

M1.(a) any **one** from:

- complex systems
- many different variables
- many alternative theories

1

(b) carbon dioxide allows short wavelength radiation to pass through
allow greenhouse gas(es) for carbon dioxide

1

the atmosphere to the Earth's surface

1

carbon dioxide absorbs outgoing long wavelength radiation

1

(c) general increase in temperature caused by increase in greenhouse gases

1

any **two** human activities correctly linked to a named greenhouse gas

eg

increased burning of fossil fuels causes more carbon dioxide

2

deforestation causes more carbon dioxide

more cattle production causes more methane

use of landfill causes more methane

[7]

M2. any **four** from:

to gain 4 marks both pros and cons should be given

Arguments for biodiesel

max **three** from:

- sustainable / renewable
- (carbon neutral) absorbs CO₂ when growing / during photosynthesis
- burning biodiesel produces low amounts particulates / carbon monoxide
allow burning biodiesel produces little / low amount of global dimming
ignore sulfur dioxide
- can use waste vegetable oils / fats (from food industry) **or** can use waste plant material
- can be used to conserve crude oil (instead of / mixed with petroleum diesel)
- produced by a low energy / temperature process
accept produced by a low tech process
- biodegrades (easily)
ignore engine effects

Arguments against biodiesel

max **three** from:

- creates food shortages
accept price of food increases
- deforestation to plant more crops leads to loss of habitat / biodiversity **or** deforestation leads to a reduction in absorption of CO₂
allow burning trees increases CO₂
allow deforestation increases global warming
- burning biodiesel produces high amounts of nitrogen oxides
allow increases acid rain
- crops takes time to grow
allow crops can fail
- vast areas of land needed to grow crops

4

conclusion supported by the argument presented, which must give added value to the points for and against given above

1

[5]

- M3.** (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]

- M4.** (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

[8]

M5. (a) any **two** environmental problems with linked explanations

- global warming (1)
accept effects of global warming
caused by (formation of) carbon dioxide / greenhouse gas (1)
ignore greenhouse effect
- acid rain (1)
accept effects of acid rain
ignore respiratory problems
caused by (formation of) sulfur dioxide (1)
accept sulfur oxide
ignore sulfuric acid
- global dimming (1)
ignore respiratory problems
caused by (formation of) particles / particulates / fires /
smoke / carbon / pm 10 (1)
- scarring of landscape (1)
caused by mining / quarrying of coal (1)
ignore ozone layer

max 4

(b) any **three** from:

- replant the trees / renewable / sustainable
ignore reusable
- carbon dioxide is used by the trees / photosynthesis
accept trees absorb carbon dioxide as they grow
*do **not** allow respiration*
- it's a (continuous carbon) cycle
accept 'carbon dioxide goes back into the air'
accept trees use CO₂ which is released when trees are burnt
- no 'new' carbon (dioxide) is produced **or**
no locked up carbon (dioxide) is released
accept no carbon (dioxide) from fossil fuels is produced

3

[7]

M6. (a) Quality of written communication
for any two ideas sensibly stated

1

any **three** from:

- plants take in (CO_2)
accept photosynthesis uses (CO_2)
- converted to glucose / starch / carbohydrates
ignore carbon compounds by itself
- CO_2 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]

- 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]