

Comp + Evolution of the Earth atm

Mark Scheme 1

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	Gold Level
Booklet	Mark Scheme 1

Time Allowed: 38 minutes

Score: /37

Percentage: /100

Grade Boundaries:

- M1.(a)** sediment / limestone formation from carbonates 1
- (b) short wavelength radiation 1
- passes through atmosphere to Earth's surface 1
- Earth's surface radiates different wavelengths 1
- which are absorbed by greenhouse gases to produce temperature increase
allow CH₄ H₂O or CO₂ 1
- (c) 13.8 %
allow values in the range 13.0 to 15.0 1
- (d) 15.08 (°C)
allow values in the range 15.05 – 15.10 1
- (e) correlation between CO₂ levels and temperature 1
- despite short-term variations of temperature 1
- supported by values from graph which show correlation

1

cannot determine causality from this data or possible causality as increasing use of fossil fuels since 1900 has caused accelerated temperature increase

1

[11]

M2.(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 decreased due to:

accept idea of 'used' to indicate a decrease

- plants / microorganisms / bacteria / vegetation / trees
- photosynthesis
ignore respiration
- 'locked up' in (sedimentary) rocks / carbonates / fossil fuels
- dissolved in oceans
ignore volcanoes

oxygen has increased due to:

accept idea of 'given out / produced'

- plants / bacteria / microorganisms / vegetation / trees
- photosynthesis
ignore respiration

nitrogen increased 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) C_nH_{2n}

1

[5]

M3. (a) (i) (thermal) decomposition

allow it breaks down

accept symbol equation or in words

allow reaction with SO_2 (to form CO_2)

1

(ii) calcium carbonate / calcium oxide / limestone / quicklime / it reacts with sulfur dioxide / forms calcium sulfate

accept it neutralises sulfur dioxide / neutralisation

ignore references to sulfur

do not accept 'calcium reacts with...'

1

(b) by incomplete / partial combustion (of the fuel)

1

insufficient oxygen / air (to burn fuel)

accept insufficient oxygen / air to burn fuel completely for 2 marks

if no other marks awarded

*accept $C + CO_2 \rightarrow 2CO$ **or***

*$2C + O_2 \rightarrow 2CO$ **or** in words for 1 mark*

1

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

- (CO₂) from the atmosphere
- (CO₂) taken in millions of years ago **or** early (atmosphere)
allow thousands / billions
allow rocks formed millions of years ago
- (CO₂) was used to form the shells / skeletons of marine organisms / fossil fuels
accept sedimentary rocks
allow used to form correct named fossil fuel
ignore limestone

2

(ii) any **one** from:

- (increases / enhances) global warming
allow greenhouse gas / effect
*do **not** accept ozone layer / acid rain / global dimming*
ignore consequences of global warming
- is additional carbon dioxide **or** not able to be absorbed by oceans / seas **or** used by (green) plants
- acidification of sea water

1

[7]

M4. (a) **Quality of written communication**

for any two ideas sensibly stated

1

any **three** from:

- plants take in (CO₂)
accept photosynthesis uses (CO₂)
- converted to glucose / starch / carbohydrates
ignore carbon compounds by itself
- CO₂ locked up in fossil fuels
accept coal / oil / natural gas / methane for fossil fuels

- CO_2 reacts with / dissolves (sea)water
accept ocean removes CO_2
- producing hydrogencarbonates
accept carbonic acid
- producing carbonates
accept named carbonates
- marine animals use carbonates to make shells
*do **not** accept bones*
- forms sedimentary rocks
accept limestone / chalk
accept marble
*do **not** accept sediments alone*

3

(b) any **two** from:

- burning of fossil fuels **or** cars /
industry / air travel / power stations
ignore increase in population
ignore more use of electricity
- natural processes cannot absorb all the extra CO_2
- deforestation
accept less photosynthesis
ignore volcanic activity
accept burn trees

2

[6]

M5. (a) 95% (1 mark for working)

2

(b) Much less carbon dioxide
Much more nitrogen

2

- (c) Plants take up CO₂
plants give out oxygen
when they die trap CO₂ in rocks and fossil fuels
methane and ammonia reacted with oxygen
nitrogen gas produced
by reaction of oxygen and ammonia
and by denitrifying bacteria
formation of ozone layer

any 4 for 1 mark each

4

[8]