

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

**MARK SCHEME for the October/November 2010 question paper  
for the guidance of teachers**

**0620 CHEMISTRY**

**0620/21**

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, which would have considered the acceptability of alternative answers.

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Page 2	Mark Scheme: Teachers' version	Syllabus	
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- 1 (a) (period) 2 / period II
- (b) (i) O / O<sub>2</sub> / oxygen [1]
- (ii) F / F<sub>2</sub> / fluorine [1]
- (iii) Li / lithium [1]
- (iv) C / carbon [1]
- (v) Be / beryllium [1]
- (vi) N / N<sub>2</sub> / nitrogen [1]
- (c) atoms; protons [2]
- [Total: 9]**
- 2 (a) thermal decomposition [1]
- (b) (i) carbon dioxide [1]
- (ii) (colourless) to white / milky  
IGNORE: goes cloudy [1]
- (c) (i) calcium oxide blown onto surface of iron / mixed with iron / blown into furnace with iron / mixed in furnace with iron; [1]  
forms slag / removes impurities (or named impurities) in iron / reacts with silicon dioxide / reacts with phosphorus oxides / reacts with acidic oxides [1]
- (ii) mixture of metal with other metals or mixture of metal(s) with non-metals [1]
- (iii) neutralising acid soils / neutralising acidic lakes / making cement / making limewater / limewash for buildings  
ALLOW: paint [1]
- (iv) 2; H<sub>2</sub>O [2]
- (v) calcium chloride [1]
- [Total: 10]**

Page 3	Mark Scheme: Teachers' version	Syllabus	
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- 3 (a) balloons / diving / cryogenics / coolant / arc welding / protective atmosphere / lasers  
NOT: hot air balloons
- (b) (i) nucleus [1]
- (ii) 3<sup>rd</sup> box down ticked (helium has complete outer shell) [1]
- (iii) 18 [1]
- (iv)  $^{34}_{18}\text{Ar}$  [1]
- (c) atoms close together;  
NOT: atoms on average more than  $\frac{1}{2}$  an atom's diameter from each other  
atoms randomly arranged [2]

[Total: 7]

- 4 (a) chloride; [1]  
NOT: chlorine  
sulfate [1]
- (b) 2.32 [1]  
IGNORE: wrong units
- (c) (i) add sodium hydroxide and aluminium (foil);  
warm gently;  
IGNORE: any results given  
ALLOW: add iron(II) sulfate  
then concentrated sulfuric acid [2]
- (ii) ammonia [1]
- (d) (i) flask IGNORE incorrect type;  
condenser ALLOW: condensing tube;  
pure water / distilled water; [3]
- (ii) any two of:  
  - distillation
  - water (in round bottomed flask) boiled  
NOT: water heated / water evaporates
  - water has a lower boiling point (than ions)
  - steam (or water vapour) condenses in condenser / steam or water vapour goes to liquid in condenser  
ALLOW: gas goes to liquid in condenser
  - solid / ions remain in flask [2]
- (iii) medicines / drugs / foodstuffs / (drinking) water [1]

[Total: 12]

Page 4	Mark Scheme: Teachers' version	Syllabus	
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- 5 (a) pH 11
- (b) 4<sup>th</sup> box down ticked (slaked lime)
- (c) (i) plants can't grow well if soil too acidic / crop yields lower if too acidic [1]  
ALLOW: plants die if soil acidic  
ALLOW: plants grow best in neutral soil / plants like neutral soil
- (ii) any three of:  
fossil fuels (or correctly named fuel) contain sulfur /  
sulfur burns /  
to form sulfur dioxide /  
sulfur dioxide reacts with oxygen in air /  
sulfur dioxide (or sulfur trioxide) reacts (or dissolves) with rain [3]
- (d) (i) neutralisation ALLOW: neutralising [1]
- (ii) add indicator to flask ALLOW: any named acid-base indicator; [1]  
any two of:
- add measured amount of calcium hydroxide to flask (or use a volumetric pipette to put the calcium hydroxide in the flask)
  - add acid (from burette) into flask
  - until indicator changes colour
  - record volume of acid added [2]
- [Total: 10]**
- 6 (a) (i) bauxite / any other ore of aluminium [1]
- (ii) removal of oxygen (from compound or substance) / gain of electrons / decrease in oxidation number / addition of hydrogen [1]
- (iii) too reactive / requires too high a temperature [1]
- (b) from left to right:  
lead, nickel, zinc, magnesium [2]
- (c) (i) (volume) decreases [1]
- (ii) (volume) increases [1]
- (d) copper → electrical wiring;  
aluminium → aircraft bodies ALLOW car bodies or electrical wiring;  
mild steel → car bodies;  
stainless steel → chemical plant [4]

**[Total: 11]**

Page 5	Mark Scheme: Teachers' version	Syllabus
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- 7 (a) (i) (group of) molecules with similar boiling points / (group of) molecules with similar molecular masses / molecules with limited range of boiling points / molecules with limited range of molecular masses / molecules coming off at the same place in the fractionation column  
IGNORE: division of petroleum components [1]
- (ii)  $C_{10}H_{22}$   
ALLOW reasonable mixtures e.g.  $C_7H_{16} + C_3H_6$  [1]
- (b) refinery gas: (fuel) for heating / (fuel) for cars / (fuel) for cooking;  
gasoline: (fuel) for cars / mowers etc [2]
- (c) contains double bonds / contains C=C bonds;  
compound containing carbon and hydrogen only [2]
- (d) (i) 1<sup>st</sup> box down ticked (catalytic addition of steam) [1]
- (ii) correct structure with all atoms and bonds shown  
OH instead of O-H = 1 mark only [2]
- (e) monomers; [2]  
polymers;
- [Total: 11]**
- 8 (a) electrodes [1]
- (b) lead / Pb; [1]  
bromine /  $Br_2$  / Br [1]  
NOT: lead ions, bromide ions
- (c) 2<sup>nd</sup> and 3<sup>rd</sup> boxes down ticked (1 each) [2]
- (d)  $PbBr_2$  [1]
- (e) (i) solid formed when two solutions mixed [1]  
NOT: solid formed at bottom of solution
- (ii) 3
- (iii) 6 [2]
- (iv) brain damage in children / affects nervous systems or nerves / poisonous [1]

**[Total: 10]**