

GCSE CHEMISTRY

Topic Paper: 9 Pollution, carbon dioxide and methane as greenhouse gases
(Chemistry of the atmosphere)
Part 1 & 2 Mark Scheme

MARK SCHEME



50 Marks



(ii) any **two** from:

allow converse arguments

low / less energy / heat or lower temperature needed

ignore no energy without explanation

low / less fuel burned

ignore no fuel without explanation

accept less fuel for extraction / transportation of raw materials

no / less carbon dioxide / global warming / less use of carbonate(s)

accept name(s) of this carbonate(s)

less landfill

ignore less litter

less use of resources / raw materials

2

[8]

M2. (a) calcium oxide

1

calcium hydroxide

1

calcium carbonate

1

substances must be in the order shown

(b) (i) strength of mortar decreases (as volume of sand increases)

1

(ii) 400 (cm³)

1

because the height the metal ball dropped from should be 42 cm and not 37 cm

accept because the other results show that the height the metal ball dropped from should have an interval of 6cm

1

(c) contains aggregate

allow bonding is stronger

1

[7]

M3. (a) (i) 3 / three

1

(ii) 5 / five

1



(b) any **one** from:

less / no transport

accept less / no distance

less / no (fossil) fuel used

ignore references to carbon dioxide / carbon emissions

1

(c) (i) carbon dioxide / CO₂

for a correct emission

1

(causes) global warming / climate change / greenhouse gas

explanation must be correct for named emission

ignore ozone layer

or

(cement) particles / smoke (1)

(causes) asthma / dust / (global) dimming (1)

accept breathing problems

or

sulfur dioxide / SO₂ / nitrogen oxides / NO_x (1)

(causes) acid rain (1)

*do **not** accept nitrogen or water vapour for emissions*

*do **not** accept no named emission*

1

(ii) absorb / trap / capture / filter / pass through water / scrub / electrostatic attraction

ignore condense / off setting / different fuel

1

[6]

M4. (a) calcium carbonate

***not** formula*

1

(b) calcium carbonate → calcium oxide

***not** common names*

allow correct formulae

1

+ carbon dioxide

1

(c) calcium hydroxide

***not** formula*

1



- (d) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$
allow if doubled
- all formulae correct, no extra ones 1
- balanced 1
- (e) filtration
allow centrifugation
not decanting
not evaporation, crystallisation 1
- (f) electrolysis stated or implied
- molten MgO / magnesium oxide is ionic / Mg^{2+} goes to cathode
not just heated 1
- or** add sodium / K / Ca / Li / a more reactive metal 1
- displaces Mg / reduces Mg
give no marks if reference made to reduction by C or H 1
- M5.** (a) limewater **or** calcium hydroxide solution 1
- (reacts with carbon dioxide and) turns cloudy / milky
linked to first point
if no other mark awarded 'puts out lighted splint' gains 1 mark 1
- (b) (i) any **two** from:
- same volume / amount of the acids
 - concentration of the acids
 - temperature
 - same surface area / size / mass / amount of calcium carbonate
 - same measuring equipment
- 2

[9]



(ii) any **three** from:

(after about 4 minutes) the sulfuric acid stops reacting **or** nitric acid continues to react

accept more CO₂ with nitric acid at any time after 4 minutes

(initially) the reaction with sulfuric acid is faster

(the reaction stops) because calcium sulfate is a solid

allow sulfuric acid produces a solid

(the reaction continues) because calcium nitrate is soluble / in solution / aqueous

allow nitric acid produces an (aqueous) solution

because the calcium sulfate prevents the sulfuric acid reacting with the calcium carbonate

(the rate is faster) because sulfuric acid contains two hydrogens

3

[7]

M6.

(i) (hot air) gives faster reaction makes coal burn faster
(provides air / oxygen to help to) allow the coal to burn / helps combustion
flushes out the waste / gases / carbon dioxide

any one for 1 mark

1

(ii) decomposition of limestone yields carbon dioxide (owtte)
the combustion / burning of coal produces carbon dioxide (owtte)

each for 1 mark

2

[3]

M7.

(a) (i) H₂O

must be formula

1

CaO

must be formula

1

(ii) carbon dioxide from the air / (Earth's early) atmosphere

it = carbon (dioxide)

accept carbon dioxide from millions of years ago

1

formed (sedimentary) rocks **or** fossil fuels

ignore trapped / stored

1



- (b) (i) decreases rapidly at first
it = carbon (dioxide) 1
- then slowly **or** levels off
allow both marks if the description is correct using either 'rapidly' or 'slowly'
allow correct use of figures for either marking point
if no other mark awarded, allow CO₂ decreased for 1 mark 1
- (ii) any **two** from:
it = carbon (dioxide)
accept photosynthesis

used by plants

dissolved in oceans

'locked up' in fossil fuels **or** formed fossil fuels

'locked up' in rocks **or** formed rocks 2
- (c) (yes)
it = percentage of carbon (dioxide)
ignore yes or no

because the percentage of carbon dioxide is increasing 1

which causes global warming (to increase)
allow (carbon dioxide) causes greenhouse effect/climate change 1
- or**

(no)

because the percentage of carbon dioxide is low (1)

compared to millions of years ago (1)
allow global warming can be caused by other factors (e.g. Sun / water vapour / methane)

[10]