

## **MARK SCHEME for the May/June 2013 series**

### **0620 CHEMISTRY**

**0620/22**

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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

Page 2	Mark Scheme	Syllabus	Paper
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- 1 (a) (i) D / chlorine /  $Cl_2$  [1]  
 E / carbon / graphite [1]  
**IGNORE:** C  
**REJECT:** diamond
- (ii) E / carbon / graphite [1]  
**IGNORE:** C  
**REJECT:** diamond
- (iii) C / ammonia /  $NH_3$  [1]
- (iv) A / ethanol [1]  
**IGNORE:** alcohol
- (v) E / graphite / carbon [1]  
**IGNORE:** C  
**REJECT:** diamond
- (b) atom; combined; molecules; ionic (1 mark each) [4]
- [Total: 10]**
- 2 (a) increases [1]
- (b) 5.2–6.6 (actual = 5.96) [1]
- (c) (substance which) speeds up chemical reaction / increases reaction rate / lowers activation energy [1]
- (d) Any three of: [3]
- high boiling point / high melting points
  - high density / they are very dense **IGNORE:** they are dense
  - form coloured compounds **REJECT:** they are coloured
  - have different oxidation states / form ions with different charges
  - form complex ions
  - **ALLOW:** they are hard(er)/ strong
- (e) 3 (Fe) [1]  
 4 ( $H_2O$ ) [1]

Page 3	Mark Scheme	Syllabus	Paper
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(f) iron sulfate [1]  
**IGNORE:** incorrect oxidation number of iron  
**IGNORE:** formula

hydrogen [1]  
**IGNORE:** formula

[Total: 10]

3 (a) A = (volumetric) pipette [1]  
 B = burette [1]  
 C = (conical) flask  
**ALLOW:** Erlenmeyer (flask) [1]  
 D = (filter) funnel [1]

(b) (i) 13.2 [1]

(ii) 10 (cm<sup>3</sup>) [1]

(iii) (pH) 7 [1]

(c) (i) 2<sup>nd</sup> and 3<sup>rd</sup> boxes ticked (calcium carbonate and calcium oxide) [2]  
 (one mark each)  
**APPLY:** listing

(ii) so that crops grow well / so crops grow better / allows maximum growth/ plants don't grow as well in too acidic conditions/plants killed/plants die [1]  
**IGNORE:** plants can grow

[Total: 10]

4 (a) (i) correct structure of methane showing all atoms and bonds [1]

(ii) name of any alkane other than methane [1]  
**IGNORE:** formulae

(iii) Any one of: [1]

(waste product from digestion in) cows / other suitable animals/  
 marshes / paddy fields / bacterial decay / decomposition of vegetation  
**IGNORE:** industrial sources / leaking from the Earth

(iv) CO<sub>2</sub> on right [1]

2 on left [1]  
**NOTE:** second mark dependent on the first being correct

Page 4	Mark Scheme	Syllabus	Paper
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(b) (i) (differences in) boiling point(s) [1]

(ii) 1 mark each [4]

diesel → fuel for cars / lorries  
 fuel oil → fuel for ships  
 kerosene → fuel for jet aircraft  
 naphtha → making chemicals

[Total: 10]

5 (a) oxygen + 20/21 (%) [1]

nitrogen + 78/79 (%) [1]

sulfur dioxide + correct source e.g. burning fossil fuels or named fossil fuel [1]

carbon monoxide + correct source e.g. car exhausts / car engines / incomplete combustion (of fossil fuels) [1]

oxides of nitrogen + correct source e.g. car exhausts / car engines / lightning [1]

(b) (i) PbS [1]

(ii) oxygen removed (from lead oxide) / carbon takes away the oxygen [1]  
**IGNORE:** reference to electrons

(c) (i) arrangement: irregular / (fairly) random / not ordered [1]

closeness: (very) close / touching / near [1]

(ii) C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> (**ALLOW:** any order) [1]

(iii) 99 [2]  
 (If 2 marks not scored **ALLOW** correct atomic masses seen C = 12, H = 1, Cl = 35.5 anywhere in the question for 1 mark)

[Total: 12]

Page 5	Mark Scheme	Syllabus	Paper
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- 6 (a) zinc → magnesium → calcium → rubidium [2]  
 1 mark for 1 pair reversed  
**ALLOW:** all reversed for 1 mark
- (b) zinc/ iron [1]  
**REJECT:** if K / Na / Al included = 0 marks
- (c) (i) 2 electrons in outer shell [1]  
 8 electrons in middle shell [1]  
**ALLOW:** 2,8,2 in numbers for 2 marks
- (ii) 14 [1]
- [Total: 6]**
- 7 (a) ions can move / ions are mobile [1]  
**IGNORE:** it has an ionic structure  
**REJECT:** if mention of atoms/ molecules
- (b) it is a molecular structure / it has no ions [1]  
**IGNORE:** electrons can't move
- (c) add water and shake / stir / mix [1]  
 filter [1]
- (d) (i) C [1]  
 (ii) graphite [1]  
 (iii) negative electrode: zinc / Zn [1]  
 positive electrode: chlorine / Cl<sub>2</sub> [1]  
**IGNORE:** Cl  
**REJECT:** Chloride / Cl<sup>-</sup>
- (iv) acidify / add nitric acid [1]  
**REJECT:** add sulfuric acid / add hydrochloric acid
- add (aqueous) silver nitrate [1]  
white precipitate [1]  
 3<sup>rd</sup> marking point dependent on correct reagent (silver nitrate)

**[Total: 11]**

Page 6	Mark Scheme	Syllabus	Paper
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- 8 (a) Any four of: [4]
- sugar dissolves
  - sugar particles become separated or water molecules get in between sugar particles
  - diffusion
  - movement of particles (in solution)
  - random (movement)
  - (sugar) particles constantly collide with (water) molecules
  - particles (in solution) spread out / separate
  - **ALLOW:** particles move from concentrated to dilute (sugar) solution
- (b) (i) 3 [1]
- (ii) 12 [1]
- (iii) any OH group ringed / all OH groups ringed [1]
- (iv) carbon dioxide [1]  
**IGNORE:** CO<sub>2</sub>
- (v) yeast [1]  
no air / oxygen present [1]  
**IGNORE:** reference to temperatures between 5–45 °C
- (vi) solvent / fuel / making a named chemical e.g. making ethanoic acid and esters / antiseptic / medical wipes / cleaning fluid / vodka sauce / paints/ disinfectant / preservatives [1]  
**IGNORE:** unqualified uses e.g. in cars / food / cooking

[Total: 11]