AQA GCSE CHEMISTRY (HIGHER) · 8462

CHEMISTRY



MARK SCHEME

4.2.2 HOW BONDING AND STRUCTURE ARE RELATED TO THE PROPERTIES OF SUBSTANCES (PACK 4)

SCORE	PERCENTAGE
/36	%

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Mark schemes

Q1.

(a)

	Calcium	Phosphorus	Fluorine
No of protons		15	
No of neutrons			10
No of electrons	20		

for 1 mark each

3

(b) (i) gain of electron(s)

from (atoms) (of) calcium

for 1 mark

2

(ii) Ca^{+}

gains 1 mark

but superscript only Ca^{2+} / Ca^{++}

gains 2 marks

2

(c) atoms
electrons
molecule(s) not compound

each for 1 mark

3

(d) (i) *ideas that*

- ionic – strong forces between ions
- molecular – weak forces between molecules

each for 1 mark

2

(ii) *ideas that*

- ionic – ions/charged particles are free to move
- molecular -molecules do not carry a charge

each for 1 mark

2

[14]

Q2.

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(a) lead chloride } *in any order*
potassium nitrate }

for 1 mark each

2

(b) lead chloride is solid / a precipitate
potassium nitrate is aqueous / in solution / dissolves in water
NOT liquid

for 1 mark each

2

(Accept ratio of molecular KNO_3 : $PbC1_2$ is 2:1 for 2 marks)
(do <u>not</u> accept relative number of atoms in each compound)

One is a solid, one is a solution – worth 1 mark

[4]

Q3.

(a) <u>2</u> Na + Cl_2 → 2 NaCl

allow 2 Na^+ Cl^- for 1 mark

(allow Na + ½Cl^2 → Na Cl)

1

(b) (i) *idea that*

- it has strong (attractive) forces/bonds between ions / charged particles

for 1 mark

(<u>not</u> '..it has a rigid structure'- this defines a solid or '...particles close together' – they are in a liquid)

1

(ii) *ideas that*

- there is <u>increased</u> vibration of ions / particles on heating
- ions have sufficient energy to overcome attractive forces / to break out of the
- rigid structure / to move about

(<u>must</u> be in terms of increased energy of particles lions)

each for 1 mark

2

(iii) • ions can go to electrodes / ions are free to move

for 1 mark
[do not credit 'ions carry charges']

1

(c) *ideas that*

- it has stronger attractive forces between atoms/particles *(not 'ions')*
- each carbon atom forms <u>covalent</u> bonds with neighbouring atoms

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each for 1 mark

2

[7]

Q4.

(a) (i) *idea that*

- two hydrogen atoms share one pair of electrons
- linked by a covalent bond
- each then has two outer electrons / a full outer shell / two
- electrons in the highest (occupied) energy level

(2 marks may be awarded for a correct electron diagram i.e. with electrons on boundary of or within marked area).

any two for 1 mark each

2

(ii) *idea that*

- helium atoms do not give / take / share electrons / react
- because the (outer) shell / orbit is full

or

- highest (occupied) energy level is full

(*but not just* "contains two electrons")

for 1 mark each

2

(b) *idea that*

- the (attractive) forces between molecules are weak

(*not* bonds between atoms)

- so little energy is required / it is easy for molecules to escape from the liquid* / escape from other molecules*

(*allow* evaporate / change into a gas)

for 1 mark each

2

[6]

Q5.

(a) *idea that*

- copper has free electrons / electrons that move throughout the structure

gains 1 mark

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but

- in copper, electrons from the highest (occupied) energy level /outer shell, are free / can move throughout the structure

  gains 2 marks

2

(b) *idea that*

- in graphite, only three bonds are formed by each carbon atom

  for 1 mark

- one outer electron (per atom), free to move

  for 1 mark

- an electric current is a flow of (free) electrons*

  for 1 mark

(this mark to be given in **either** (a) **or** (b) but not in both)*

3

[5]

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