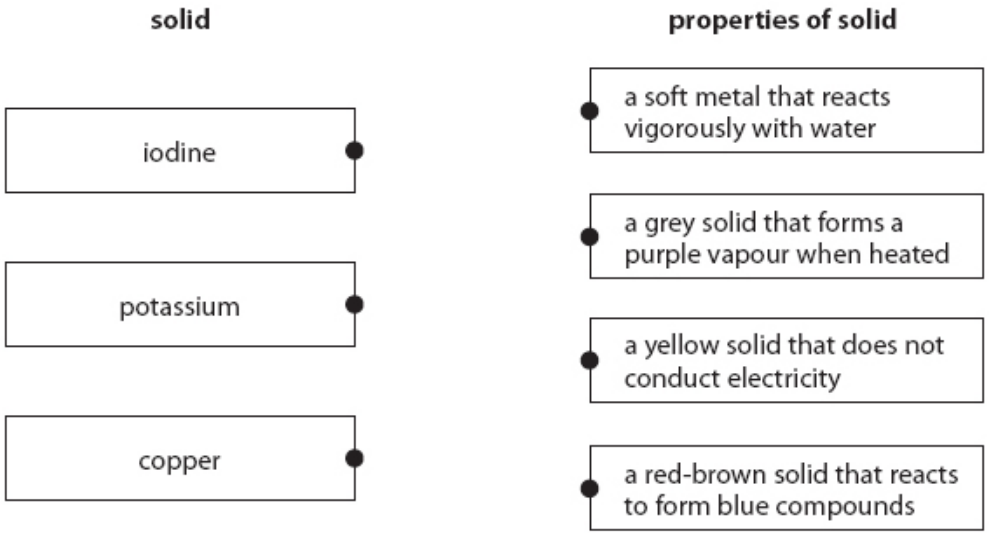
.....

.....

.....

(d) The table shows some solids and some properties of solids.

Draw **one** straight line from each solid to properties of that solid.



(Total for Question = 9 marks)

Q9.

* Explain how, in this reaction, magnesium and oxygen atoms form a solid that has a high melting point.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 6 marks)

Q10.

The elements beryllium, magnesium, calcium, strontium and barium are in group 2 of the periodic table.

State how the position of barium in the periodic table shows that it is a metal.

(1)

.....

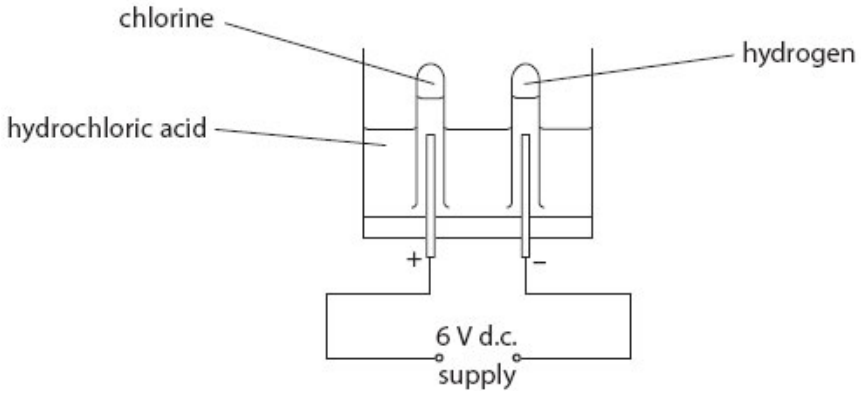
.....

(Total for question = 1 mark)

Q11.

(a) Electrolysis of hydrochloric acid produces chlorine and hydrogen.

The apparatus used is shown.



(i) Explain what is meant by **electrolysis.**

(2)

.....

.....

(ii) Describe the test to show that a gas is chlorine.

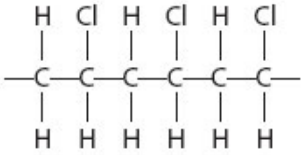
(2)

.....

.....

.....

(iii) Chlorine is used in the manufacture of a polymer.
Part of this polymer molecule is



State the name of the polymer.

(1)

.....

(b) Dilute hydrochloric acid reacts with silver nitrate solution to form silver chloride and nitric acid.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The reaction produces silver chloride as a precipitate.
In an equation this would be shown as

(1)

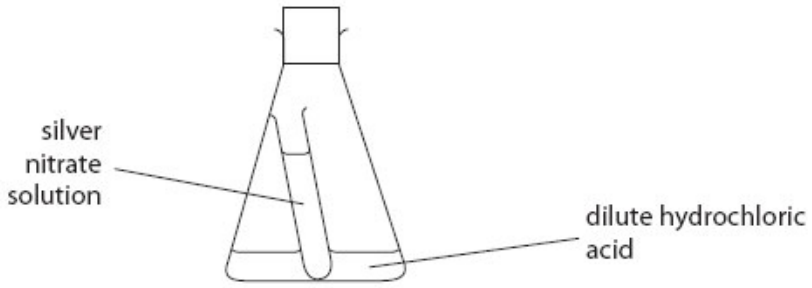
☒ **A** AgCl(aq)

☒ **B** AgCl(g)

☒ **C** AgCl(l)

☒ **D** AgCl(s)

(ii) This apparatus is used to investigate the mass of the reactants and the mass of products in this reaction.



The total mass of this apparatus was measured.
The flask was shaken to allow the silver nitrate solution and dilute hydrochloric acid to react.
After the reaction the total mass of the apparatus was measured again.

State how the total mass of the apparatus after the reaction will compare with the total mass of the apparatus before the reaction.

(1)

.....

(iii) Write the balanced equation for the reaction of silver nitrate solution, $AgNO_3$, with dilute hydrochloric acid to form silver chloride, AgCl, and nitric acid.

(2)

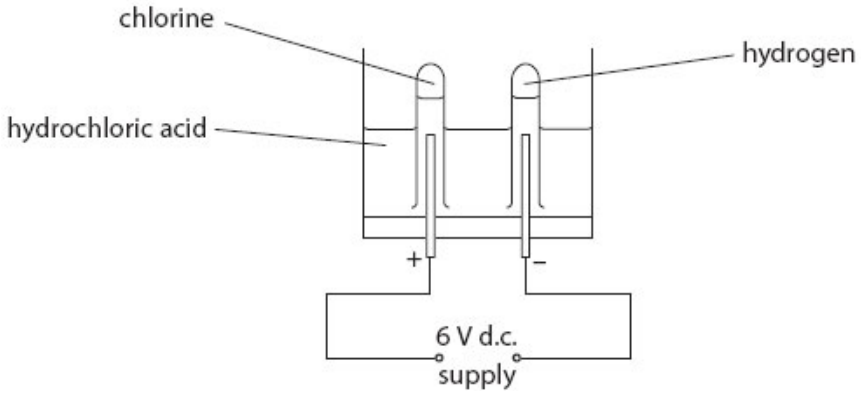
.....

(Total for Question = 9 marks)

Q12.

(a) Electrolysis of hydrochloric acid produces chlorine and hydrogen.

The apparatus used is shown.



(i) Explain what is meant by **electrolysis.**

(2)

.....

.....

(ii) Describe the test to show that a gas is chlorine.

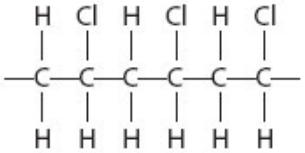
(2)

.....

.....

.....

(iii) Chlorine is used in the manufacture of a polymer.
Part of this polymer molecule is



State the name of the polymer.

(1)

.....

(b) Dilute hydrochloric acid reacts with silver nitrate solution to form silver chloride and nitric acid.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The reaction produces silver chloride as a precipitate.
In an equation this would be shown as

(1)

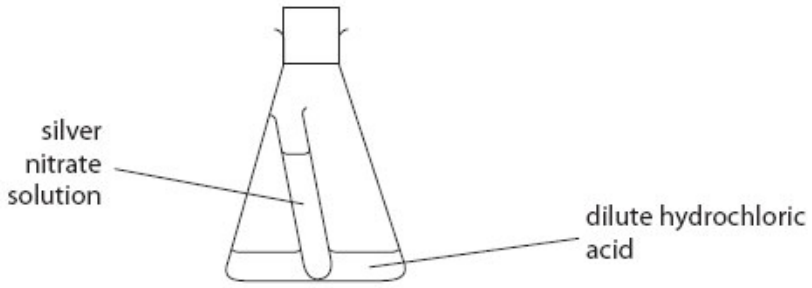
☒ **A** AgCl(aq)

☒ **B** AgCl(g)

☒ **C** AgCl(l)

☒ **D** AgCl(s)

(ii) This apparatus is used to investigate the mass of the reactants and the mass of products in this reaction.



The total mass of this apparatus was measured.
The flask was shaken to allow the silver nitrate solution and dilute hydrochloric acid to react.
After the reaction the total mass of the apparatus was measured again.

State how the total mass of the apparatus after the reaction will compare with the total mass of the apparatus before the reaction.

(1)

.....

(iii) Write the balanced equation for the reaction of silver nitrate solution, $AgNO_3$, with dilute hydrochloric acid to form silver chloride, AgCl, and nitric acid.

(2)

.....

(Total for Question = 9 marks)

Q13.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Chlorine has an atomic number of 17.

Figure 3 shows the arrangement of electrons in an atom of chlorine.

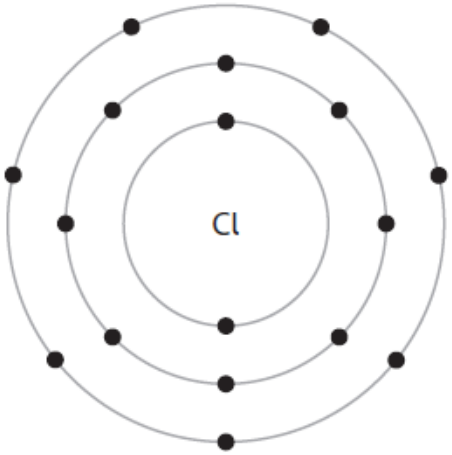


Figure 3

(i) What is the electronic configuration of this atom?

(1)

☒ **A** 10.7

☒ **B** 17

☒ **C** 2.8.7

☒ **D** 7.8.2

(ii) Explain, using Figure 3, why chlorine belongs to group 7 of the periodic table.

(2)

.....

.....

.....

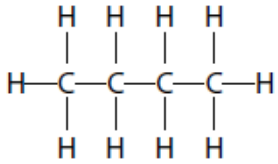
.....

(Total for question = 3 marks)

Q14.

Alkanes and alkenes are hydrocarbons.

The structure of a molecule of butane is shown.



Which of the following is the empirical formula for butane?

(1)

☒ **A** CH

☒ **B** CH_2

☒ **C** C_2H_5

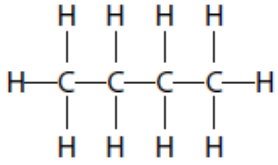
☒ **D** C_4H_{10}

(Total for question = 1 mark)

Q15.

Alkanes and alkenes are hydrocarbons.

The structure of a molecule of butane is shown.



Which of the following is the empirical formula for butane?

(1)

☒ **A** CH

☒ **B** CH_2

☒ **C** C_2H_5

☒ **D** C_4H_{10}

(Total for question = 1 mark)

Q16.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

When copper sulfate solution reacts with sodium hydroxide solution, a precipitate of copper hydroxide and a solution of sodium sulfate are formed.

The equation is

$$CuSO_4 + 2NaOH \rightarrow Cu(OH)_2 + Na_2SO_4$$

The formula of the sodium ion is Na^+.

What is the formula of the sulfate ion?

(1)

☒ **A** SO_4^+

☒ **B** SO_4^-

☒ **C** SO_4^{2+}

☒ **D** SO_4^{2-}

(Total for question = 1 mark)

Q17.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

Magnesium has an atomic number of 12.

Which line in the table shows the correct numbers of protons, neutrons and electrons in a positively charged magnesium ion?

(1)

	number of		
	protons	neutrons	electrons
☒ A	10	12	12
☒ B	10	12	10
☒ C	12	10	12
☒ D	12	12	10

(Total for question = 1 mark)

Q18.

Sodium has an atomic number of 11.

Which line in the table shows the correct numbers of protons, neutrons and electrons in a positively charged sodium ion, Na^+?

(1)

	number of		
	protons	neutrons	electrons
☒ A	10	12	11
☒ B	10	11	10
☒ C	11	10	11
☒ D	11	12	10

(Total for question = 1 mark)

Q19.

Sodium has an atomic number of 11.

Which line in the table shows the correct numbers of protons, neutrons and electrons in a positively charged sodium ion, Na^+?

(1)

	number of		
	protons	neutrons	electrons
☒ A	10	12	11
☒ B	10	11	10
☒ C	11	10	11
☒ D	11	12	10

(Total for question = 1 mark)

Q20.

Some of the elements in the periodic table are metals.

The electronic configuration of a metal is 2.8.3

Which row shows the group and period of the periodic table where this metal is found?

(1)

	group	period
☒ A	2	3
☒ B	2	8
☒ C	3	2
☒ D	3	3

(Total for question = 1 mark)

Q21.

An aluminium atom has the atomic number 13 and the mass number 27.

Which row shows the numbers of subatomic particles present in an aluminium ion, Al^{3+}?

(1)

	protons	neutrons	electrons
☒ **A**	13	14	13
☒ **B**	13	14	10
☒ **C**	14	13	10
☒ **D**	14	13	17

(Total for question = 1 mark)

Q22.

An aluminium atom has the atomic number 13 and the mass number 27.

Which row shows the numbers of subatomic particles present in an aluminium ion, Al^{3+}?

(1)

	protons	neutrons	electrons
☒ **A**	13	14	13
☒ **B**	13	14	10
☒ **C**	14	13	10
☒ **D**	14	13	17

(Total for question = 1 mark)

Q23.

Some properties of four solids, **A**, **B**, **C** and **D**, are shown in Figure 6.

The solids, in no particular order, are copper carbonate, copper oxide, magnesium metal and sodium hydroxide.

	A	B	C	D
colour of solid	black	silver	white	green
observation when solid is added to water	black solid remains	a few bubbles appear on surface of solid	solid dissolves and forms colourless solution	green solid remains
pH of mixture of solid added to water	7	8	13	7
observation when solid is added to dilute sulfuric acid	on warming, solid disappears to form blue solution	effervescence solid disappears to form colourless solution	solid disappears to form colourless solution	effervescence solid disappears to form blue solution

Figure 6

Identify the solids **A**, **B**, **C** and **D**, explaining how the information in Figure 6 supports the identification of each solid.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 6 marks)

Q24.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Titanium and iron are examples of transition metals.

Iron, when heated in air, reacts with oxygen to form iron oxide.

(i) This reaction is an example of

(1)

☐ **A** crystallisation

☐ **B** distillation

☐ **C** neutralisation

☐ **D** oxidation

(ii) The equipment shown in Figure 7 can be used to find the mass of oxygen that combines with iron.

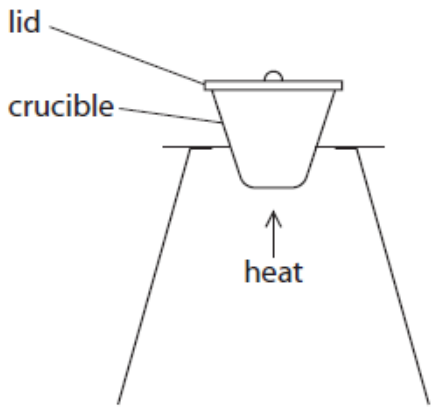


Figure 7

Describe how the equipment shown in Figure 7 could be used to find the mass of oxygen that combines with 0.500 g of iron wool in a crucible and lid of known mass.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 4 marks)

Q25.

Aluminium is a metal.

Aluminium is used in overhead power lines.

The power lines are supported by pylons as shown in Figure 3.

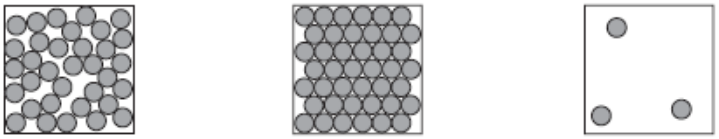


Figure 3

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

(i) Which diagram shows the arrangement of the atoms in the aluminium metal?

(1)



☐ **A** ☐ **B** ☐ **C**

(ii) Overhead power lines are made of aluminium with a steel core, as shown in Figure 4.

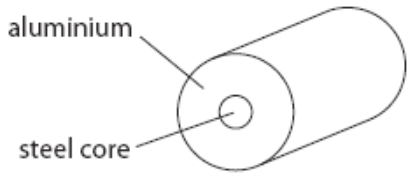


Figure 4

Figure 5 shows some properties of steel and aluminium.

property	steel	aluminium
density ($g\,cm^{-3}$)	7.87	2.70
relative strength	high	low

Figure 5

Explain why the power lines are made of aluminium with a steel core rather than pure aluminium.

(2)

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

Q26.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

Sodium sulfate, Na_2SO_4, is an ionic solid.

(i) Which of these is most likely to be a property of solid sodium sulfate?

(1)

☒ **A** good conductor of electricity

☒ **B** high melting point

☒ **C** low boiling point

☒ **D** malleable

(ii) The formula of the sodium ion is Na^+.

What is the formula of the sulfate ion?

(1)

☒ **A** SO_4^+

☒ **B** SO_4^-

☒ **C** SO_4^{2+}

☒ **D** SO_4^{2-}

(iii) Explain, in terms of electrons, how a sodium atom, Na, forms a sodium ion, Na^+.

(2)

.....

.....

.....

(Total for question = 4 marks)

Q27.

When iron reacts with chlorine, iron chloride is formed.

Two possible equations for this reaction are

A $Fe + Cl_2 \rightarrow FeCl_2$

B $2Fe + 3Cl_2 \rightarrow 2FeCl_3$

In an experiment, 8.40 g iron reacts with chlorine to form 19.05 g iron chloride.

Show, using a calculation, which reaction, **A** or **B**, is taking place.

You must show your working.

(relative atomic masses: Cl = 35.5, Fe = 56.0)

(3)

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

Q28.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

Which of the following is true for most metals?

(1)

☒ **A** they are dull

☒ **B** they have low melting points

☒ **C** they are found on the right-hand side of the periodic table

☒ **D** they are malleable

(Total for question = 1 mark)

Q29.

(a) Sodium chloride is a metal chloride which is soluble in cold water.

(i) Give the name of a metal chloride which is insoluble in cold water.

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** copper chloride

☒ **B** lead chloride

☒ **C** magnesium chloride

☒ **D** potassium chloride

(ii) Sodium chloride has a melting point of 801 °C.

Explain why the melting point of sodium chloride is high.

(2)

.....

.....

.....

(iii) Describe how you would test for the presence of chloride ions in a solution of sodium chloride.

(3)

.....

.....

.....

.....

.....

.....

*(b) Magnesium has an electronic configuration of 2.8.2.
Oxygen has an electronic configuration of 2.6.

Explain, in terms of their electronic configurations, how magnesium and oxygen atoms react to form the ionic compound magnesium oxide, MgO, and include a description of the structure of solid magnesium oxide.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question = 12 marks)

Q30.

(a) Sodium chloride is a metal chloride which is soluble in cold water.

(i) Give the name of a metal chloride which is insoluble in cold water.

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** copper chloride

☒ **B** lead chloride

☒ **C** magnesium chloride

☒ **D** potassium chloride

(ii) Sodium chloride has a melting point of 801 °C.

Explain why the melting point of sodium chloride is high.

(2)

.....

.....

.....

(iii) Describe how you would test for the presence of chloride ions in a solution of sodium chloride.

(3)

.....

.....

.....

.....

.....

.....

*(b) Magnesium has an electronic configuration of 2.8.2.
Oxygen has an electronic configuration of 2.6.

Explain, in terms of their electronic configurations, how magnesium and oxygen atoms react to form the ionic compound magnesium oxide, MgO, and include a description of the structure of solid magnesium oxide.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question = 12 marks)

Q31.

(a) Magnesium oxide is an ionic compound.

The electronic configuration of magnesium is 2.8.2.
The electronic configuration of oxygen is 2.6.

Describe, in terms of electrons, how a magnesium atom and an oxygen atom form ions in magnesium oxide, MgO.

(3)

.....

.....

.....

.....

.....

.....

(b) Calculate the relative formula mass of magnesium oxide, MgO.
(relative atomic masses: O = 16; Mg = 24)

(1)

.....

relative formula mass = ...

Q32.

(a) Magnesium oxide is an ionic compound.

The electronic configuration of magnesium is 2.8.2.
The electronic configuration of oxygen is 2.6.

Describe, in terms of electrons, how a magnesium atom and an oxygen atom form ions in magnesium oxide, MgO.

(3)

.....

.....

.....

.....

.....

.....

(b) Calculate the relative formula mass of magnesium oxide, MgO.
(relative atomic masses: O = 16; Mg = 24)

(1)

.....

relative formula mass = ...

Q33.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Ionic compounds

(1)

☒ **A** conduct electricity when solid

☒ **B** do not conduct electricity when molten

☒ **C** have low boiling points

☒ **D** have high melting points

Q34.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Ionic compounds

(1)

- ☒ **A** conduct electricity when solid
- ☒ **B** do not conduct electricity when molten
- ☒ **C** have low boiling points
- ☒ **D** have high melting points

Q35.

(a) Which of the following is the formula of a cation?

Put a cross (☒) in the box next to your answer.

(1)

- ☒ **A** Mg
- ☒ **B** Na^+
- ☒ **C** H_2O
- ☒ **D** F^-

(b) (i) The formula of a potassium ion is K^+ and of a carbonate ion is CO_3^{2-}.

Which of the following is the formula of potassium carbonate?

Put a cross (☒) in the box next to your answer.

(1)

- ☒ **A** KCO_3
- ☒ **B** $K(CO)_3$
- ☒ **C** K_2CO_3
- ☒ **D** $K(CO_3)_2$

(ii) When dilute hydrochloric acid is added to potassium carbonate, a gas is evolved.

Describe the test for this gas.

(2)

.....

.....

.....

.....

Q36.

(a) Which of the following is the formula of a cation?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** Mg

☒ **B** Na^+

☒ **C** H_2O

☒ **D** F^-

(b) (i) The formula of a potassium ion is K^+ and of a carbonate ion is CO_3^{2-}.

Which of the following is the formula of potassium carbonate?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** KCO_3

☒ **B** $K(CO)_3$

☒ **C** K_2CO_3

☒ **D** $K(CO_3)_2$

(ii) When dilute hydrochloric acid is added to potassium carbonate, a gas is evolved.

Describe the test for this gas.

(2)

.....

.....

.....

.....

Q37.

Substance X is a gas at room temperature.
It is a simple molecular, covalent substance.

Which row of the table shows the properties that substance X is most likely to have?

(1)

	boiling point in °C	relative solubility in water
☒ **A**	–6	low
☒ **B**	600	high
☒ **C**	–6	high
☒ **D**	600	low

(Total for question = 1 mark)

Q38.

Students **A**, **B**, **C** and **D** carry out experiments to find the mass of oxygen that combines with a given mass of magnesium, when the magnesium burns completely.

They use the apparatus shown in Figure 7.

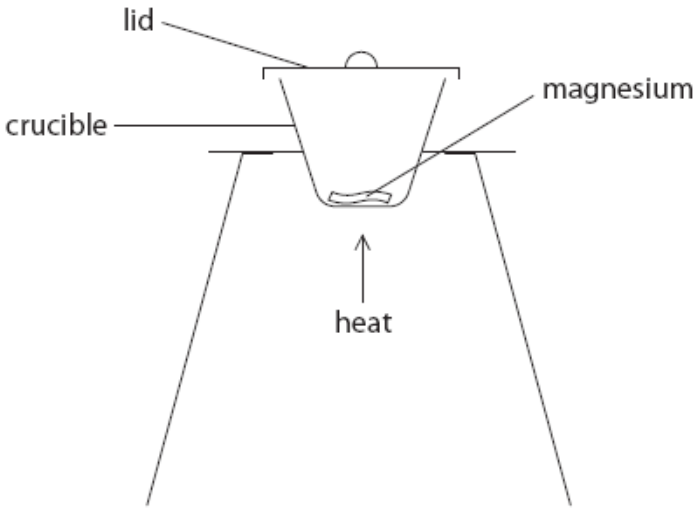


Figure 7

(i) During heating the students raise the lid slightly from time to time.

Explain why this is necessary.

(2)

.....

.....

.....

.....

(ii) The table shows the results obtained by the four students.

Which student obtained an anomalous result?

(1)

student	mass of magnesium used / g	mass of magnesium oxide formed / g	mass of oxygen reacted / g
☒ **A**	0.12	0.20	0.08
☒ **B**	0.24	0.40	0.16
☒ **C**	0.36	0.56	0.20
☒ **D**	0.48	0.80	0.32

(iii) A student is asked to prove that the reaction that has taken place in the crucible is complete.

Describe an additional step that a student could carry out to prove that all the magnesium had reacted.

(2)

.....

.....

.....

.....

(Total for question = 5 marks)

Q39.

In industry sodium carbonate is made from sodium chloride solution and calcium carbonate in the Solvay Process.

(a) Describe the test to show that calcium carbonate contains carbonate ions.

(3)

.....

.....

.....

.....

(b) Another product of the Solvay Process is calcium chloride.

Calculate the relative formula mass of calcium chloride, $CaCl_2$.
(Relative atomic masses: Ca = 40; Cl = 35.5)

(1)

.....

relative formula mass = ...

(c) The overall equation for the Solvay Process is

$$2NaCl + CaCO_3 \rightarrow Na_2CO_3 + CaC_2$$

Calculate the maximum mass of sodium carbonate that could be formed by reacting 40 kg of calcium carbonate with an excess of sodium chloride solution.
(Relative formula masses: $CaCO_3$ = 100; Na_2CO_3 = 106)

(2)

.....

.....

.....

.....

.....

mass of sodium carbonate = ... kg

(d) Sodium carbonate was made in a laboratory experiment.
The theoretical yield of the experiment was 15.0 g.
The actual yield of the experiment was 10.4 g.

(i) Calculate the percentage yield of sodium carbonate in this experiment.

(2)

.....

.....

.....

.....

percentage yield = ...

(ii) Suggest **two** reasons why the actual yield was less than the theoretical yield.

(2)

reason 1 .....

.....

reason 2 .....

.....

(Total for Question = 10 marks)

Q40.

In industry sodium carbonate is made from sodium chloride solution and calcium carbonate in the Solvay Process.

(a) Describe the test to show that calcium carbonate contains carbonate ions.

(3)

.....

.....

.....

.....

(b) Another product of the Solvay Process is calcium chloride.

Calculate the relative formula mass of calcium chloride, $CaCl_2$.
(Relative atomic masses: Ca = 40; Cl = 35.5)

(1)

.....

relative formula mass = ...

(c) The overall equation for the Solvay Process is

$$2NaCl + CaCO_3 \rightarrow Na_2CO_3 + CaC_2$$

Calculate the maximum mass of sodium carbonate that could be formed by reacting 40 kg of calcium carbonate with an excess of sodium chloride solution.
(Relative formula masses: $CaCO_3$ = 100; Na_2CO_3 = 106)

(2)

.....

.....

.....

.....

.....

mass of sodium carbonate = ... kg

(d) Sodium carbonate was made in a laboratory experiment.
The theoretical yield of the experiment was 15.0 g.
The actual yield of the experiment was 10.4 g.

(i) Calculate the percentage yield of sodium carbonate in this experiment.

(2)

.....

.....

.....

.....

percentage yield = ...

(ii) Suggest **two** reasons why the actual yield was less than the theoretical yield.

(2)

reason 1 .....

.....

reason 2 .....

.....

(Total for Question = 10 marks)

Q41.

Two compounds of barium are barium sulfide and barium chloride.

(i) A beaker of barium chloride solution and a beaker of dilute sulfuric acid were placed on a balance, as shown in Figure 6.

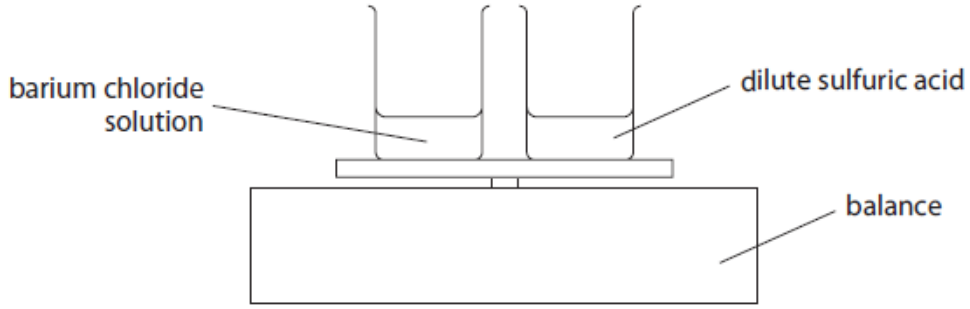


Figure 6

The total mass reading on the balance was 25.7 g.

The dilute sulfuric acid was poured into the barium chloride solution and the beaker replaced on the balance, as shown in Figure 7.

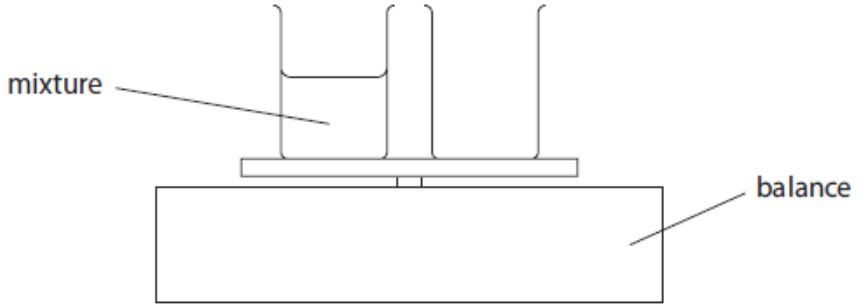


Figure 7

The mixture formed contained a white precipitate.

State the total mass reading on the balance after the reaction.

(1)

.....

(ii) Give the name of the white precipitate formed by the reaction of barium chloride solution with dilute sulfuric acid.

(1)

.....

(Total for question = 2 marks)

Q42.

A chlorine atom contains 17 electrons, 18 neutrons and 17 protons.

(i) State the mass number of this chlorine atom.

(1)

.....

(ii) Give the electronic configuration of this chlorine atom.

(1)

.....

(Total for question = 2 marks)

Q43.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The particles in atoms are electrons, neutrons and protons.

The mass of an electron is

(1)

- ☒ **A** greater than the mass of a neutron
- ☒ **B** the same as the mass of a proton
- ☒ **C** smaller than the mass of a proton
- ☒ **D** the same as the mass of a neutron

Q44.

A chlorine atom contains 17 electrons, 18 neutrons and 17 protons.

(i) State the mass number of this chlorine atom.

(1)

.....

(ii) Give the electronic configuration of this chlorine atom.

(1)

.....

(Total for question = 2 marks)

Q45.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The particles in atoms are electrons, neutrons and protons.

The mass of an electron is

(1)

- ☒ **A** greater than the mass of a neutron
- ☒ **B** the same as the mass of a proton

☒ **C** smaller than the mass of a proton

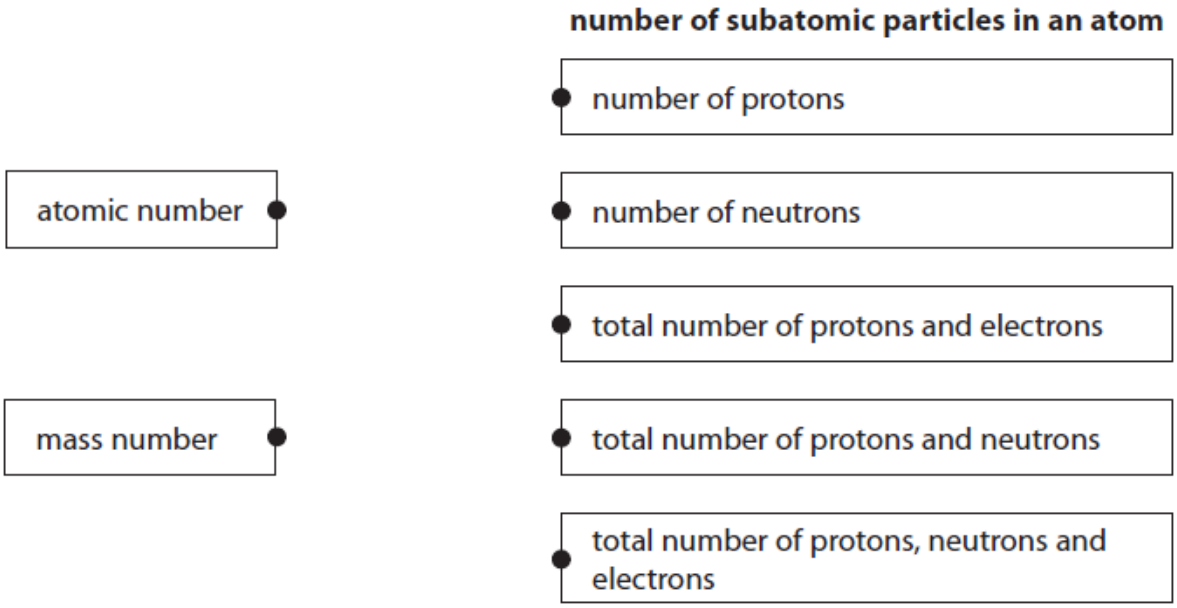
☒ **D** the same as the mass of a neutron

Q46.

An atom of an element has an atomic number and a mass number.

Draw one straight line from each of these to the numbers of subatomic particles it shows to be present in an atom.

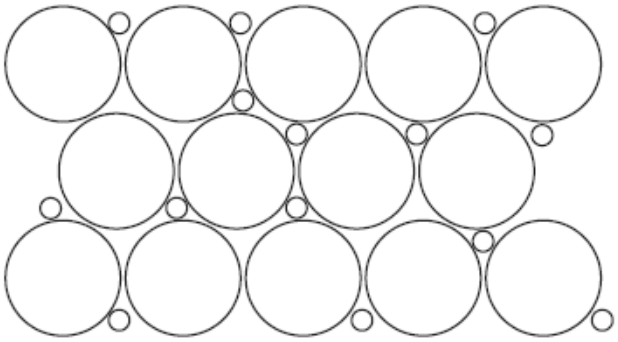
(2)



(Total for question = 2 marks)

Q47.

* The diagram shows the structure of a metal.



Use the diagram to describe the structure of a metal and to explain why metals are malleable and conduct electricity.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

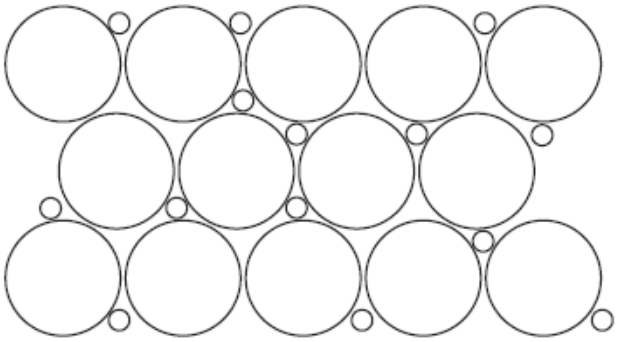
.....

.....

.....

Q48.

* The diagram shows the structure of a metal.



Use the diagram to describe the structure of a metal and to explain why metals are malleable and conduct electricity.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

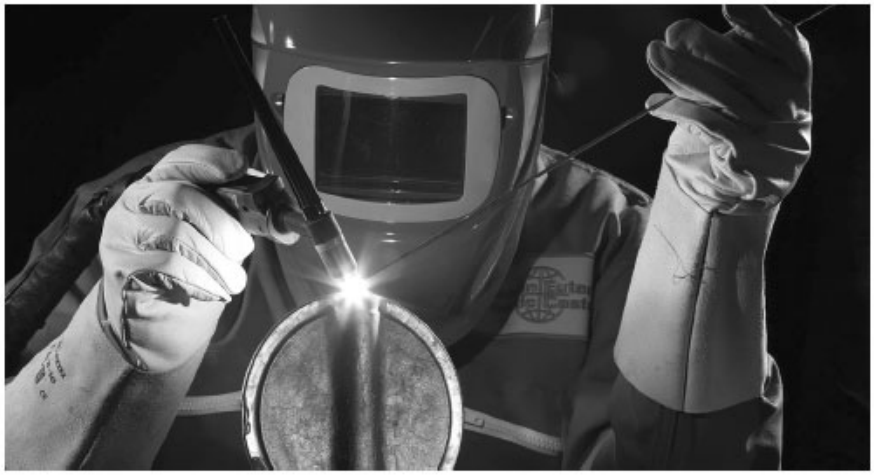
.....

.....

.....

Q49.

(a) Two pieces of metal can be joined by welding them together.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The structure of a metal is a lattice of

(1)

☒ **A** anions

☒ **B** anions and cations

☒ **C** cations in a sea of electrons

☒ **D** molecules in a sea of electrons

(ii) To join two pieces of metal by welding, they must be melted together.

State why a high temperature has to be used.

(1)

.....

.....

(iii) The pieces of metal are welded together in an atmosphere of argon.

Explain why an atmosphere of argon is used.

(2)

.....

.....

.....

.....

(b) Some metals react with halogens.

Iron reacts with bromine, Br_2, to form iron(III) bromide, $FeBr_3$.

Write the balanced equation for this reaction.

(2)

.....

(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

At room temperature, iodine is a

(1)

☒ **A** brown gas

☒ **B** brown liquid

☒ **C** grey solid

☒ **D** purple gas

(d) When a halogen is added to a solution containing halide ions a displacement reaction may occur

In the table

✓ shows a displacement reaction occurs

× shows a displacement reaction does not occur

halogen added	halide ion in solution		
	chloride ion	bromide ion	iodide ion
chlorine		✓	✓
bromine	×		✓
iodine	×	×	

Use the information in the table to explain the order of reactivity of the three halogens.

(2)

.....

.....

.....

.....

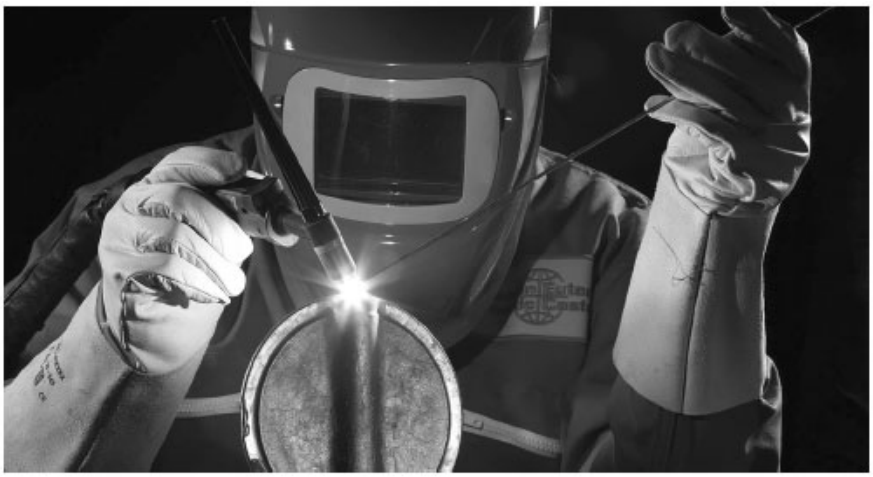
.....

.....

(Total for Question = 9 marks)

Q50.

(a) Two pieces of metal can be joined by welding them together.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The structure of a metal is a lattice of

(1)

☒ **A** anions

☒ **B** anions and cations

☒ **C** cations in a sea of electrons

☒ **D** molecules in a sea of electrons

(ii) To join two pieces of metal by welding, they must be melted together.

State why a high temperature has to be used.

(1)

.....

.....

(iii) The pieces of metal are welded together in an atmosphere of argon.

Explain why an atmosphere of argon is used.

(2)

.....

.....

.....

.....

(b) Some metals react with halogens.

Iron reacts with bromine, Br_2, to form iron(III) bromide, $FeBr_3$.

Write the balanced equation for this reaction.

(2)

.....

(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

At room temperature, iodine is a

(1)

☒ **A** brown gas

☒ **B** brown liquid

☒ **C** grey solid

☒ **D** purple gas

(d) When a halogen is added to a solution containing halide ions a displacement reaction may occur

In the table

✓ shows a displacement reaction occurs

✗ shows a displacement reaction does not occur

halogen added	halide ion in solution		
	chloride ion	bromide ion	iodide ion
chlorine		✓	✓
bromine	×		✓
iodine	×	×	

Use the information in the table to explain the order of reactivity of the three halogens.

(2)

.....

.....

.....

.....

.....

.....

(Total for Question = 9 marks)

Q51.

Particles and formulae

(a) Atoms contain protons, neutrons and electrons.

Complete the table to show the relative mass and relative charge of each particle and its position in an atom.

(3)

	relative mass	relative charge	position in atom
proton		+1	
neutron	1		in nucleus
electron			

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

An atom of an element **always** contains

(1)

☒ **A** more protons than neutrons

☒ **B** equal numbers of protons and neutrons

☒ **C** more electrons than protons

☒ **D** equal numbers of protons and electrons

(c) The symbols for some atoms are given in the box

Ca	Cl	K	N	Ne	O

From the box, choose the symbol of

(i) an atom in group 2 of the periodic table

(1)

.....

(ii) an atom that readily forms an ion with a charge of 2−

(1)

.....

(d) The formula of aluminium nitrate is $Al(NO_3)_3$

(i) State the total number of atoms in the formula $Al(NO_3)_3$

(1)

.....

(ii) What is the most likely formula of aluminium nitride?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** $Al(NO_3)_2$

☒ **B** $AlNO_3$

☒ **C** $AlNO_2$

☒ **D** AlN

(Total for question = 8 marks)