

MARK SCHEME

GCSE

CHEMISTRY

AQA - COMBINED SCIENCE

C9 - TEST 6

CHEMISTRY OF THE ATMOSPHERE

Advanced

Mark schemes

1.

(a) (i) 80(%)

allow answers in range 78–80(%)

1

(ii) any **five** from:

max 4 marks if no reference to oxygen

ignore changes due to combustion of fossil fuels

- (green) plants / algae photosynthesise
- take in carbon dioxide (for photosynthesis)
- release oxygen (in photosynthesis)
*do **not** accept for / in respiration*
accept carbon dioxide has decreased and oxygen has increased for 1 mark
- carbon dioxide dissolved in oceans
accept oceans act as reservoir
- carbon dioxide locked up in (sedimentary) rocks / carbonates / limestone
- carbon dioxide locked up in fossil fuels
allow locked up in biomass

5

(b) any **two** from:

- on Mars the temperature is below freezing point of water / 0°C
allow water is frozen / ice on Mars
- on Venus the temperature is above boiling point of water / 100°C
allow water is a gas / steam or has boiled / evaporated on Venus
- not enough water vapour (in atmosphere) on Venus
ignore references to water vapour on Mars

2

[8]

2.

(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

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3.

(a) (i) acid rain

accept consequences of acid rain

allow asthma / bronchitis

ignore toxic gas

1

(ii) global dimming

accept dimming alone

1

(b) (i) **sustainable:**

maximum **two** from:

- crops (that produce oil) can be grown in most places owtte
- renewable
- use less fossil fuels / diesel
- use (refined) waste oils

low pollution:

maximum **two** from:

ignore references to CO₂ here

- most emissions are lower **or** any two named emissions from CO / SO₂ / PM₁₀ are lower
- much / lot less SO₂ emissions (than the others) owtte
- accept spillages / waste is biodegradable
- less new CO₂ **or** (more) carbon neutral

3

(ii) plants / photosynthesis use carbon (dioxide) from the air*

1

it / biodiesel releases carbon (dioxide) from plants / crops / photosynthesis*

() allow 1 mark for biodiesel is (more) carbon neutral*

1

(fossil) diesel releases 'locked up' / new carbon (dioxide) / doesn't absorb CO₂ / absorbed it millions of years ago

1

4.

(a) burning of fossil fuels

accept burning of a named fossil fuel

1

(b) Change:

carbon dioxide dissolves / is absorbed by oceans / water

accept ocean acts as a reservoir / store

1

Effect:

increases acidity of water

ignore references to acid rain

accept as alternative approach:

change: global warming / greenhouse gas

effect: leads to increase in ocean / water temperature

1

- (c) (i) 422
allow answers in range of 418-430 1
- (ii) from 1980 to 2010 carbon dioxide increased by 50ppm **and** coral decreased by 50%
allow answers in range of 48-52 ppm 1
- from 2010 to 2020 carbon dioxide increased by 32 ppm,
allow answers in range of 30-40 ppm
allow ecf from part (i) with a tolerance of ± 2 ppm 1
- (so) would expect coral to decrease by half again
accept increasing rate of change of carbon dioxide / coral
or
exponential rate of change of carbon dioxide / coral 1

[7]

5.

- (a) because the sensors are not near where people / residents live
accept because the sensors are not between cement works and where people live 1
- because the sensors are not positioned where concentration of particles was likely to be highest
accept because the sensors are not positioned downwind 1
- (b) the average concentration of particles was **only** 1.8(ppm)
or the average concentration of particles was below 2(ppm)
accept the average concentration of particles was 1.8(ppm) which is less than 2.0 (ppm) 1
- (c) because the readings at some (2/3) sensors could have been higher than 2ppm 1
- because the sensors did not detect particles below 0.5mm 1
- because small particles / particles below 0.5mm / 0.4mm / 0.3mm / 0.2mm could (still) cause cancer / asthma 1
- ignore global dimming or cars becoming dirty or position of sensors*

[6]

6.

- (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

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