

Comp + Evolution of the Earth atm

Mark Scheme 1

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|------------------|---------------------------------------|
| Level | GCSE (9-1) |
| Subject | Combined Science: Trilogy - Chemistry |
| Exam Board | AQA |
| Topic | 5.9 Chemistry of the Atmosphere |
| Sub-Topic | Comp + Evolution of the Earth atm |
| Difficulty Level | Silver Level |
| Booklet | Mark Scheme 1 |

Time Allowed: 58 minutes

Score: /58

Percentage: /100

Grade Boundaries:

M1.(a) any **one** from:

- not enough evidence or proof
allow no evidence or no proof
- (life and the Earth were created) billions of years ago
allow a long time ago
ignore different beliefs or no one was there.

1

- (b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks

No relevant content

Level 1 (1–2 marks)

Statements based on diagrams

Level 2 (3–4 marks)

Description of how one change occurred

Level 3 (5–6 marks)

Descriptions of how at least two changes occurred

Examples of chemistry points made in the response could include:

Main changes

- oxygen increased because plants / algae developed and used carbon dioxide for photosynthesis / growth producing oxygen; carbon dioxide decreased because of this
- carbon dioxide decreased because oceans formed and dissolved / absorbed carbon dioxide; carbon dioxide became locked up in sedimentary / carbonate rocks and / or fossil fuels
- oceans formed because the Earth / water vapour cooled and water vapour in the atmosphere condensed
- continents formed because the Earth cooled forming a supercontinent / Pangaea which formed the separate continents
- volcanoes reduced because the Earth cooled forming a crust.

Other changes

- nitrogen has formed because ammonia in the Earth's early atmosphere reacted with oxygen / denitrifying bacteria.

6

[7]

M2.(a) (i) H₂O

must be formula

1

CaO

must be formula

1

- (ii) carbon dioxide from the air / (Earth's early) atmosphere
it = carbon (dioxide)
accept carbon dioxide from millions of years ago

1

formed (sedimentary) rocks **or** fossil fuels
ignore trapped / stored

1

- (b) (i) decreases rapidly at first
it = carbon (dioxide)

1

then slowly **or** levels off
*allow both marks if the description is correct using either 'rapidly' **or** 'slowly'*
allow correct use of figures for either marking point
if no other mark awarded, allow CO₂ decreased for 1 mark

1

- (ii) any **two** from:
it = carbon (dioxide)
accept photosynthesis

- used by plants
- dissolved in oceans
- 'locked up' in fossil fuels **or** formed fossil fuels
- 'locked up' in rocks **or** formed rocks

2

(c) (yes)

it = percentage of carbon (dioxide)

ignore yes or no

because the percentage of carbon dioxide is increasing

1

which causes global warming (to increase)

allow (carbon dioxide) causes greenhouse effect/climate change

1

or

(no)

because the percentage of carbon dioxide is low (1)

compared to millions of years ago (1)

allow global warming can be caused by other factors (e.g. Sun / water vapour / methane)

[10]

M3. (a) carbon dioxide decreased (by plants / trees)

allow plants / trees absorbed carbon dioxide

1

oxygen increased (by plants / trees)

allow plants / trees released oxygen

if neither of these marks awarded

allow plants / trees

photosynthesise for 1 mark

1

because coal 'locks up' / traps / stores carbon dioxide / carbon

allow trees 'locked up' carbon dioxide / carbon

1

(b) carbon / C

hydrogen / H

sulfur / S

all 3 correct 2 marks

1 or 2 correct 1 mark

allow H₂

ignore oxygen

2

(c) (i) 2 2

balancing must be correct

*do **not** accept changed formulae*

1

(ii) increases atmospheric pollution

carbon dioxide / CO₂ released

1

from the (thermal) decomposition of calcium carbonate **or**

*accept causes global warming **or** CO₂ is a greenhouse gas*

description of this decomposition **or** equation

ignore sulfur dioxide and effects in this part

1

decreases atmospheric pollution

sulfur dioxide / SO₂ is removed

accept less acid rain produced

1

by reaction with calcium oxide **or** calcium carbonate

*accept neutralisation **or** forms calcium sulfate*

1

[10]

M4. (a) (i) any **two** from:

- used by plants
allow specific plants and algae
- used for photosynthesis
ignore oxygen released / respiration
- absorbed / dissolved in oceans
ignore oceans formed
- locked up in fossil fuels / limestone / sedimentary rocks

2

(ii) calcium carbonate / CaCO_3

1

decomposed / thermal decomposition

*do **not** allow reaction with oxygen*

accept quicklime / calcium oxide produced

$\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ gains **2** marks

1

(b) increasing (CO_2 or global warming)

1

more rapid increase recently

1

carbon dioxide causes global warming

*accept greenhouse gas **or***

climate change / sea level rising

***or** ice caps melting*

*do **not** accept ozone layer or acid rain or global dimming*

1

(c) (i) any **one** from:

- Wegener had no evidence / proof
accept movement too slow to measure
- other scientists had different ideas / views
accept continents / plates fixed or land bridge
- did not respect Wegener as a scientist / geologist

1

(ii) any **three** from:

- plates (move)
ignore continents
- heat energy / radioactivity (causes)
- convection currents
- in mantle

3

[11]

M5. (a) complete diagram with 2 carbon atoms and 5 hydrogen atoms each C–C and each C–H linked by a single line (bond)

1

(b) (i) the greater the number of (carbon) atoms (in an alkane molecule) the greater its boiling point **or** vice versa

allow as the (carbon) chain gets longer the boiling point increases

ignore melting points

*do **not** accept reference to greater number of molecules*

1

(ii) *they = hydrocarbons from the graph*

it = C₃₀H₆₂

any **two** from:

- low boiling point / volatile
accept they are gases or liquids
- low viscosity
- high flammability
accept easier to burn / ignite
- small molecules
accept short chains
ignore number of carbon atoms
- burn completely
ignore speed of burning

2

(c) (i) $16 (\text{CO}_2) + 18 (\text{H}_2\text{O})$

1

- (ii) (carbon dioxide in the Earth's early) atmosphere
accept from volcanoes (millions of years ago)
or from dead plants / animals
allow dead sea creatures
ignore shells

1

- (iii) increase in burning / use of fossil fuels

1

locked up carbon (carbon dioxide) is released
allow carbon / carbon dioxide from millions of years ago is released
accept extra carbon dioxide is not 'absorbed' (by the carbon cycle)

1

[8]

- M6.** (a) (thought to cause) global warming / green house (effect) / climate change
ignore other consequences of global warming
*do **not** accept acid rain / ozone layer / global dimming*

1

- (b) any **three** from:

- replant trees / renewable / sustainable
ignore reusable
- carbon (dioxide) used by trees / photosynthesis
accept trees absorb carbon (dioxide) as they grow
ignore respiration
- it is a (continuous / carbon) cycle
accept burning wood is carbon neutral

or

carbon (dioxide) goes back into the air

*for the **second** and **third** bullet points: accept trees use carbon dioxide which is released when (trees / wood are / is) burnt for **2** marks*

- no new carbon (dioxide) is produced

or

no locked up carbon (dioxide) is released

or

the carbon (dioxide) was absorbed millions of years ago

3

[4]

- M7.** (a) (i) *it = water vapour*

condensed

accept temperature went below 100°C / boiling point of water
allow cooled to form liquid / water / rain
*do **not** accept evaporated*

1

formed the oceans / seas

ignore rain

*accept (water vapour) cooled and formed the ocean / sea for
2 marks*

1

(ii) any **two** from:

ignore oxygen / nitrogen increased

ignore reference to volcanoes / respiration

- used by (green) plants / algae
accept photosynthesis / plants give out oxygen
- changed into oxygen
- dissolved in oceans / seas
accept (locked up) in shells / skeletons (of animals)
- (locked up) in carbonates / sedimentary rocks
- (locked up) in fossil fuels / named fossil fuel

2

(b) (i) cannot get to / reach / drill to / see the core

*accept the core is (too) far down (into the Earth) / do not
know what happens under the crust / Earth's surface*

accept it is (too) hot / radioactive

ignore lack of evidence unqualified

1

(ii) any **three** from:

- heat / energy released
- from radioactive decay / processes
accept radioactivity / nuclear reactions
- (causing) convection currents
- in the mantle

3

[8]