

- 1 (a) (i) lower concentration [1]
ACCEPT without reference to experiment 2
but higher concentration must be referred to expt 1
COND fewer collisions **or** lower rate of collision [1]
- (ii) powdered so larger surface area [1]
COND so more collisions **or** higher rate of collisions [1]
- (iii) higher temperature particles move faster
or more particles have enough energy to react **or** have more energy
or more particles have E_a [1]
COND collide more frequently
or more particles have energy to react
or more collisions result in a reaction [1]
NOTE for conformity faster collisions = rate of collisions
- (b) (i) from origin [1]
gradient decreases until = 0 [1]
therefore has to be a curve
- (ii) mass of one mole of $\text{CaCO}_3 = 100$
number of moles of $\text{CaCO}_3 = 0.3/100 = 0.003$ [1]
moles of $\text{HCl} = 5/1000 \times 1 = 0.005$ [1]
reagent in excess is CaCO_3 [1]
ecf from above
would need 0.006 moles of HCl
or hydrochloric acid only reacts with 0.0025 moles of CaCO_3 [1]
NOTE this mark needs to show recognition of the 1:2 ratio
- (iii) mark **ecf** to (ii), that is from moles of limiting reagent in (ii) [1]
moles of $\text{CO}_2 = 0.005 \times 0.5 \times 24 = 0.06 \text{ dm}^3$
NOT cm^3 unless numerically correct. 60 cm^3
Ignore other units
NOTE If both number of moles integers then no ecf for (ii) and (iii)

[Total: 13]

- 2 (a) limestone **or** marble **or** chalk or coral or calcite or aragonite [1]
- (b) 100 [1]
56 ignore units in both cases [1]
- (ii) 7.00kg is 1/8 of 56 [1]
1/8 of 100kg is 12.5kg [1]
Give both marks for correct answer without explanation. Ignore missing units but penalise wrong units
- (c) Any reasonable explanation
Plants prefer soil pH about 7
Plants do not grow (well) in acidic soils/plants grow better
To increase crop yields
Any **ONE** [1]
Do **NOT** accept in acidic soils plants die
- (ii) With calcium carbonate, pH cannot go above 7 [1]
It is not washed away by the rain/remains longer in the soil
It is not absorbed by the plant [1]
OR
With calcium oxide, pH can go above 7 [1]
It is washed away by the rain [1]
- (iii) Any correct use - making steel/iron, making cement, making glass, [1]
disposing of acid wastes, removing sulphur dioxide from flue
gases, (stone in) building, indigestion tablets, toothpaste, cosmetics etc

[TOTAL = 9]

Question	Answer	Marks
3(a)(i)		1
(a)(ii)		1
(a)(iii)		1
(a)(iv)		1
(a)(v)		1
(b)(i)	air;	1
(b)(ii)	iron;	1
(b)(iii)	any 2 from: carbon dioxide; carbon monoxide; nitrogen;	2
(c)(i)	as the percentage of carbon increases, so the malleability decreases;	1
(c)(ii)	M1 oxygen (gas) blown in; M2 carbon dioxide formed / $C + O_2 \rightarrow CO_2$;	1 1 2

Question	Answer	Marks	Guidance
4(a)	<p><i>Forming an oxide</i> (all) elements or (all) impurities become oxides;</p> <p><i>M2 Gaseous oxides</i> carbon dioxide or sulfur (di)oxide escape/are removed as gases;</p> <p><i>M3 Acidic oxides</i> silicon(IV) oxide or phosphorus(III/V) oxide react/are neutralised by calcium oxide/lime;</p> <p><i>M4 Equation mark</i> any one of the following equations $S + O_2 \rightarrow SO_2$; $C + O_2 \rightarrow CO_2$ or $2C + O_2 \rightarrow 2CO$; $Si + O_2 \rightarrow SiO_2$; $4P + 5O_2 \rightarrow 2P_2O_5$ or $P_4 + 5O_2 \rightarrow 2P_2O_5$; $4P + 3O_2 \rightarrow 2P_2O_3$ or $P_4 + 3O_2 \rightarrow 2P_2O_3$;</p> <p><i>M5 Word equation mark</i> any one of the following word equations calcium oxide + silicon(IV) oxide \rightarrow calcium silicate; calcium oxide + phosphorus(III/V) oxide \rightarrow calcium phosphate;</p>	5	<p>(All) elements or (all) impurities react with oxygen A M1 for any one element becoming an oxide</p> <p>A formulae / carbon monoxide A oxides of sulfur / carbon I sulfur trioxide</p> <p>A silicon (di)oxide for silicon(IV) oxide A phosphorus (tri/pent)oxide for phosphorus(III/V) oxide</p> <p>A multiples I state symbols I unbalanced equations R other combustion equations with incorrect species</p> <p>A calcium oxide + silicon(IV) oxide \rightarrow slag A correct symbol equation for M5 but R other equations with incorrect species used as M5</p>

Question	Answer	Marks	Guidance
4(b)(i)	<i>Any one from:</i> (making) car (bodies); machinery; chains; pylons; white goods; nails; screws; as a building material; sheds / roofs; reinforcing concrete;	1	A bridges A tools I cutlery
(b)(ii)	<i>Any one from:</i> knives; drills; railway tracks; machine / cutting tools / hammers; razor blades; chisels;	1	I cutlery items I bridges
(b)(iii)	M1 atoms or cations or (positive) ions or metal ions; M2 arranged in a lattice or in layers or in rows or in a regular structure; M3 rows or layers slide over one another;	3	I (sea of) electrons R protons or nuclei for M1 A M2 non-directional forces A ECF on particle named in M1 for M3 I 'atoms' slide over one another
(b)(iv)	carbon atoms or particles in structure different size (to cations); M2 so reduce moving or interrupt movement;	2	R ions and molecules for M1 A M2 for prevents sliding A M2 for 'stops' sliding