

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
International General Certificate of Secondary Education

**MARK SCHEME for the May/June 2008 question paper**

**0620 CHEMISTRY**

**0620/02**

Paper 2 (Core Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2008 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

Page 2	Mark Scheme	Syllabus
	IGCSE – May/June 2008	0620

- 1 (a) (i) B/calcium carbonate/ $\text{CaCO}_3$  [1]  
(ii) E [1]  
(iii) C/carbon dioxide/ $\text{CO}_2$  [1]  
(iv) D/ethane [1]
- (b) bromine water/bromine [1]  
decolourises/turns colourless [1]  
NOT: turns clear  
ALLOW: (acidified) potassium manganate(VII); turns colourless (2 marks)  
IGNORE: original colour of bromine/potassium manganate(VII)
- (c) calcium carbonate [1]  
NOT:  $\text{CaCO}_3$
- (d) lubricant/2nd box down ticked [1]  
IF: more than one box ticked = 0
- (e) substance containing more than one type of atom different atoms [1]  
ALLOW: more than one type of element/two elements  
bonded/joined/(chemically) combined/combination  
**Both parts needed.**  
IF: word mixture appears = 0
- (f) covalent [1]  
NOT: single bonding
- [Total: 10]**
- 2 (a) calcium carbonate [1]
- (b) any 4 from:  
  - statue becomes (chemically) eroded;  
ALLOW: statue becomes corroded/amount of limestone reduced  
NOT: destroys limestone/limestone melting/damages the statue
  - iron pins corroded/eroded/eaten away OWTTE
  - acid rain;
  - caused by burning fossil fuels;
  - sulphur dioxide formed/from sulphur in fossil fuels;  
ALLOW: nitrogen dioxide formed/from car exhausts
  - sulphur dioxide dissolves to form acid;  
ALLOW: nitrogen dioxide dissolves to form acid
  - sulphuric acid in air  
ALLOW: nitric acid in air
  - acid reacts with limestone/carbonate/statue/iron/pins  
NOT: (unqualified) acid reacts
[4]

Page 3	Mark Scheme	Syllabus	er
	IGCSE – May/June 2008	0620	

- (c) iron/pin(s) corrode/rust/eaten away/erode/oxidises  
ALLOW: iron pins dissolve away  
ALLOW: iron/pins react with (acid) in air  
NOT: iron pins have reacted/weak and break  
NOT: it/the arm has rusted
- (d) (i) atoms (of same element) with different number of neutrons/atoms with different numbers of nucleons but same number of protons/ same elements [1]  
ALLOW: atoms with same atomic number but different mass number
- (ii) –/negative [1]  
0/no charge [1]  
+/positive [1]  
IGNORE: numbers in front of – or +
- (iii) 56 [1]  
ALLOW: 30 + 26
- (e) any suitable use e.g. measuring thickness of paper/detecting leaks in pipes (ALLOW: checking leakage for suitable substances e.g. water/oil) /sterilization of surfaces/making electricity/power stations/ [1]  
NOT: medical uses
- (f) iron + nitric acid → iron nitrate + hydrogen [1]  
IGNORE: oxidation numbers unless incorrect/dilute (nitric acid)  
NOT: heat on either side of equation/equation without arrow  
ALLOW: = for arrow

[Total: 13]

- 3 (a)  $Cl^-$ /chloride [1]
- (b) sulphate [1]  
IGNORE: oxidation numbers
- (c) potassium + sodium (both needed for the mark) [1]  
ALLOW:  $K^+$  and  $Na^+$ /K and Na
- (d) sodium chloride [1]  
ALLOW: NaCl/  
ALLOW: salt
- (e) any two of: calcium/magnesium/potassium/sodium [2]

Page 4	Mark Scheme	Syllabus
	IGCSE – May/June 2008	0620

- (f) (i) 3 (rd period)
- (ii) single bonding pair  
6 non-bonding electrons in each atom  
IGNORE: incorrect inner electrons
- (g) any 2 of: [2]
- distillation removes dissolved ions/ salts;  
ALLOW: distillation removes only the water/extracts water/solvent  
IGNORE: reference to impurities without qualification
  - filtration doesn't remove dissolved ions/salts;  
ALLOW: filtration can't remove very small particles OWTTE  
ALLOW: filtration only removes large particles  
IGNORE: filtration removes solids  
IGNORE: reference to impurities
  - filtration does not remove bacteria/germs;
  - distillation removes/kills bacteria/germs  
IGNORE: cost/speed arguments

[Total: 11]

- 4 (a) any suitable e.g. as a coolant/for specific named reactions e.g. making ethanol from ethene/making sulphuric acid [1]  
ALLOW: as a solvent  
ALLOW: to make hydroelectricity/electricity  
NOT: (unspecified) making chemicals  
NOT: to drink/wash, etc.
- (b) any two of: [2]
- sand has very fine/small spaces (between the grains)  
(idea of small spaces)
  - water/small molecules/small particles can pass through;  
(idea of small molecules going through)
  - water molecules are small/water is a liquid;  
(water molecules small/liquid)
  - (large) particles cannot pass through spaces/are trapped by sand/blocks particles/  
(idea of particles not getting though/trapping by sand)  
NOT: by filtering  
NOT: filter takes out the smaller molecules in water  
IGNORE: references to absorbing/impurities
- (c) add sodium hydroxide; [1]  
white ppt/milky ppt/white solid (both white and ppt/solid needed); [1]  
soluble in excess/gives colourless solution in excess [1]  
**OR**  
add (aqueous) ammonia; white ppt; insoluble in excess/does not redissolve
- (d) to kill bacteria/germs [1]  
ALLOW: antibacterial/kills harmful organisms  
NOT: dissolves bacteria  
ALLOW: to stop bacteria growing

Page 5	Mark Scheme	Syllabus	er
	IGCSE – May/June 2008	0620	

- (e) (i) chlorine + potassium bromide  $\rightarrow$  potassium chloride + bromine  
(–1 for each error or omission including no arrows/heat on left)
- (ii) it/iodine is less reactive than bromine/iodine lower in the reactivity series than bromine  
ORA [1]  
NOT: iodine lower in the reactivity series than bromide  
NOT: iodine lower in the reactivity series than potassium bromide/iodine can't displace bromine  
NOT: its not reactive enough/lower in the Periodic Table

- (f) (i) exothermic [1]
- (ii) ionic [1]
- (iii) sodium (atom) loses an electron [1]  
chlorine (atom) gains an electron [1]  
[sodium (atom) gives an electron to chlorine = 2]  
IGNORE: incorrect number of electrons/ reference to charges  
NOTE: any reference to sharing electrons = 0]

[Total: 14]

- 5 (a) hydrogen/H<sub>2</sub> [1]  
NOT: H
- (b) (i) to ensure all the (sulphuric) acid reacted [1]  
NOT: to ensure it reacted
- (ii) filtration/filter ALLOW: decanting/pouring off the solution [1]  
NOT: distillation/evaporation of sulphuric acid
- (c) evaporate water/evaporation/leave in a warm place; [1]  
ALLOW: heat/boil then allow solution to cool/heat then evaporate  
NOT: not heat/boil (to get the crystals)  
NOT: crystallisation/allow to crystallise;
- dry crystal on filter paper [1]  
ALLOW: filter off crystals and allow to dry
- (d) (i) sulphuric acid + magnesium carbonate/hydroxide/oxide [1]  
or magnesium + a less reactive metal sulphate  
NOT: magnesium + sulphuric acid (since in question)
- (ii) sulphuric acid + magnesium carbonate  $\rightarrow$  magnesium chloride + water + carbon dioxide/  
sulphuric acid + magnesium hydroxide  $\rightarrow$  magnesium chloride + water/  
sulphuric acid + magnesium oxide  $\rightarrow$  magnesium chloride + water  
or e.g. magnesium + copper sulphate  $\rightarrow$  magnesium sulphate + copper [1]  
ALLOW: correct answer(s) in either parts (i) or (ii)  
ALLOW: correct symbols equations

Page 6	Mark Scheme	Syllabus
	IGCSE – May/June 2008	0620

- (iii) contaminants might harm health/may make you ill/cause side effects  
ALLOW: medicine would not work as well/might cause health problem  
IGNORE: contain contaminants/poisonous/kills you  
IGNORE: medicine would not work  
NOT: decrease the effect (unless specified of what i.e. of the medicine)

(e) 6 (g) [1]  
IF: unit incorrect = 0

(f) 97.5 (%) [1]

[Total: 10]

- 6 (a) (i) (group of) molecules/compounds with similar boiling points/group of molecules/compounds which distil at same place in the fractionating column [1]
- (ii) fuel gas [1]  
ALLOW: methane
- (iii) Any two of:
- temperature gradient in column/column hotter at bottom/column colder at top;
  - different fractions have different boiling points  
ALLOW: separated according to their boiling points/each fraction forms at a different temperature
  - molecules condense/turn from gas to liquid at different heights in the column;
  - molecules condense/turn to liquid when temperature drops below their boiling point;  
ALLOW: molecules condense at their boiling point;
  - smaller molecules move further up the column OR  
larger molecules/molecules with higher boiling point condense lower in the column  
or smaller molecules/molecules with lower boiling point condense higher in column  
= 2 [2]
- (iv) oil stoves/aircraft (fuel)/(fuel for) lamps [1]  
NOT: fuels for power stations/for burning/starting fires
- road (surfacing)/(tar for) roofing [1]  
ALLOW: paint  
NOT: tar without qualification
- (b) (i) breaking down of larger molecules/hydrocarbons/converting large molecules into small molecules/large chains to small chains [1]  
IGNORE: conditions  
NOT: implication of reacting with something else  
NOT: breaking larger substances to smaller  
NOT: breaking high fractions to low fractions
- (ii)  $C_{12}H_{26}$  [1]  
ALLOW: other correctly balanced combinations within reason e.g.  $C_{10}H_{22} + 2C_2H_4$  or with 3 species

Page 7	Mark Scheme	Syllabus
	IGCSE – May/June 2008	0620

- (c) (i) speeds up rate of reaction  
ALLOW: alters/changes rate of reaction
- (ii) reversible (reaction)/equilibrium (reaction)/reaction can go both ways  
IGNORE: exothermic/endothemic
- (iii) fermentation [1]
- (iv) turns red/pink; [1]  
bubbles/ effervescence/fizzes [1]  
IGNORE: temperature changes/ppt/neutralises  
NOT: gas/carbon dioxide formed

[Total: 13]

- 7 (a) Any 2 of:
- crystals dissolve
  - water molecules colliding with crystal
  - diffusion
  - movement of ions  
NOT: copper particles/copper atoms/copper molecules  
NOT: particles slide over each other
  - movement of water molecules/water particles
  - movement is random  
[movement of (unspecified) particles = 1 maximum]  
NOT: movement of water/copper sulphate/crystals  
NOT: particles spread out  
IGNORE: movement from high to low concentration [2]
- (b) arrangement: regular [1]  
ALLOW: particles close together/linear/in lines/lattice/closely packed  
motion: none/vibrating [1]  
NOT: does not move a lot
- (c) suitable container with filter paper dipping into labelled solvent; [1]  
spot above solvent level [1]  
IF: metal ion where the solvent should be = 0 marks
- (d) (i) cathode [1]
- (ii) pure foil: gets further copper deposit/increases in thickness/gets less shiny [1]  
ALLOW: gets heavier/mass increases  
ALLOW:  $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$  (ignore wrong balance)  
impure foil: copper removed/decreases in thickness/appears cleaner [1]  
ALLOW: gets lighter/decreases in mass/dissolves/is corroded  
ALLOW:  $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$   
NOT: wears away  
NOT: disappears

[Total: 9]