

- 1 (a) (i) macromolecular / giant covalent / giant atomic [1]
all atoms held in position / in tetrahedral structure / to four other carbon
atoms / all strong bonds [1]
- (ii) jewellery / drilling / cutting / engraving / cutting edges in scalpels [1]
mark first use offered
- (iii) layer structure / sheets [1]
molecules / ions in layers = [0]
layers can slide (over each other) [1]
- (iv) lubricant / pencils / electrodes [1]
mark first use offered
- (b) 4e between carbon and oxygens [1]
2 non-bonding pairs on both oxygens [1]
cond correct coding – only scored if marks 1 and 2 awarded [1]
ignore O₂ in atom
- (ii) 4O around each Si [1]
2Si around each O [1]
must refer to diagram **not** valencies **or** electron distributions
- (iii) SiO₂ has higher mp or bp
SiO₂ is a solid, CO₂ is a gas (at rtp)
(when both are solids) then SiO₂ is harder
has higher density
SiO₂ insoluble, CO₂ soluble [2]
any **two**, comparison needed
- 2 (a) to complete the outer shell (of oxygen) / full outer or valence shell / 8 (electrons) in outer
shell / Noble gas structure / to complete outer shell / to complete the octet
ignore reference to hydrogen atoms / reference to accepting / sharing or gaining electrons [1]
- (b) loses (one) electron [1]
not loses electrons
- (c) opposite charges attract / electrostatic attraction / positive attracts negative / + and – attract
[1]
- (d) in solid ions cannot move / flow / no free ions / ions in a lattice [1]
in solution ions can move / flow / mobile ions / ions free (to move) [1]

[Total: 5]

- 3 (a) (i) D [1]
- (ii) E [1]
- (iii) B or F [1]
- (iv) B [1]
- (v) A [1]
- (b) CF_2 or CaI_2 [1]
COND next two marks conditional on correct formula
 C^{2+} and F or Ca^{2+} and I [1]
 7× and 1o round F/I [1]
NOTE covalent = 0
 Ignore electrons around Ca
accept arrow notation arrow from electron on calcium atom to iodine
- (ii) high melting point or boiling point
 conducts when molten or in solution
 soluble in water
 brittle
 correct chemical properties
 hard
 Any **TWO** [2]
NOT crystalline solid **NOT** does not conduct as a solid

[Total: 10]

- 4 (a) 3Na : 1N correct ratio [1]
 correct charges [1]
 8e around N [1]
- if no symbols then must have correct key
 if covalent only mark 1
 ignore electrons around sodium
 if the response includes both a correct and an incorrect answer
 do not select correct one, mark = [0]
- (b) (positive ions **or** cations [1]
NOT atoms **or** cores **or** nuclei
 layers **or** lattice **or** regular pattern [1]
 delocalised **or** free **or** mobile electrons **or** sea [1]
- OR** positive ions **or** cations [1]
NOT atoms **or** cores **or** nuclei
 attraction between ions and electrons [1]
 delocalised **or** free **or** mobile electrons **or** sea [1]
 the attraction/electrostatic bonding must be between ions and
 delocalised electrons, between cations and anions does not score
ACCEPT bond if qualified - electrostatic bond, etc.
 if molecular **or** molecules then cannot score cation mark
- (ii) delocalised/free/mobile electrons [1]
or electrons can move [1]
- layers **or** ions **or** atoms **or** particles [1]
NB more flexible than **2(b)(i)**
 can slip **or** move past each other **or** bonding non-directional [1]
- (c) tetrahedral [1]
 1Si : 4O bonded/surrounded, etc. [1]
 1O : 2 Si [1]
- NOT** molecules of oxygen, etc.
NOT intermolecular forces
ONLY tetrahedral can score for either of the above
- Despite what the question states, **ACCEPT** a clear accurate diagram which shows the
 above three points.
- (ii) hard
 high mp **or** bp
 colourless (**NOT** clear) **or** shiny **or** translucent
 non/poor conductor (of electricity)
 brittle
 insoluble
 any **TWO** [2]
NOT crystalline **or** strong

[Total: 14]

- 5 good [1]
 named example e.g. sodium chloride [1]
ACCEPT correct formula
- silica **or** silicon(IV) oxide **or** sand **or** silicon oxide
 named polymer only **TWO** elements [1]
- electrons [1] and positive ions [1] [2]
 good [1]
- [Total: 6]**

- 6 (a) Correct ratio MgBr_2 **or** $\text{Mg } 2\text{Br}$ [1]
 Accept anywhere in space
 IF formula suggests covalency then [1] only for MgBr_2
or $\text{Mg } 2\text{Br}$
 correct charges Mg^{2+} and Br [1]
 Do not be concerned about location of minus sign
 8e around bromine [1]
NOTE do not require correct coding – just 7 and 1 coded differently
NOTE ignore electrons around magnesium
- (b) (i) pattern **or** order **or** regular **or** repeat **or** alternate [1]
COND positive and negative ions **or** atoms **or** molecules **or** particles [1]
NOTE Accept a sketch that shows the above, that is particles arranged in a regular way, e.g. any ionic compound such as sodium chloride
- (ii) Any reason from the list: [1]
 charges must balance
or based on valencies
or group II and group VII
or 2e in outer level and 7e in outer level
or magnesium loses 2 electrons and bromine gains 1 electron (per atom)
- (iii) reducing **or** reduction **or** reductant [1]
 lost electrons **or** given **or** donated electrons **or** transferred (to bromine) [1]
 reduced [1]
 gained **or** accepted electrons [1]
- [Total: 10]**

7 More than required number of answers – [0]

- (i) **A, B, D** [1]
- (ii) **D** [1]
- (iii) **F** [1]
- (iv) **C and E** [1]
- (v) **A** [1]
- (vi) **E** [1]

[TOTAL = 6]

Question 1

- (a)(i) lattice [1]
- (ii) high melting point **or** high fixed points
poor conductor as solid
good conductor as liquid, accept either aqueous or molten
hard
soluble in water
Any **TWO** [2]
- (b)(i) Mg^{2+} [1]
- (ii) N^3 [1]
- (iii) Mg_3N_2 [1]
- (iv) opposite charges [1]
Do NOT accept "attract" it is in the question
accept electrostatic attraction as a phrase

TOTAL = 7