Question Number	Correct Answer	Reject	Mark
1	C		1

Question Number	Correct Answer	Reject	Mark
2	A		1

Question Number	Correct Answer	Reject	Mark
3	D		1

Question Number	Correct Answer	Reject	Mark
4	D		1

Question Number	Correct Answer	Reject	Mark
5	A		1

6)

	Correct Answer	Reject	Mark
	C		1

7)

	Correct Answer	Reject	Mark
	B		1

8)

uestion umber	Correct Answer	Reject	Mark
(a)	A		1

uestion umber	Correct Answer	Reject	Mark
(b)	C		1

9)

	Correct Answer	Reject	Mark
	A		1

10)

	Correct Answer	Reject	Mark
	C		1

11)

(a)	D		1

estion mber	Correct Answer	Reject	Mark
(b)	B		1

estion mber	Correct Answer	Reject	Mark
(c)	C		1

12)

!(a)(i)	**The mark is for the idea of impact by high energy electrons** **Any ONE of:** High-energy electrons Bombard with electrons Fast electrons (fired at sample) Accelerated electrons (fired at sample) (High-energy) electrons fired (at sample) (Sample) blasted with electrons Electron gun ALLOW "beam of electrons" IGNORE any comments (correct or incorrect) re subsequent ionization of the sample	High-**density** electrons	**1**

uestion umber	Acceptable Answers	Reject	Mark
!(a)(ii)	Electric field /electrostatic field / charged plates /voltage plates	**Positively-charged** plates /electronic field /electric current /(electro) magnetic field / electric coil	**1**

uestion umber	Acceptable Answers	Reject	Mark
!(a)(iii)	Magnetic field/magnet / electromagnet /magnetic plates/ electromagnetic field	**"Negative** magnetic field"/ negatively-charged magnet	**1**

(b)	(Molecular mass of a substance is) that of the molecular ion/parent ion OR (m/e value for) peak/ion of largest mass OR (m/e value for) peak/ion furthest to the right ALLOW "last peak"/"peak at the end"	Highest peak/ tallest peak/ comments about determination of relative atomic mass	**1**

estion mber	Acceptable Answers	Reject	Mark
(c)	**Mark independently:** **First mark:** Any mention of (determination of) amount /mass/abundance of ^{14}**C** (in cloth) ALLOW Any mention of (determination of) concentration/content/percentage of ^{14}**C** (in cloth) **OR** find proportion of ^{12}**C** : ^{14}**C** (in cloth) **(1)** **Second mark:** Any mention of any one of the following:- (Use) half-life of ^{14}**C** / mention that amount of ^{14}**C** (in cloth) decreases (over time) / ^{14}**C** decays over time / comparison of amount of ^{14}**C** in living systems / comparison of amount of ^{14}**C** in modern materials / compare with ^{12}**C** : ^{14}**C** in living systems **(1)**	amount of ^{14}**C** (in cloth) increases (over time)	**2**

13)

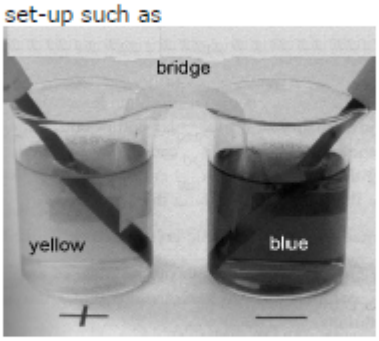
(a)	**ALLOW reverse arguments in each case** **Any three from:-** • **sodium atoms/sodium ions** are larger (than magnesium atoms/ions) **NOTE:** Allow symbols (eg Na or Na^+) **(1)** • sodium ions are Na^+ whereas magnesium ions are Mg^{2+} OR Na^+/sodium **ions** have smaller charge (density) than Mg^{2+}/ magnesium **ions** **(1)** **[NOTE:** It follows that the statement that "Na^+ ions are larger than Mg^{2+} ions" would score the first two scoring points above)**]** • sodium has fewer **delocalized** electrons (than magnesium) **(1)** • attraction between the positive ions and (delocalized) electrons is weaker in sodium (than magnesium) **(1)** • sodium is not close-packed (but magnesium is close-packed) **(1)** • less energy needed (to break bonds) **(1)**	Attraction between **nucleus** and (delocalized) electrons Mention of **intermolecular forces/molecules** negates the energy mark **NOTE:** Arguments based on ionization energies **OR** suggestion of removal of outer shell electrons as part of the melting process scores **(0) overall**	**3**

ıber			
(b)	**First mark:** Idea of (breaking) **covalent bonds** in silicon **(1)** **Second and third marks:** **ANY TWO FROM** • Silicon is **giant** covalent / giant atomic/giant molecular/ macromolecular/giant structure/giant lattice IGNORE just "giant" **(1)** • Phosphorus made up of simple molecules /small molecules/ P_4 molecules /phosphorus is molecular covalent /molecular/simple covalent IGNORE just "simple"/"simple structure" **(1)** • Between phosphorus molecules: weak forces/weak intermolecular forces/weak London forces/weak van der Waals' forces/weak dispersion forces/weak induced-dipole forces **(1)** **[ALLOW** "weak bonds" if implies between phosphorus **molecules]** • More energy needed (to break bonds in silicon) **(1)**	Intermolecular forces broken in silicon/ covalent bonds broken in phosphorus "silicon giant ionic"/"silicon giant metallic" Weak bonds between phosphorus **atoms**	**3**

14)

(a)

First mark:
Diagram showing U-tube OR filter paper on a microscope slide OR electrodes in a beaker OR other feasible set-up such as

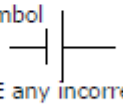


but a + and a — sign must be shown somewhere on the diagram by signs or words, positive and negative.

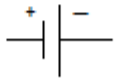
NOTES
If set-up in the picture above is used, in addition to the + and — signs a bridge between the two beakers must also be shown.
External circuits do not have to be complete (e.g. wires can be shown attached to a slide, provided the **+** and **—** labels included).

If the words cathode and/or anode are included, for the first mark to be awarded the cathode must be shown as —ve and/or the anode as +ve

If a battery symbol



shown, IGNORE any incorrect polarities, that is



IGNORE any electrode materials
EXCEPT Cu^{2+} and/or CrO_4^{2-} **(1)**

	Second mark: Description to include the idea that the **ions move/ions** are **mobile/ions migrate** **MUST BE IN WORDS** ALLOW if description focuses on the movement of one of the ions to the oppositely-charged electrode **(1)** **Third mark:** Yellow ion/yellow (colour)/CrO_4^{2-} moves towards the/+ve (electrode)/ anode **(1)** **Fourth mark:** Blue ion/blue (colour)/Cu^{2+} moves towards cathode /—ve (electrode) **(1)** Mark CQ on candidate's cathode and anode signs for the **3rd** and **4th** marks	**Just** ions are attracted to the electrodes of opposite charge	

estion mber	Acceptable Answers	Reject	Mark
(b)(i)	(Forces of attraction between) oppositely-charged ions/positive and negative ions/cations and anions IGNORE comments about electron transfer	Just ionic bonds/ Just "electrostatic forces of attraction"	**1**

estion mber	Acceptable Answers	Reject	Mark
(b)(ii)	**First mark:** Ions of the same charge (repel)/ positive ions (repel)/negative ions (repel) **(1)** **Second mark:** Nuclei (of the ions repel) ALLOW 'protons' (in the ions repel) OR Electron clouds OR electrons (in the ions repel) **(1)**	"**Magnetic** repulsion" negates first mark "Electrons repel nuclei"	**2**

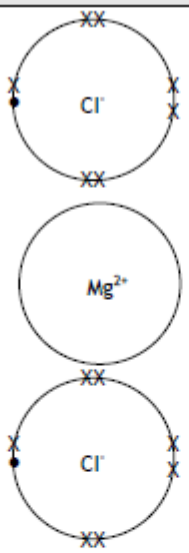
C) N.A

(d)(i)	**First mark:** **Mg^{2+} AND O^{2-}** higher charge / **Mg^{2+} AND O^{2-}** higher charge density (than Mg^{+} and O^{-}) NOTE: **both** ions needed **(1)** **Second mark:** Mg^{2+} smaller (than Mg^{+}) **(1)** IGNORE comparisons of the relative sizes of O^{-} with O^{2-} even if INCORRECT IGNORE any references to polarization (of ions) and/or covalent character	Any mention of 'intermolecular forces' scores **(0)** overall for this question	**2**

estion mber	Acceptable Answers	Reject	Mark
(d)(ii)	(Lattice energy of $Mg^{2+}O^{2-}$ is) more exothermic/more negative ALLOW greater/increased/higher/ more/larger/bigger IGNORE "stronger lattice"	"energy **required**" OR Lower/less/ smaller	**1**

15)

Question Number	Acceptable Answers	Reject	Mark
(a)	$(1s^2\ 2s^2)\ 2p^6\ 3s^2\ 3p^5$ (ignore repetition of $1s^2\ 2s^2$) *ALLOW* subscripts, correct use of p_x, p_y and p_z orbitals or normal font for electrons	2 8 7	1

(b) (i)	 Correct number of outer electrons (ignore whether dots and / or crosses) drawn **and also** ratio of magnesium : chloride ions is 1:2 **(1)** Correct formulae and charges of the ions shown somewhere **(1)** **NOTE:** Diagram for Mg^{2+} showing the outermost shell with $8e^-$ (dots and/or crosses) and/or Cl^- shown with a 2 in front or 2 as a subscript would also score both marks **Mark the two points independently**	Covalent bonding (0) Incorrect numbers of electrons in inner shells if drawn for first mark "MG^{2+}" and/or "CL^{-}" for second mark	**2**