

# MARK SCHEME

# GCSE

## CHEMISTRY

## AQA - TRIPLE SCIENCE

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C2 - TEST 4

BONDING

Intermediate

## Mark schemes

- 1.** (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]**
- 2.** (a) carbon  
*allow C* 1
- (b) (i) (atoms are in) layers (that) can slide over each other 1
- because between the layers there are only weak forces  
*accept because there are no (covalent) bonds between the layers*  
*accept Van der Waals forces between the layers*  
*do **not** allow intermolecular bonds between the layers*  
*if no other marks are awarded allow weak intermolecular forces for 1 mark* 1
- (ii) because each atom forms four (covalent) bonds **or** (diamond is a) giant (covalent) structure **or** lattice **or** macromolecular  
*any reference to ionic / metallic bonding or intermolecular forces scores a maximum of 1 mark*  
*accept carbon forms a tetrahedral shape* 1

(and) covalent bonds are strong  
*accept covalent bonds need a lot of energy / difficult to break*

1

- (iii) because graphite has delocalised electrons  
*allow sea of electrons*  
*allow each carbon atom has one free electron*

1

which can move through the whole structure (and carry the current / charge / electricity)

1

[7]

3.

- (a) (i) covalent  
*two different answers indicated gains 0 marks*

1

- (ii) carbon  
*two different answers indicated gains 0 marks*

1

- (iii) 3  
*two different answers indicated gains 0 marks*

1

- (b) layers can slide / slip

1

because there are no bonds between layers  
*accept because weak forces / bonds between layers*

**or** so (pieces of) graphite rubs / breaks off

**or** graphite left on the paper

1

[5]

4.

- (a) 1-100 nm in size

**or**

a few (hundred) atoms in size

*accept very / really small / tiny*

**or**  $10^{-9}$

*accept billionth of a metre **or** any number that implies very small*

*accept measured in nanometers*

*if answer 'very small' ignore incorrect numerical values*

1

(b) any **two** from:

- less tennis balls need to be made
- tennis balls last longer **or** don't have to replace as often
- less materials / resources / fuel used up / saves resources  
*accept saving materials*
- less energy used **or** making tennis balls uses energy  
*accept saving energy*
- less pollution caused  
*accept named pollutant*  
*accept global warming / greenhouse effect*
- less waste  
*eg fewer tennis balls going to landfill*

2

**[3]**

**5.**

(a) (i) reacts with carbon / C

*accept burns / oxidises carbon*

1

carbon dioxide / CO<sub>2</sub> / gas is formed / given off

*accept carbon monoxide / CO*

*accept correctly balanced equation for 2 marks*

*ignore state symbols*

1

(ii) change / improve properties

*accept any specific property*

*accept to make alloys / special steels*

*ignore brittle*

1

(b) any **two** from:

- to conserve ores / iron  
*accept ores / iron are non-renewable / non-sustainable*  
*allow less quarrying / mining*
- to prevent the use of landfills  
*allow reduce waste*
- to conserve energy / fuel  
*accept fossil fuels are non-renewable*
- to reduce carbon / carbon dioxide emissions
- to meet EU / International targets  
*ignore costs / demand*

2

[5]

6.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

**0 marks**

No relevant content

**Level 1 (1–2 marks)**

*There is a statement about the bonding and / or structure **or** melting / boiling point of chlorine **or** sodium chloride.*

**Level 2 (3–4 marks)**

*There are statements about the bonding and / or structure of chlorine **or** sodium chloride.*

**Level 3 (5–6 marks)**

*There are statements about the bonding and / or structure of chlorine **and** sodium chloride.*

*There is an explanation of why chlorine is a gas **or** sodium chloride is a solid.*

**Examples of chemistry points made in response:**

**Chlorine:**

covalent bonds between atoms

forming (simple) molecules

*no / weak attraction / bonds between molecules*

low boiling point

**Sodium chloride:**

*ionic bonds **or** electrostatic attraction*

strong bonds

in all directions

between oppositely charged ions

forming giant lattice

*large amounts of energy needed to break bonds*

*high melting point*

[6]

7.

- (a) 2,4 (drawn as crosses) on shells  
*accept dots / e / - etc.*

1

(b) (i) hard

*allow rigid / high melting point*

*do **not** allow references to bonding*

*ignore strong*

*ignore unreactive*

*ignore structure*

1

(ii) any **three** from

*max 2 if ionic / metallic / molecule / intermolecular bonds **or**  
incorrect number of bonds*

- giant structure / lattice / macromolecular  
*allow many bonds*
- covalent (bonds)
- (covalent) bonds are strong  
*accept needs lots of energy to break bonds (owtte)*
- (each) carbon / atom forms four bonds

**or**

(each) carbon / atom bonded to four other atoms

3

- (c) any **three** from:  
*max 2 if ionic / ions / metallic / molecule*  
*'it' needs to be qualified*

graphite

- has delocalised / free electrons  
*do **not** accept the electrons move unless qualified (around structure etc)*

**or**

electrons that can move through / around the structure

- each carbon is joined to three other carbon atoms  
*allow graphite has three bonds*

**or**

one electron from each atom is free / delocalised

diamond

- has no free / delocalised electrons  
*do **not** accept the electrons do not move*

**or**

no electrons that move around the structure

- all the electrons are used for bonding  
*allow diamond has 4 bonds*

**or**

each carbon joined to four other carbon atoms

3

**[8]**

**8.**

- (a) (i) correct number of electrons (18)  
*accept any combination of dots and crosses*

1

2, 8, 8

*2, 8, 8 written on rings = 1 mark*

1

- (ii) loses 2 electrons **or** loses both electrons  
*loses electrons = 1 mark*  
*any answers about gaining electrons = 0 marks*

2

(b) (i) 5

*accept multiples if all correct*

1

(ii) 6

*accept multiples if all correct*

1

**[6]**