GCSE Chemistry

Evolution of the Atmosphere

Mark Scheme

Time available: 55 minutes
Marks available: 50 marks

1. (a) the Earth's (surface) temperature was high **or** at/above 100 °C

allow the Earth's (surface) temperature was too / very hot ***or*** *water evaporated / boiled* ***or*** *turned to steam / gas*

allow because of heat from volcanoes

ignore the Earth's (surface) was covered by volcanoes

ignore water turned to water vapour

1

(b) (i) air ——————— mixture

1

carbon dioxide ——— compound

1

argon ——————— element

1

allow only one line from each substance

(ii) oxygen

1

(iii) about 80 %

1

(c) (i) 0.03(0) (%)

1

(ii) increased

1

slowly then rapidly

1

allow figures from graph to indicate increase

(iii) any **two** from:

- use of fossil fuels
- deforestation

allow less trees / plants

- cars/transport
- industry/factories

ignore more people

2

[11]

2. (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]

3. (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

*$CaCO_3 \rightarrow CaO + CO_2$ 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]

4. (a) any **two** from:

asks for cause therefore no marks for just describing the change

must link reason to a correct change in a gas

carbon dioxide has <u>decreased</u> due to:

accept idea of 'used' to indicate a decrease

- plants / micro organisms / bacteria / vegetation / trees
- photosynthesis

  ignore respiration
- 'locked up' in (sedimentary) rocks / carbonates / fossil <u>fuels</u>
- dissolved in oceans

  ignore volcanoes

oxygen has <u>increased</u> due to:

accept idea of 'given out / produced'

- plants / bacteria / micro organisms / vegetation / trees
- photosynthesis

  ignore respiration

nitrogen <u>increased</u> due to:

accept idea of 'given out / produced'

- ammonia reacted with oxygen
- bacteria / micro organisms

  ignore (increase in) use of fossil fuels / deforestation

2

(b) (because methane's) boiling point is greater than the average / surface temperature **or** Titan's (average / surface) temperature is below methane's boiling point

*ignore references to nitrogen **or** water*

1

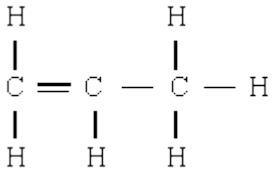
any methane that evaporates will condense

accept boils for evaporates

accept cooling and produce rain for condensing

1

(c) (i)



bonds must be displayed correctly

ignore bond angles

1

(ii) poly(propene) / polypropene / polypropylene

*do **not** allow polypropane*

any **two** from:

- double bonds open up / break / become single(*)
- propene molecules / monomers / they join / undergo addition polymerisation(*)

1

- form chains / long molecules(*)

*(*)correct chemical equation gains **2** marks*

ignore large

*using monomer incorrectly max **2** marks*

2

5. (a) **either** any **two** points (1) each from

* (surface) below 100 °C (the surface) below the boiling point of water

* (allowed the) condensation (of water vapour)

accept (rate of) condensation greater than (the rate of) evaporation

* from the atmosphere

accept from the air

or condensed water (vapour) (1)
was pulled by gravity into depressions (1)

***or** idea of impervious sea bed*

or from comets (which crashed on the Earth) (1)

ice (from these) melted (1)

2

(b) any **two** processes (1) each from

* dissolving in (sea) water

* (taken in during) photosynthesis

*accept taken in by algae **or** plants*

- formation of carbonate(s)
  or calcium carbonate **or** chalk **or**
  calcite

  *accept formation of shells **or** bones **or** corals*

2

[4]

6. (a) nitrogen and oxygen

both required either order

1

(b) (i) any **two** from

(atmosphere) is now cooler water vapour has condensed
to form sea(s) / ocean(s)

2

(ii) any **two** from

has dissolved in / reacted with seawater has formed carbonates
(evolution of green) plants removed by photosynthesis
has formed fossil fuels

2

(c) (i) 225

accept any date in the Triassic period
225 – 191 (mya)
do not credit 190 (mya)

1

(ii) on different (tectonic) plates

***or** answer refers to African and South American plates*

1

(movement) due to convection currents in the mantle

1

due to energy / heat from the core

***or** due to radioactivity*

1

[9]