

Mark schemes



1.

(a) incomplete combustion

1

(because) insufficient / limited oxygen supply

1

(b) any **two** from:

- carbon monoxide toxic / poisonous
allow description of how carbon monoxide is toxic / poisonous
ignore carbon monoxide is harmful / dangerous / deadly
- greater public concern / awareness about pollution
ignore comments about the effects of other pollutants
ignore unspecified comments about carbon monoxide pollution
- more cars so otherwise there would be more carbon monoxide entering atmosphere
- improved engine technology
- catalytic converters have been introduced

2

(c) any **one** from:

- (to reduce) health problems
allow (to reduce) specified health problems e.g. breathing difficulties, asthma, lung cancer
- (to reduce) global dimming
allow (to reduce) the effects of global dimming e.g. reduced light levels
allow (to reduce) smog
allow (to reduce) the formation of particulates
ignore global warming
*do **not** accept to reduce soot*

1

(d) nitrogen (from atmosphere) reacts with oxygen (from atmosphere)

1

at high temperature (in engine)

ignore heat / hot

or

with a spark (from spark plug)

1



- (e) $2 \text{NO}_2 \rightarrow \text{N}_2 + 2 \text{O}_2$
allow multiples
if incorrect, allow N_2 for 1 mark

2

- (f) any **one** from:
- acid rain
allow specific effects of acid rain
 - respiratory problems
allow specific respiratory problems e.g. breathing difficulties, asthma
 - carbon monoxide
 - global dimming **or** smog
- max 1 mark if global warming mentioned*

2

- (g) transition metals

1

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2.

- (a) sulfur dioxide
- (b) any **one** from:
- kills aquatic animals / plants
 - damages limestone buildings / statues
 - damage to forests

1

1

- (c) (sample) **C**

1

contains most sulfur

or

produces most sulfur dioxide

1

- (d) $1 \times \frac{66.3}{22.1}$

1

= 3 (kg)

1

an answer of 3 (kg) scores 2 marks



(e) any **two** from:

- not easily detected
- colourless
allow cannot see it
- odourless
allow cannot smell it

2

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3.

(a) 72/24

an answer of 3 (mm / year) scores 2 marks

1

= 3 (mm / year)

an answer of 3.125 (mm / year) scores 1 mark

1



- (b) **Level 3 (5-6 marks):**
Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

Level 2 (3-4 marks):

Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

Level 1 (1-2 marks):

Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

Level 0

No relevant content

Indicative content

description

- global air temperature has risen overall / erratically
- mean sea level has risen (steadily)
- carbon dioxide has risen steadily
- methane has risen overall / erratically

explanations

- (carbon dioxide increase because) increase in fossil fuel combustion
or
- (carbon dioxide increase because) increase in deforestation
- methane from cattle / landfill / rice plantations
- carbon dioxide and / or methane trap heat
or
- carbon dioxide and / or methane are greenhouse gases
- polar ice caps melt
or
- seawater expands

linked explanation

- greenhouse gases linked to temperature rise
- temperature rise linked to seawater level

6

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

- bias
- simplified models
- lack of peer review
ignore reproducible

2

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4.

- (a) Sulfur dioxide causes aci

1

(b) red / orange / yellow

*do **not** accept any other colours*

1



because sulfur dioxide (when in solution) is an acid

1

(c) (there are) weak forces (of attraction)

*do **not** accept any reference to covalent bonds breaking*

1

between the molecules

*do **not** accept any other particles*

1

(these) take little energy to overcome

award third mark only if first mark given

1



(d) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks

No relevant content

Level 1 (1 – 2 marks)

A relevant comment is made about the data.

Level 2 (3 – 4 marks)

Relevant comparisons have been made, and an attempt made at a conclusion.

Level 3 (5 – 6 marks)

Relevant, detailed comparisons made and a justified conclusion given.

examples of the points made in the response

effectiveness

- W removes the most sulfur dioxide
- D removes the least sulfur dioxide

material used

- Both W and D use calcium carbonate
- Calcium carbonate is obtained by quarrying which will create scars on landscape / destroy habitats
- D requires thermal decomposition, this requires energy
- D produces carbon dioxide which may cause global warming / climate change
- S uses sea water, this is readily available / cheap

waste materials

- W product can be sold / is useful
- W makes carbon dioxide which may cause global warming / climate change
- D waste fill landfill sites
- S returned to sea / may pollute sea / easy to dispose of

6

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5.

(a) (i) *use of carbon throughout = max 1*

burning biodiesel releases CO₂

ignore burning trees

1

CO₂ is absorbed / used by the crops/plants (used to produce the biodiesel)

allow CO₂ absorbed / used by trees

1



(ii) *allow use of carbon for carbon dioxide throughout*

increases CO₂ / greenhouse effect
accept causes global warming

OR

allow causes climate change

less CO₂ is absorbed (from atmosphere)
ignore other correct effects

1

because burning trees releases CO₂
accept fewer trees to absorb CO₂
or crops / plants do not absorb as much CO₂ as trees

OR

because there is less photosynthesis
ignore habitats / biodiversity
if no other mark awarded global dimming because of smoke / particles gains 1 mark

1

(b) any **one** from:

ignore carbon neutral / cost / less harmful / environmentally friendly

- crude oil / fossil fuel is running out / non-renewable
allow biodiesel is renewable / sustainable
- demand for fuels / energy is increasing
ignore demand for biodiesel is increasing
- new legislation / protocols

1

(c) (i) uses crops / land that could be used for food
allow destroys habitats or reduces biodiversity
ignore cost

1

(ii) increases the cost of food / land
ignore cost of machinery / process
ignore cheaper to produce biodiesel

1

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