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GCSE
CHEMISTRY

Topic Paper: 2.1 Chemical bonds, ionic, covalent and metallic
Part 1 & 2 Mark Scheme

MARK SCHEME

56 Marks

More resources available at www.kickstart-tutors.uk/resources

M1. (a) (Chromium =) 20

in correct order

1

(Nickel =) 8

accept Chromium = 8 ***and*** *Nickel = 20 for* ***1*** *mark*

1

(b) (i) (because iron is made up of only) one type of atom

1

(ii) not strong

allow too soft ***or*** *too flexible*
accept it rusts / corrodes ***or*** *that it could wear away*
accept could change shape / bend
accept layers / atoms could slide (over each other)

1

(iii) structure is different / distorted / disrupted

accept not in layers ***or*** *not regular*

1

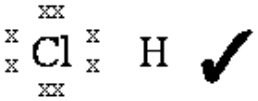
so it is difficult for layers / atoms / particles to slip / slide (over each other)

accept layers cannot slip / slide

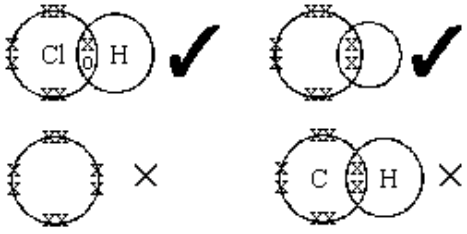
1

[6]

M2. (a) bonding pair in the overlap **and** 6 other electrons arranged around the chlorine



must have either circles or symbols
need not be pairs but must not be in the overlap region
accept without H and Cl if clear
accept all x's or all o's



1

(b) H_2 + Cl_2 → 2HCl

accept multiples or fractions
accept correct formulae but not balanced for 1 mark
correctly balanced equation containing
'correct' lower / upper case symbols gets 1 mark

2

(c) $MgCl_2$

accept $Mg^{2+}(Cl^-)_2$

1

(d) because magnesium chloride is made of ions **or** is ionic

accept there are strong forces of attraction between the ions / particles in $MgCl_2$ *or strong electrostatic attractions*

accept more energy to separate particles in $MgCl_2$

*do **not** accept* $MgCl_2$ *molecules*

*do **not** accept reference to breaking bonds*

1

hydrogen chloride is made of molecules **or** is covalent

accept there are only weak forces of attraction (between the particles / molecules) in HCl

*do **not** accept weak covalent bonds*
*do **not** accept reference to breaking bonds*
*do **not** accept* $MgCl_2$ *is a solid and HCl is a gas*

1

[6]

M4. (a) all electrons correct (inner shell need not be shown)

three bond pairs and two electrons anywhere else

can use dots, crosses or e's in any combination

1

(b) covalent

accept phonetic spelling

*do **not** accept convalent*

1

[2]

M5. (a) LHS lithium + water

accept Li and H_2O

accept hydrogen oxide for water

1

RHS hydrogen + lithium hydroxide

accept H_2 *and LiOH*

ignore attempts at balancing
ignore charges

1

(b) ***Quality of written communication***

One mark for the correct use of any **three** of the terms atom, covalent, bond(ing), saturated, hydrocarbon or alkane

1

any **three** from*:*

one / the carbon (atom)
reject molecules once

four hydrogen (atoms)
shape / properties neutral

CH_4

hydrocarbon

saturated / single bond

covalent bond / shared electrons

alkane
reject ionic bond

3

[6]

M6. (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]

M7. (a) Group 2 / Alkaline Earth Metals

for 1 mark

1

(b) (i) $MgCl_2$/Mg^{2+} $(Cl^{-})_2$

(or equation with correct answer)

for 1 mark

1

(ii) ionic / electrovalent

for 1 mark

1

[3]

M8. (a) *weaker bonds*

allow (other substances) react with the silicon dioxide

or

fewer bonds

ignore weaker / fewer forces

or

disruption to lattice

*do **not** accept reference to intermolecular forces / bonds*

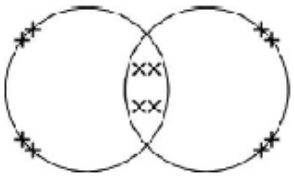
1

(b) (i) Na_2O

*do **not** accept brackets or charges in the formula*

1

(ii)



electrons can be shown as dots, crosses, e or any combination

2 bonding pairs

accept 4 electrons within the overlap

1

2 lone pairs on each oxygen

accept 4 non-bonding electrons on each oxygen

1

(c) *lattice / regular pattern / layers / giant structure / close-packed arrangement*

1

(of) positive ions **or** (of) atoms

1

(with) delocalised / free electrons

*reference to incorrect particles **or** incorrect bonding **or** incorrect structure = max **2***

1

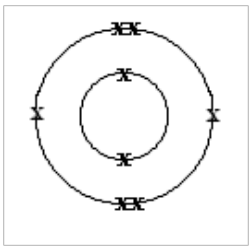
[7]

M9. (a) $2Mg + O_2 \rightarrow 2MgO$

accept correct multiples / fractions

1

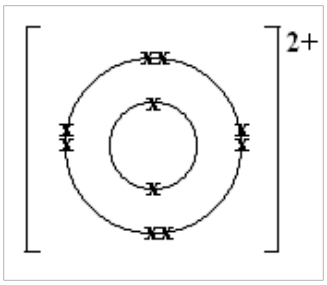
(b)



electrons do not need to be paired
accept dots / circles / e instead of crosses
*do **not** allow 2.6 without diagram*

1

(c)



electrons do not need to be paired
allow without bracket s/ must have the charge
accept dots / circles / e instead of crosses
ignore extra empty outer shells
ignore nucleus
*do **not** allow [2.8]$^{2+}$ without diagram*

1

(d) oppositely charged (ions / atoms)

allow positive and negative(ions / atoms)

1

(they) attract

must be in correct context
accept held by electrostatic forces
ignore ionic bonding
***maximum 1** if they refer to intermolecular forces / attractions / covalent bonds*

1

(e) magnesium chloride

accept $MgCl_2$ (if correctly written)

1

[6]