

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the May/June 2009 question paper
for the guidance of teachers

0620 CHEMISTRY

0620/02

Paper 2 (Core Theory), maximum raw mark 80

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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0620	02

- 1 (a) (i) iron(III) oxide / iron oxide / Fe_2O_3 ; [1]
ALLOW: iron
- (ii) lead(II) bromide / lead bromide / PbBr_2 ; [1]
NOT: lead
- (iii) calcium carbonate / CaCO_3 ; [1]
NOT: carbonate
- (iv) sodium hydroxide / NaOH ; [1]
ALLOW: hydroxide / OH^-
NOT: sodium
- (v) methane; [1]
- (b) (i) oxygen is removed (from the iron oxide); [1]
ALLOW: carbon takes the oxygen from the iron oxide
ALLOW: oxygen goes to the carbon / the oxygen combines with the carbon
ALLOW: oxidation number of iron decreases / electrons added to iron
NOT: the iron oxide loses electrons
- (ii) haematite; [4]
limestone;
blast;
slag;
- [Total: 10]**
- 2 (a) calcium, magnesium, iron, copper; [1]
- (b) bubbles produced steadily / moderately / slowly /
bubbles produced faster than iron and slower than magnesium /
fewer bubbles than magnesium and more than iron; [1]
ALLOW: many bubbles produced but less than magnesium
NOT: bubbles produced rapidly / less rapidly
NOT: less bubbles than magnesium / more bubbles than iron
NOT: reaction / it's faster than iron and slower than magnesium
- (c) (i) magnesium floats on top of the magnesium chloride ORA /
magnesium is above the magnesium chloride ORA; [1]
ALLOW: magnesium is on top of the magnesium chloride ORA
- (ii) (magnesium) too reactive / above carbon in reactivity series / more reactive than
carbon; [1]
ALLOW: magnesium is a reactive metal / magnesium is reactive
ALLOW: too high a temperature needed for the extraction
NOT: magnesium oxide / magnesium will not react with carbon

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
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- (iii) to prevent magnesium reacting with the air / oxygen / nitrogen; [1]
ALLOW: to stop magnesium oxidising
NOT: because it is reactive
NOT: to stop it reacting
NOT: because inert gases are unreactive
- (iv) nitrogen / helium / neon / argon / krypton / xenon / radon; [1]
- (d) (i) structure of ethene showing all atoms and all bonds; [1]
ALLOW: correct electronic structure
- (ii) two of: [2]
(1 mark each)
- carbon monoxide + poisonous / toxic;
ALLOW: carbon monoxide combines with haemoglobin / red blood cells
ALLOW: carbon monoxide suffocates
NOT: carbon monoxide harmful / dangerous
 - hydrogen + flammable / explosive;
NOT: hydrogen dangerous
 - hydrogen sulfide + poisonous / toxic;
ALLOW: harmful
NOT: dangerous / affects breathing
 - ethene + flammable;
 - methane + flammable;
ALLOW: explosive
- (e) (i) carbon monoxide + water / steam → carbon dioxide + hydrogen; [1]
ALLOW: arrow for equilibrium sign
NOT: carbon oxide instead of carbon monoxide
NOT: mixture of words and symbols
- (ii) equilibrium / reversible reaction / the reaction can go both ways / the reaction can go backwards or forwards; [1]
ALLOW: the reaction can also go backwards
NOT: the reaction goes backwards
- (iii) add sodium hydroxide (solution) / (aqueous) ammonia; [1]
(red-)brown / rusty red precipitate (both points); [1]
ALLOW: solid for precipitate
ALLOW: yellow-brown precipitate / orange precipitate
IGNORE: references to excess ammonia / sodium hydroxide
NOT: red precipitate

[Total: 13]

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0620	02

- 3 (a)** (fractional) distillation; [1]
ALLOW: fractionation
- (b)** Two of: [2]
- fuel gas / refinery gas;
 - naphtha;
 - light gas oil / heavy gas oil / fuel oil;
 - lubricating oil / lubricating fraction; (NOT: lubricant)
 - bitumen; (ALLOW: residue)
- IGNORE: kerosene / paraffin / gasoline / petrol / diesel
IGNORE: methane / named chemical compounds
IGNORE: gas alone
- (c)** oil stoves / aircraft fuel / for jet engines / for car engines; [1]
ALLOW: for making more petrol
ALLOW: for cooking / for heating / for lighting / for fuel
- (d)** A and D; (both needed) [1]
- (e)** ethane; [4]
unreactive;
oxygen;
water;
- (f)** saturated: has only single bonds / contains the maximum amount of hydrogen atoms [1]
(that can be combined with carbon atoms);
ALLOW: does not have double bonds
ALLOW: consists of single bonds
NOT: has single bonds
hydrocarbon: (compound / substance) containing hydrogen and carbon only / it has carbon and hydrogen only; [1]
REJECT: it has carbon and hydrogen molecules only / ideas of mixtures of carbon and hydrogen

[Total: 11]

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0620	02

- 4 (a) ammonia / NH₃; [1]
- (b) goes blue; [1]
ALLOW: goes purply-blue
NOT: goes blue then bleaches
NOT: goes purple
- (c) ammonium chloride; [3]
carbon dioxide;
water;
NOT: formulae
NOT: ammonia chloride
- (d) (i) to replace nitrogen lost from soil; [1]
ALLOW: to make (crop) plants grow better
ALLOW: to make plants grow more / faster
ALLOW: to improve crop yield
IGNORE: to replace minerals lost from the soil / to replace nutrients
- (ii) more nitrogen / greater percentage of nitrogen; [1]
NOT: more nitrate
- (iii) 80; [1]
- (e) oxygen / O₂; [1]
NOT: O
- (f) acid rain / effect of acid rain e.g. trees or plants die / pond animals die / fish die / [1]
erosion of buildings / corrosion of bridges;
ALLOW: smog / damages buildings
NOT: destroys buildings
NOT: breathing difficulties / lung damage / irritation to throat / poisonous / harmful

[Total: 10]

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0620	02

- 5 (a) carbon dioxide released / gas is released / gas is formed; [1]
 NOT: we get carbon dioxide, calcium chloride and water
- (b) (i) 615 s; [1]
 ALLOW: in numbers in range 600–630 s
- (ii) X on or near the line at beginning of experiment; [1]
 ALLOW: on or near line up to 50 s
- (iii) shallower curve at initial rate; [1]
 starts levelling off at 100.2 g; [1]
 ALLOW: (beginning to) level off between 100.15 and 100.25 g
- (c) (i) increases / goes faster; [1]
 NOT: takes less time / becomes fast / reaction increases
- (ii) increases / goes faster; [1]
 NOT: takes less time / becomes fast / reaction increases
- (d) combustion; [3]
 small;
 large;
- (e) (i) respiration; [1]
 NOT: oxidation
- (ii) (substance / compound / it) speeds up / increases the rate of a reaction; [1]
 ALLOW: changes rate of reaction
 NOT: decreases the rate
 IGNORE: references to biological substances

[Total: 12]

Page 7	Mark Scheme: Teachers' version	Syllabus	Paper
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- 6 (a) Br₂; [1]
- (b) particles random AND roughly similar size to the one shown; [1]
particles very close together or touching; [1]
- (c) Any three of: [3]
- bromine evaporates / liquid evaporates; (NOT: it evaporates)
 - more energetic particles from liquid to vapour;
 - diffusion;
 - random movement of molecules / particles move everywhere / both air and bromine particles are moving;
 - (bromine and air) particles get mixed up / collision of bromine and air particles;
ALLOW: molecules in place of particles
NOT: atoms in place of particles
- (d) (light) green; [1]
IGNORE: yellow
to
reddish-brown / brown / orange / yellow-brown; [1]
NOT: yellow / red
- (e) bromine higher in reactivity series than iodine / bromine more reactive than iodine; [1]
NOT: bromide more reactive than iodide
NOT: magnesium bromide more reactive
NOT: bromine stronger than iodine
- (f) (i) NaBr; [1]
ALLOW: Na⁺Br⁻
NOT: multiples e.g. 2NaBr
- (ii) zinc bromide; [1]
ALLOW: zinc(II) bromide
NOT: ZnBr₂
- (iii) covalent; [1]
NOT: single bonding
- (iv) A and D; (both needed) [1]
- (v) the ions can move / ions are mobile; [1]
ALLOW: the ions are free (from each other)
NOT: ions delocalised / charged particles moved
REJECT: electrons and ions move

[Total: 14]

Page 8	Mark Scheme: Teachers' version	Syllabus	Paper
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- 7 (a) Cl_2 ; [1]
correct balancing; [1]
- (b) bonding pair; [1]
chlorine electrons all correct and no other electrons on hydrogen; [1]
ALLOW: use of circle / dot for chlorine and cross for hydrogen
IGNORE: inner electrons
- (c) pH1; [1]
- (d) hydrogen; [1]
NOT: H_2
- (e) Any two of: [2]
- evaporate off some of the water / heat solution to crystallisation point;
ALLOW: concentrate the solution
NOT: boil off the water / implication that all the water is removed
NOT: heat without further qualification
 - leave to crystallise / leave in the warm / leave in the air / leave on a window sill /
leave at room temperature;
NOT: let it cool / leave it to cool
 - dry crystals with filter paper;
NOT: heat / warm to dry / put in an oven
- (f) (i) chlorine / Cl_2 ; [1]
NOT: Cl
- (ii) zinc / Zn; [1]

[Total: 10]