

# Common Atmospheric Pollutants + Sources

## Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.9 Chemistry of the Atmosphere
Sub-Topic	Common Atmospheric Pollutants + Sources
Difficulty Level	Gold Level
Booklet	Mark Scheme 1

Time Allowed: 43 minutes

Score: /43

Percentage: /100

Grade Boundaries:

**M1.(a)** because sulfur dioxide causes acid rain

1

which kills fish / aquatic life **or** dissolves / damages statues / stonework **or** kills / stunts growth of trees

*if no other mark awarded then award 1 mark for sulfur dioxide is toxic or causes breathing difficulties.*

1

(b) (i) electrons are lost

1

(ii)  $\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$   
*allow  $\text{Cu}^{2+} \rightarrow \text{Cu} - 2\text{e}^{-}$*   
*ignore state symbols*

1

(iii) copper sulfate  
*allow any ionic copper compound*

1

(c) (lattice of) positive ions

1

delocalised electrons  
*accept sea of electrons*

1

(electrostatic) attraction between the positive ions and the electrons

1

electrons can move through the metal / structure **or** can flow  
*allow electrons can carry charge through the metal / structure*  
*if wrong bonding named or described or attraction between oppositely charged ions then do not award M1 or M3 – MAX 2*

1

(d) (copper compounds are absorbed / taken up by) plants  
*allow crops*

1

which are burned

1

the ash contains the copper compounds

*do not award M3 if the ash contains copper (metal)*

1

(e)

/ A <sub>r</sub>	55.6 / 63.5	16.4 / 56	28.0 / 32
moles	0.876	0.293	0.875
ratio	3	1	3
formula	Cu <sub>3</sub> FeS <sub>3</sub>		

*award 4 marks for Cu<sub>3</sub>FeS<sub>3</sub> with some correct working*

*award 3 marks for Cu<sub>3</sub>FeS<sub>3</sub> with **no** working*

*if the answer is not Cu<sub>3</sub>FeS<sub>3</sub> award up to 3 marks for correct steps from the table apply ecf*

*if the student has inverted the fractions award 3 marks for an answer of CuFe<sub>3</sub>S*

4

[16]

**M2.(a)** circle round any one (or more) of the covalent bonds

*any correct indication of the bond – the line between letters*

1

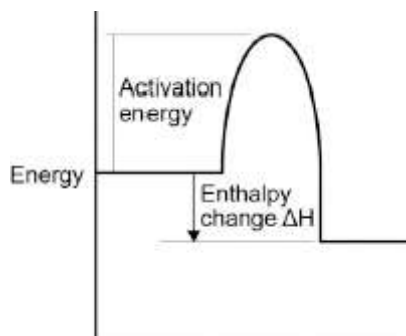
(b) Methane contains atoms of two elements, combined chemically

1

(c) (i) activation energy labelled from level of reagents to highest point of curve  
*ignore arrowheads*

1

enthalpy change labelled from reagents to products



arrowhead **must** go from reagents to products only

1

(ii)  $2\text{O}_2$

1

$2\text{H}_2\text{O}$

*if not fully correct, award 1 mark for all formulae correct.*

*ignore state symbols*

1

(iii) carbon monoxide is made

1

this combines with the blood / haemoglobin **or** prevents oxygen being carried in the blood / round body **or** kills you **or** is toxic **or** poisonous

*dependent on first marking point*

1

(iv) energy is taken in / required to break bonds

*accept bond breaking is endothermic*

1

energy is given out when bonds are made

*accept bond making is exothermic*

1

the energy given out is greater than the energy taken in

*this mark only awarded if both of previous marks awarded*

1

(d) (i) energy to break bonds = 1895

*calculation with no explanation max = 2*

1

energy from making bonds = 1998

1

$1895 - 1998 (= -103)$

**or**

energy to break bonds = 656

energy from making bonds = 759

$656 - 759 (= -103)$

*allow:*

*bonds broken – bonds made =*  
*413 + 243 – 327 – 432 = -103 for 3 marks.*

1

(ii) The C — Br bond is weaker than the C — Cl bond

1

[15]

M3.(a) Sulfur dioxide causes acid rain.

1

(b) red / orange / yellow  
*do **not** accept any other colours*

1

because sulfur dioxide (when in solution) is an acid

1

(c) (there are) weak forces (of attraction)  
*do **not** accept any reference to covalent bonds breaking*

1

between the molecules  
*do **not** accept any other particles*

1

(these) take little energy to overcome  
*award third mark only if first mark given*

1

(d) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a ‘best-fit’ approach to the marking.

**0 marks**

No relevant content

### **Level 1 (1 – 2 marks)**

A relevant comment is made about the data.

### **Level 2 (3 – 4 marks)**

Relevant comparisons have been made, and an attempt made at a conclusion.

### **Level 3 (5 – 6 marks)**

Relevant, detailed comparisons made and a justified conclusion given.

### **examples of the points made in the response**

#### **effectiveness**

- W removes the most sulfur dioxide
- D removes the least sulfur dioxide

#### **material used**

- Both W and D use calcium carbonate
- Calcium carbonate is obtained by quarrying which will create scars on landscape / destroy habitats
- D requires thermal decomposition, this requires energy
- D produces carbon dioxide which may cause global warming / climate change
- S uses sea water, this is readily available / cheap

#### **waste materials**

- W product can be sold / is useful
- W makes carbon dioxide which may cause global warming / climate change
- D waste fill landfill sites
- S returned to sea / may pollute sea / easy to dispose of