This is a Class 1 exam

Lebanon Evangelical School for Boys and Girls

Lebanon Evangelical School
for Boys and Girls Loueizeh - Baabda

Stage Exam 01

17FEB2025

Do NOT write in this box. Your MARK will be placed here.

Subject :	Chemistry
Class :	9A
Teacher :	Mrs. Saydeh Nasrallah
Duration :	1 hour

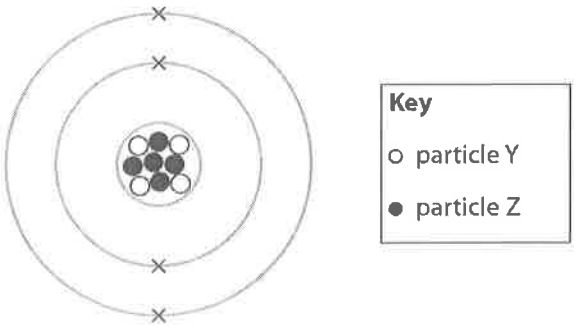
You are to answer the questions to this exam on : This exam paper

Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

Answer ALL questions.
Some questions must be answered with a cross in a box. If you change your mind about an answer, put a line through the box and then mark your new answer with a cross.

1. The diagram shows the particles in the atom of an element.



(a) Particle Y is a proton.
What is particle Z?

(1)

☒ **A** an electron
☒ **B** a molecule
☒ **C** a neutron
☒ **D** a nucleus

(b) Which of these has the smallest mass?

(1)

☒ **A** an electron
☒ **B** a neutron
☒ **C** a nucleus
☒ **D** a proton

(c) Where is most of the mass found in an atom?

(1)

☒ **A** Electrons
☒ **B** Neutrons
☒ **C** Nucleus
☒ **D** Protons

(d) What is the mass number of this atom?

(1)

☐ **A** 4
☐ **B** 5
☐ **C** 9
☐ **D** 13

(e) What is the atomic number of this atom?

(1)

- ☒ **A** 4
- ☒ **B** 5
- ☒ **C** 9
- ☒ **D** 13

(f) Identify the element that contains this atom.

(1)

.....

(g) Draw lines to connect each **particle** with its correct **description**.

(2)

Particle	Description
proton	relative mass of 0.0005
electron	positively charged and relative mass of 1
neutron	no charge

(Total for Question 1 = 8 marks)

2. The three states of matter are solid, liquid and gas.

(a) Substances can change from one state to another.

The box gives some words about changes of state.

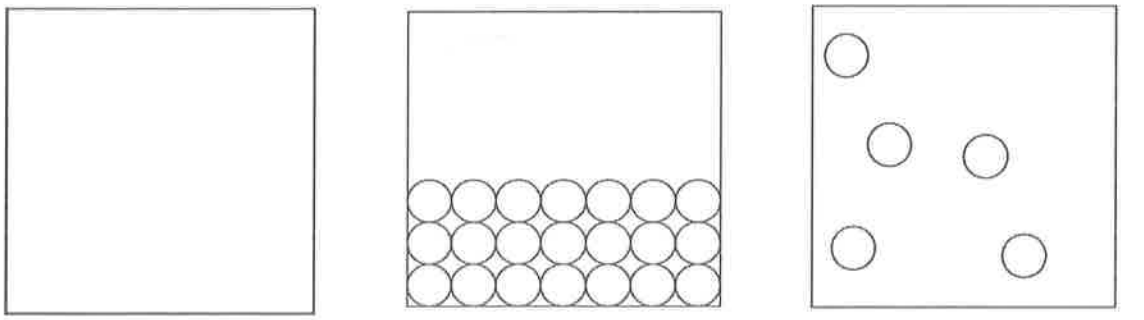
condensing	cooling	evaporation	
freezing	heating	melting	sublimation

Complete the table by giving the correct word from the box for each change of state.
You may use each word once, more than once or not at all.

(2)

Change of state	Name of change
from gas to liquid	
from solid to gas	

(b) The diagram shows how the particles of a substance are arranged in two different states.



....

Complete the diagram by labeling the two states of matter.
Identify the third state, label it and draw the correct arrangement of particles.

(2)

(iii) Describe the arrangement and movement of particles in a solid.

(2)

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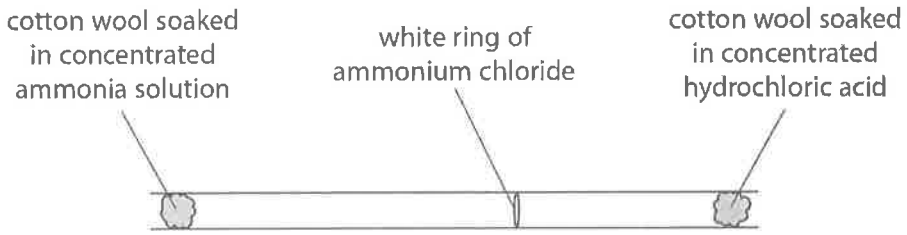
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(c) When ammonia gas and hydrogen chloride gas mix, they react together to form a white solid called ammonium chloride. The equation for the reaction is

$$NH_3(g) + HCl(g) \rightarrow NH_4Cl(s)$$

A teacher soaks a piece of cotton wool in concentrated ammonia solution and another piece of cotton wool in concentrated hydrochloric acid.
The teacher places the two pieces of cotton wool at opposite ends of a glass tube at the same time. After several minutes, a white ring of solid ammonium chloride forms.



(i) State the name given to the spreading out of gas particles.

(1)

.....

(ii) The experiment was performed in the lab at 20°C. At this temperature the white ring took 10 minutes to form. How long will it take to form at 30°C?

(1)

☐ **A** 5 minutes
☐ **B** 10 minutes
☐ **C** 20 minutes
☐ **D** None of the above

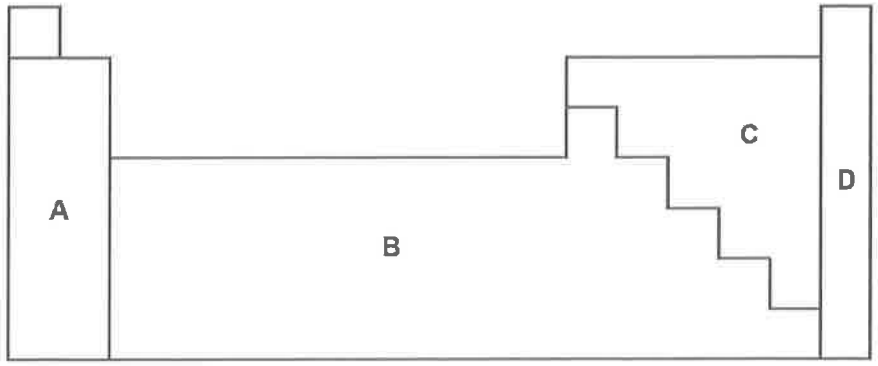
(Total for Question 2 = 8 marks)

3. (a) Sodium fluoride has the formula NaF. The formula of the sodium ion is Na^+.
What is the formula of the fluoride ion?

(1)

☒ **A** F^+
☒ **B** F^-
☒ **C** F^{2+}
☒ **D** F^{2-}

(b) An element **gains** electrons to form a full outer shell.
Which part of the Periodic Table will the element be from? Choose from the diagram below.



(1)

☒ **A**
☒ **B**
☒ **C**
☒ **D**

(c) The melting point of magnesium chloride is 714°C.
Which state symbols are used for magnesium chloride at these temperatures?

(1)

	State symbol at 25 °C	State symbol at 110 °C
☒ **A**	g	g
☐ **B**	s	s
☒ **C**	s	g
☐ **D**	g	s

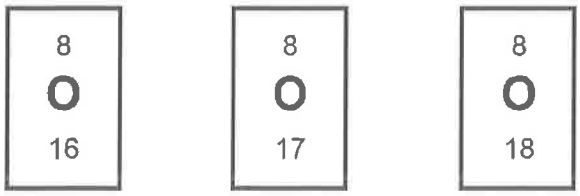
(d) Hydrochloric acid, HCl, reacts with magnesium, Mg.
Magnesium chloride and hydrogen are made. What is the balanced symbol equation for this reaction?

(1)

☒ **A** $2HCl + Mg \rightarrow MgCl + H_2$
☒ **B** $2HCl + Mg \rightarrow MgCl + H$
☒ **C** $2HCl + Mg \rightarrow MgCl_2 + H_2$
☒ **D** $2HCl + Mg \rightarrow MgCl_2 + H$

(Total for Question 3 = 4 marks)

4. This question is about atoms of the element oxygen.
The element oxygen has three different isotopes.



Isotope **1** Isotope **2** Isotope **3**

(a) In terms of subatomic particles, define the term isotopes.

(2)

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(b) A sample of air contains all three isotopes of oxygen.
It contains: 99.76% of isotope **1**
0.04% of isotope **2**.
Calculate the percentage of isotope **3** in the sample of air.

(2)

% of isotope **3** = ... %

(c) Calculate the relative atomic mass of oxygen. Give your answer to 1 decimal place.

(3)

Ar = ...

(Total for Question 4 = 7 marks)

5. The table below shows information about some elements and oxides from Period 3.

Name	Formula	Melting point	Does it conduct electricity when molten?	Does it conduct electricity when solid?	Structure
Magnesium oxide	MgO	high	yes	.....	.....
Magnesium	Mg	high	yes	.....	.....
Silicon dioxide	SiO_2	.....	.....	no	giant covalent

(a) Complete the table above.

(3)

(b) Chlorine is a simple covalent molecule with a low melting point.
Which statements about chlorine and silicon dioxide are **true**, and which are **false**?
Tick **one** box in each row.

(2)

	True	False
Chlorine and silicon dioxide have atoms joined by shared pairs of electrons.		
The forces between chlorine molecules are strong.		
The bonds between silicon atoms and oxygen atoms are strong.		

(c) Both magnesium oxide and magnesium conduct electricity when molten.
Complete the table below to show the particles that conduct electricity.
Use words from the list.

(2)

atoms	**electrons**	**ions**	**molecules**

	Particles that conduct electricity
Magnesium oxide	.....
Magnesium	.....

(d)(i) Draw a labelled diagram showing the structure of potassium metal.

(2)

(ii) Explain, in terms of structure and bonding, why potassium metal is malleable.

(2)

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(Total for Question 5 = 11 marks)

6. This question is about ionic and covalent compounds.

(a) The table shows the formulae of some positive and negative ions, and the formulae of some compounds containing these ions.

	Cl^-	O^{2-}	SO_4^{2-}
Na^+		Na_2O	Na_2SO_4
NH_4^+	NH_4Cl		
Zn^{2+}	$ZnCl_2$		$ZnSO_4$

(i) Complete the table by giving the formulae of the missing compounds.

(3)

(ii) Give the name of the compound with the formula $ZnSO_4$.

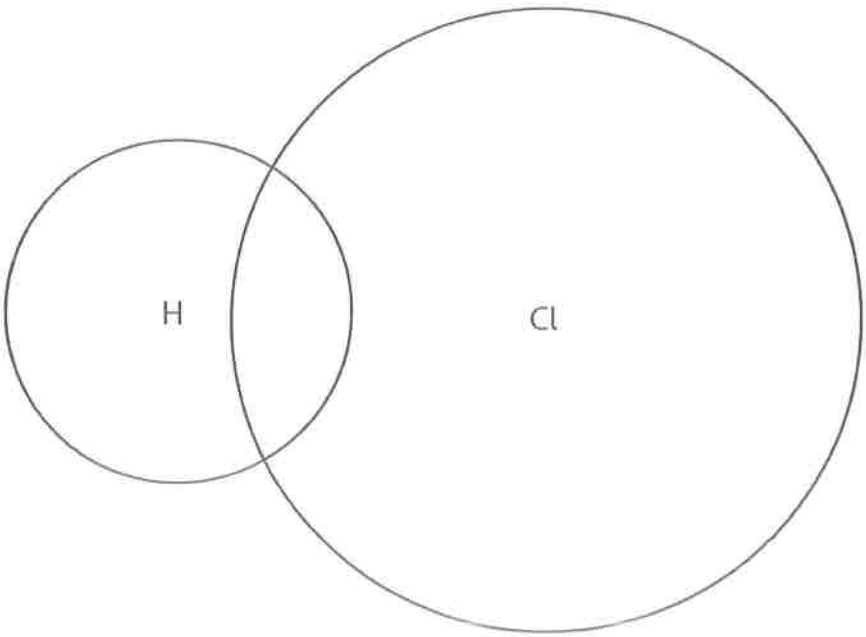
(1)

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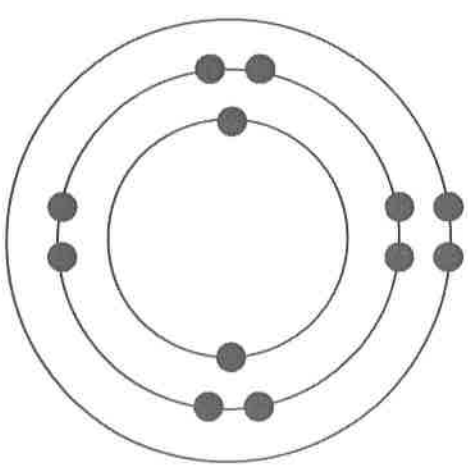
(b) Hydrogen chloride and magnesium chloride have different types of bonding and have different structures.

(i) Complete the dot-and-cross diagram to show the outer shell electrons in a molecule of hydrogen chloride.

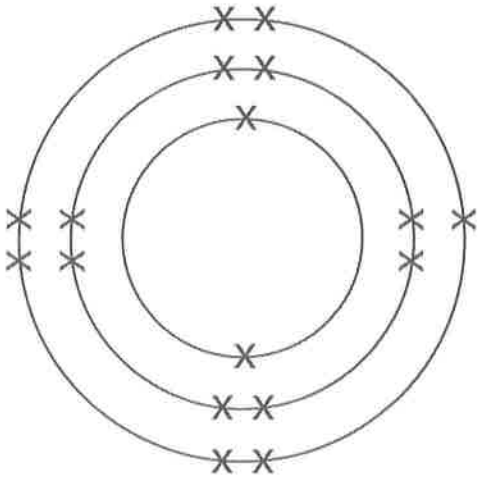
(2)



(ii) The diagram shows the electronic configuration of a magnesium atom and of a chlorine atom.



Magnesium



Chlorine

Draw the electronic configuration of a magnesium ion and of a chloride ion in the boxes. Show the charge on each ion.

(2)

Magnesium ion	Chloride ion

(iii) Compare and contrast the different types of bonding in hydrogen chloride and magnesium chloride.
In your answer, you should refer to:
- the name of the bond
- the particles involved in the bonding
- how is the bond established.

(4)

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER 50 MARKS

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

Key

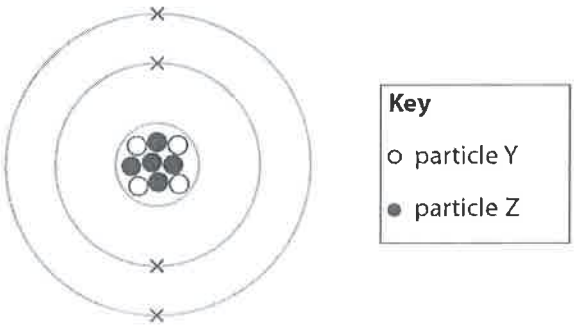
relative atomic mass
atomic symbol
name
atomic (proton) number

** The lanthanoids (atomic numbers 58–71) and the actinoids (atomic numbers 90–103) have been omitted.*

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

Answer ALL questions.
Some questions must be answered with a cross in a box. If you change your mind about an answer, put a line through the box and then mark your new answer with a cross.

1. The diagram shows the particles in the atom of an element.



(a) Particle Y is a proton.
What is particle Z?

(1)

- ☐ **A** an electron
- ☐ **B** a molecule
- ☒ **C** a neutron
- ☐ **D** a nucleus

(b) Which of these has the smallest mass?

(1)

- ☒ **A** an electron
- ☐ **B** a neutron
- ☐ **C** a nucleus
- ☐ **D** a proton

(c) Where is most of the mass found in an atom?

(1)

- ☐ **A** Electrons
- ☐ **B** Neutrons
- ☒ **C** Nucleus
- ☐ **D** Protons

(d) What is the mass number of this atom?

(1)

- ☐ **A** 4
- ☐ **B** 5
- ☒ **C** 9
- ☐ **D** 13

(e) What is the atomic number of this atom?

(1)

- [x] **A** 4
- [ ] **B** 5
- [ ] **C** 9
- [ ] **D** 13

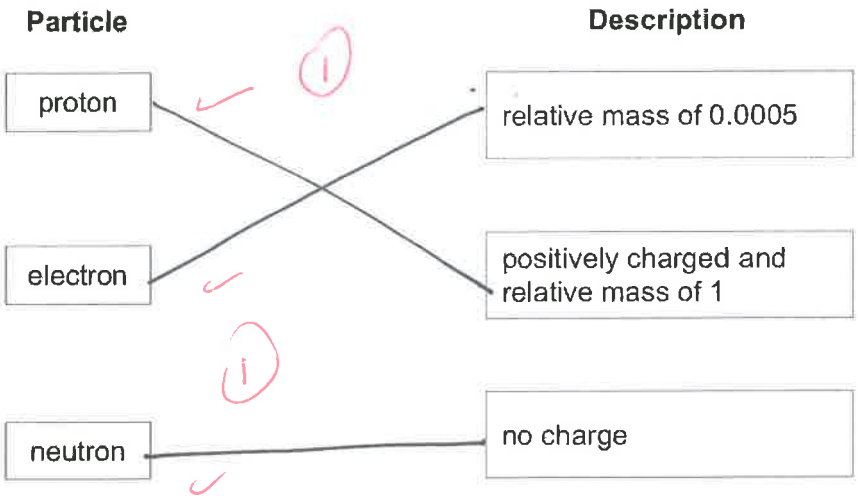
(f) Identify the element that contains this atom.

(1)

Beryllium

(g) Draw lines to connect each **particle** with its correct **description**.

(2)



(Total for Question 1 = 8 marks)

2. The three states of matter are solid, liquid and gas.

(a) Substances can change from one state to another.

The box gives some words about changes of state.

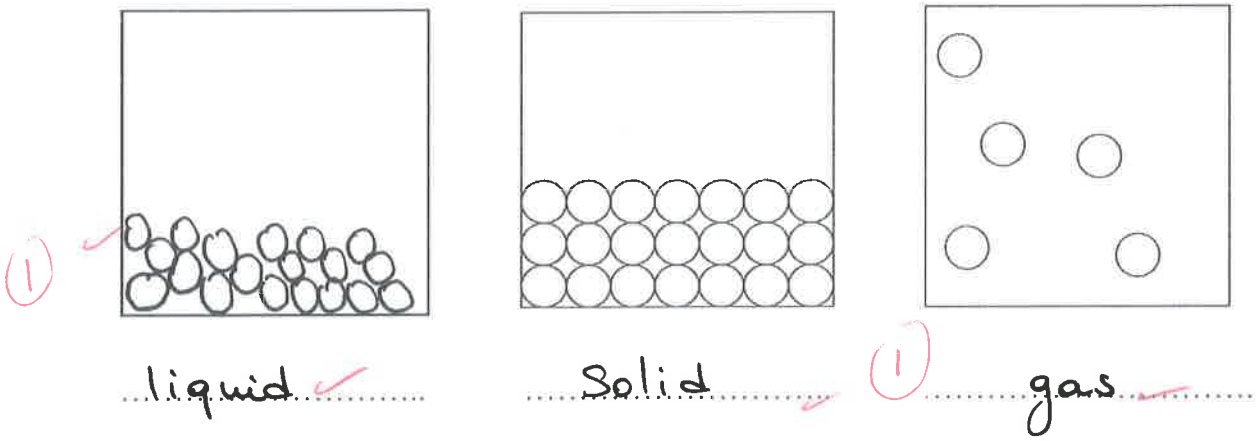
condensing	cooling	evaporation	
freezing	heating	melting	sublimation

Complete the table by giving the correct word from the box for each change of state.
You may use each word once, more than once or not at all.

(2)

Change of state	Name of change
from gas to liquid	condensing (1)
from solid to gas	sublimation (1)

(b) The diagram shows how the particles of a substance are arranged in two different states.



(1)

liquid ✓ Solid ✓ (1) gas ✓

Complete the diagram by labeling the two states of matter.
Identify the third state, label it and draw the correct arrangement of particles.

(2)

(iii) Describe the arrangement and movement of particles in a solid.

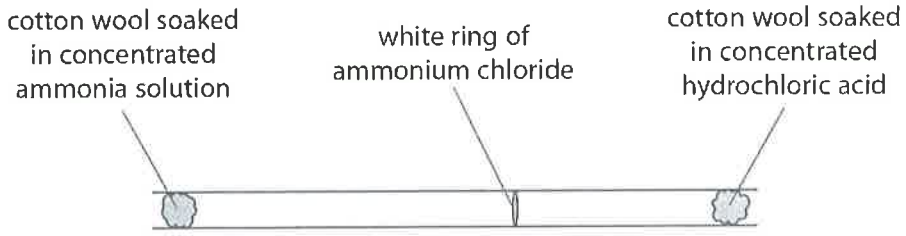
(2)

In solid, particles only vibrate around a fixed position ✓ (1)
Particles in solid state, have a regular arrangement ✓ (1)

(c) When ammonia gas and hydrogen chloride gas mix, they react together to form a white solid called ammonium chloride. The equation for the reaction is

$$NH_3(g) + HCl(g) \rightarrow NH_4Cl(s)$$

A teacher soaks a piece of cotton wool in concentrated ammonia solution and another piece of cotton wool in concentrated hydrochloric acid.
The teacher places the two pieces of cotton wool at opposite ends of a glass tube at the same time. After several minutes, a white ring of solid ammonium chloride forms.



(i) State the name given to the spreading out of gas particles.

(1)

Diffusion ✓ (1)

(ii) The experiment was performed in the lab at 20°C. At this temperature the white ring took 10 minutes to form. How long will it take to form at 30°C?

(1)

☒ **A** 5 minutes ✓ (1)
☐ **B** 10 minutes
☐ **C** 20 minutes
☐ **D** None of the above

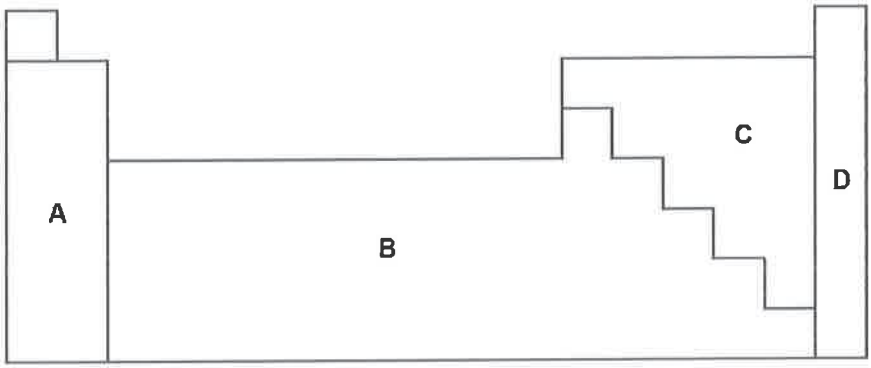
(Total for Question 2 = 8 marks)

3. (a) Sodium fluoride has the formula NaF. The formula of the sodium ion is Na^+.
What is the formula of the fluoride ion?

(1)

- ☐ **A** F^+
- ☒ **B** F^- ✓1
- ☐ **C** F^{2+}
- ☐ **D** F^{2-}

(b) An element **gains** electrons to form a full outer shell.
Which part of the Periodic Table will the element be from? Choose from the diagram below.



(1)

- ☒ **A**
- ☒ **B**
- ☒ **C** ✓1
- ☒ **D**

(c) The melting point of magnesium chloride is 714°C.
Which state symbols are used for magnesium chloride at these temperatures?

(1)

	State symbol at 25 °C	State symbol at 110 °C
☐ **A**	g	g
☒ **B** ✓1	s	s
☐ **C**	s	g
☐ **D**	g	s

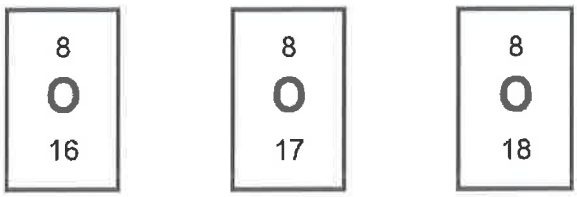
(d) Hydrochloric acid, HCl, reacts with magnesium, Mg.
Magnesium chloride and hydrogen are made. What is the balanced symbol equation for this reaction?

(1)

☐ **A** $2HCl + Mg \rightarrow MgCl + H_2$
☐ **B** $2HCl + Mg \rightarrow MgCl + H$
☒ **C** $2HCl + Mg \rightarrow MgCl_2 + H_2$ ✓ (1)
☐ **D** $2HCl + Mg \rightarrow MgCl_2 + H$

(Total for Question 3 = 4 marks)

4. This question is about atoms of the element oxygen.
The element oxygen has three different isotopes.



Isotope **1** Isotope **2** Isotope **3**

(a) In terms of subatomic particles, define the term isotopes.

(2)

Isotopes are atoms of the same element with the same number of protons but different number of neutrons

(b) A sample of air contains all three isotopes of oxygen.
It contains: 99.76% of isotope **1**
0.04% of isotope **2**.
Calculate the percentage of isotope **3** in the sample of air.

(2)

$100 - (99.76 + 0.04)$

% of isotope **3** = 0.2 %

(c) Calculate the relative atomic mass of oxygen. Give your answer to 1 decimal place.

(3)

$$R.A.M = \frac{99.76 \times 16 + 0.04 \times 17 + 0.2 \times 18}{100}$$

Ar = 16.0

(Total for Question 4 = 7 marks)

5. The table below shows information about some elements and oxides from Period 3.

Name	Formula	Melting point	Does it conduct electricity when molten?	Does it conduct electricity when solid?	Structure
Magnesium oxide	MgO	high	yes	No	giant ionic
Magnesium	Mg	high	yes	yes	giant metallic
Silicon dioxide	SiO_2	high	no	no	giant covalent

(a) Complete the table above.

(3)

(b) Chlorine is a simple covalent molecule with a low melting point.
Which statements about chlorine and silicon dioxide are **true**, and which are **false**?
Tick **one** box in each row.

(2)

	True	False
Chlorine and silicon dioxide have atoms joined by shared pairs of electrons.	✓	
The forces between chlorine molecules are strong.		✓
The bonds between silicon atoms and oxygen atoms are strong.	✓	

(c) Both magnesium oxide and magnesium conduct electricity when molten.
Complete the table below to show the particles that conduct electricity.
Use words from the list.

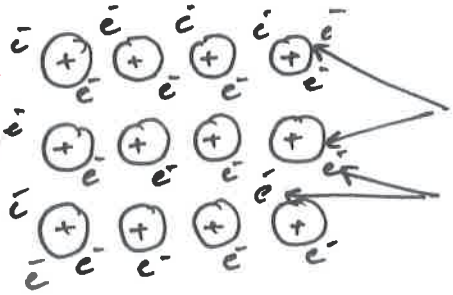
(2)

atoms	electrons	ions	molecules

	Particles that conduct electricity
Magnesium oxide	ions
Magnesium	electrons

(d)(i) Draw a labelled diagram showing the structure of potassium metal.

(2)



(ii) Explain, in terms of structure and bonding, why potassium metal is malleable.

(2)

The metallic bonding / attraction established between the sea of delocalised e⁻ and the array of cations is maintained upon application of external forces / stress ; where the sea of delocalised e⁻ prevent the repulsion between neighbouring layers thus, making metals malleable.

(Total for Question 5 = 11 marks)

6. This question is about ionic and covalent compounds.

(a) The table shows the formulae of some positive and negative ions, and the formulae of some compounds containing these ions.

	Cl^-	O^{2-}	SO_4^{2-}
Na^+	NaCl (1)	Na_2O	Na_2SO_4
NH_4^+	NH_4Cl		$(NH_4)_2SO_4$ (1)
Zn^{2+}	$ZnCl_2$	ZnO (1)	$ZnSO_4$

(i) Complete the table by giving the formulae of the missing compounds.

(3)

(ii) Give the name of the compound with the formula $ZnSO_4$.

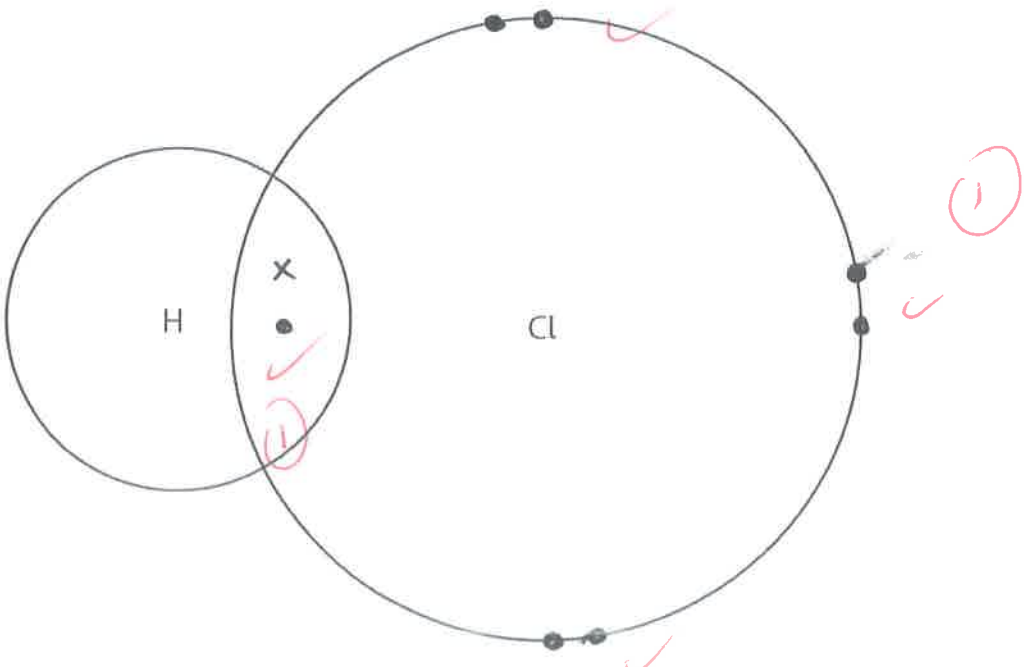
(1)

Zinc sulfate (1)

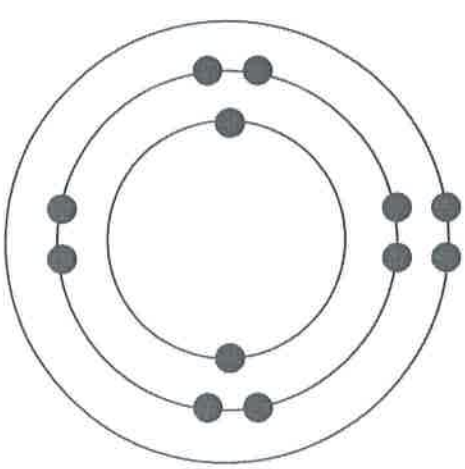
(b) Hydrogen chloride and magnesium chloride have different types of bonding and have different structures.

(i) Complete the dot-and-cross diagram to show the outer shell electrons in a molecule of hydrogen chloride.

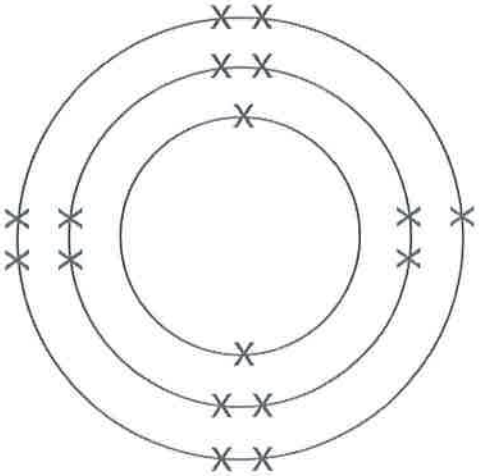
(2)



(ii) The diagram shows the electronic configuration of a magnesium atom and of a chlorine atom.



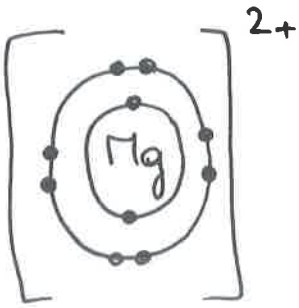
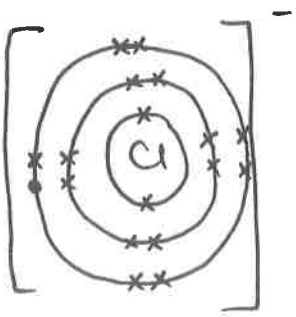
Magnesium



Chlorine

Draw the electronic configuration of a magnesium ion and of a chloride ion in the boxes. Show the charge on each ion.

(2)

 Magnesium ion	 Chloride ion

(iii) Compare and contrast the different types of bonding in hydrogen chloride and magnesium chloride.
In your answer, you should refer to:
- the name of the bond
- the particles involved in the bonding
- how is the bond established.

(4)

The atoms in hydrogen chloride are held by the attraction between their nuclei and the shared pair of e^-. This type of attraction is called a covalent bond ✓ (2)

While in magnesium chloride, there is a transfer of e^- between the atoms of magnesium and chlorine and thus forming anions & cations. These ions are attracted by strong electrostatic attractions called the ionic bonding ✓✓ (2)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER 50 MARKS

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

** The lanthanoids (atomic numbers 58–71) and the actinoids (atomic numbers 90–103) have been omitted.*

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.