

M1.(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]

- M2.** (a) (i) (thermal) decomposition
allow it breaks down
accept symbol equation or in words
allow reaction with SO₂ (to form CO₂) 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]

M3. (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 / micro organisms / 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 / micro organisms / 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

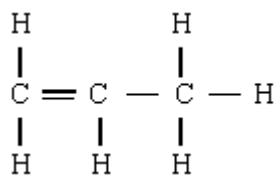
any methane that evaporates will condense

accept boils for evaporates

accept cooling and produce rain for condensing

1

(c) (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(*)
- form chains / long molecules(*)

()correct chemical equation gains 2 marks*

ignore large

using monomer incorrectly max 2 marks

1

2

[8]

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
- CO₂ reacts with / dissolves (sea)water
accept ocean removes CO₂
- 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 CO₂
- 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]

- M6.** (a) amount of CO₂ (much) lower
amount of O₂ (much) higher
amount of N₂ (much) higher (owtte.)
less other gases/less NH₃/less CH₄

any 2 for 2 marks

2

- (b) 4 points from:
plants (evolved)/photosynthesis/algae
take in CO₂
give out O₂
water vapour condensed
ozone formed from oxygen
less CO₂ is produced now from volcanic activity
CO₂ from air trapped in sedimentary rocks or fossil fuels
nitrogen produced by bacteria/living organisms/microbes/decay of dead organisms (**not** nitrifying bacteria, nitrogen fixing 4 bacteria)
nitrogen produced by reaction of NH₃ with O₂/decomposition of NH₃
nitrogen builds up because it is unreactive

(Assume answer refers to today's atmosphere)

any 4 for 1 mark each

4

[6]

- M7.** (a) (i) burning / breathing / respiration / fuels / food
for 1 mark each **2**
- (ii) 1. rock is heated / subducted (owtte) / close to magma / melted
1. rock is decomposed / carbon dioxide released through volcanoes
for 1 mark each **2**
- (b) carbon dioxide reacts / dissolves in sea-water / dissolves in rain water
insoluble carbonates / calcium carbonate are / is formed carbon dioxide turned into shells /
coral / limestone / chalk / sediments also soluble hydrogencarbonates (calcium /
magnesium) are formed photosynthesis by plants
any three for 1 mark each **3**
- (c) (i) sea unable to absorb all the extra carbon dioxide being produced
more trees being cut down / deforestation increased burning of fuels / more cars /
more industry (*not* more people)
any one for 1 mark **1**
- (ii) global warming / greenhouse effect or effects such as melting ice caps /
rising sea levels / climatic change / more deserts
(*not* changes to ozone layer)
for one mark **1**

[9]

M8. (a) any **two** 1 mark each

burning / combustion

fossil fuels **or** (locked up) carbon

accept fuel / named fuel

oxygen used

2

(b) any **three** from

produces (calcium) carbonate

which is insoluble

produces (calcium) hydrogencarbonate

which is soluble

photosynthesis

releases oxygen

3

[5]