

## **MARK SCHEME for the October/November 2013 series**

### **0439 CHEMISTRY (US)**

**0439/21**

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.

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

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- 1 (a) (i) nitrogen  
(ii) sulfur  
(iii) iodine [1]  
(iv) helium [1]  
(v) nickel [1]  
(vi) iodine [1]
- (b) substance containing only 1 type of atom / substance which cannot be broken down further by chemical means [1]
- (c) Any 3 of: [3]  
conducts electricity / conducts heat / conducts  
shiny / lustrous  
ductile / can be drawn into wires  
malleable / can be shaped  
**ALLOW:** high boiling point / high melting point / solid at room temperature  
**ALLOW:** rings when hit / sonorous

[Total: 10]

- 2 (a) (i) pair of bonding electrons [1]  
8 electrons around chlorine and no additional electrons around hydrogen [1]
- (ii) covalent because has shared (pair of) electrons [1]  
**ALLOW:** low melting point / low boiling point / it is a gas / doesn't conduct electricity / both non-metals
- (b) pH 2 [1]
- (c) (i) calcium chloride [1]  
carbon dioxide [1]  
water [1]  
**NOTE:** do not allow formulae
- (ii) 2 [1]  
calcium chloride [1]

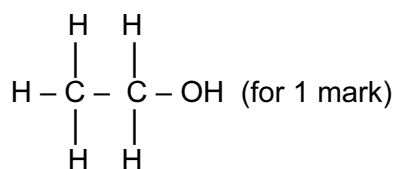
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- (d) (i) values from 215 to 245 (s)
- (ii) 22 (cm<sup>3</sup>)
- (iii) Any 2 of: [2]  
 temperature / mass of magnesium / particle size of magnesium / surface area of magnesium

[Total: 13]

- 3 (a) 1 mark each correct answer [4]  
 carbon / hydrogen  
 hydrogen (if carbon given for first marking point) / carbon (if hydrogen given for first marking point)  
 similar  
 functional

- (b) (i)



- (ii) carbon dioxide [1]  
 water [1]

- (c) (i) COOH ringed [1]  
 (ii) 7 [1]  
 (iii) foodstuffs / drinks / cosmetics / water [1]  
**IGNORE:** generalised answers e.g. kitchen / cleaning

[Total: 11]

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4 (a) Any 4 of:

- both contain carbon atoms
- both have covalent bonding
- both are giant structures / lattices
- both contain rings / have hexagonal patterns / rings of 6 atoms
- in diamond, atoms arranged tetrahedrally
- in graphite, atoms arranged in layers
- flat rings in graphite
- bent rings in diamond
- all bonds same length in diamond
- graphite has some longer bonds / weaker bonds
- in diamond, each C atom joined to 4 others
- in graphite, each C atom joined to 3 others

(b) lime water; [1]  
 turns milky / cloudy / white ppt [1]  
 2<sup>nd</sup> mark dependent on correct reagent

(c) poisonous / kills you / toxic [1]  
**ALLOW:** harmful / higher level answers referring to combining with haem  
**IGNORE:** causes respiration problems / damages lungs

(d) oxygen removed from iron oxide [1]  
**ALLOW:** oxidation number of iron decreases / iron gains electrons / CO becomes oxidised / oxygen adds to CO

(e) limestone [1]  
 air [1]

[Total: 10]

5 (a) filter paper / chromatography paper [1]  
 solvent / alcohol / other suitable solvent [1]  
**NOT:** leaves / pigments in solvent

(b) X drawn on base line [1]

(c) chromatography [1]

(d) (i) 2<sup>nd</sup> box down ticked / aqueous nickel(II) sulfate [1]

(ii) nickel [1]

(iii) cathode [1]

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- (e) protection from corrosion / make it less reactive / make it unreactive  
better appearance / more shiny
- (f) (i)  $6\text{H}_2\text{O}$  [1]
- (ii) reversible reaction / equilibrium reaction / reaction goes both ways /  
reaction goes backwards as well (as forwards) [1]  
**IGNORE:** reaction goes backwards / it is the reverse reaction
- (iii) add water (to white nickel(II) chloride) / hydrate (white nickel(II) chloride) [1]

[Total: 12]

- 6 (a) Any 4 of: [4]

in steam, molecules are far apart  
in water, molecules are close together  
in steam, molecules are moving very fast  
in water, molecules are moving slowly / sliding over each other  
in steam more randomness in arrangement of molecules  
**NOTE:** molecules are further apart in steam (than in water) = 2 marks  
**NOTE:** molecules move faster in steam (than in water) = 2 marks  
**NOTE:** for molecules the word particles can be used  
**NOT:** implication of particles 'apart' in liquids

- (b) (i) substance which dissolves another / it dissolves a solute / substance which dissolves a  
solute / it dissolves something; [1]
- (ii) ethanol [1]  
**IGNORE:** alcohol
- (c) endothermic [1]
- (d) 1<sup>st</sup> box ticked /aqueous ammonium chloride [1]
- (e) (i) LiOH on right [1]  
2 on left (mark dependent on LiOH being correct) [1]
- (ii) 20g [1]

[Total: 11]

- 7 (a) (i) copper [1]
- (ii) (copper is) better electrical conductor / iron is worse conductor [1]  
**IGNORE:** copper is a good conductor

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- (iii) does not conduct (electricity)
- (iv) lead
- (v) stronger / has more strength [1]  
**IGNORE:** tougher / harder / less malleable
- (vi) lead [1]
  
- (b) (i) zinc [1]
- (ii) (zinc) hydroxide [1]  
**ALLOW:** error carried forward from wrong metal in part (b)(i)
  
- (c) C,B,D,A [1]
  
- (d)  $\text{CuCl}_2$  [1]  
**ALLOW:**  $\text{Cl}_2\text{Cu}$
  
- (e) positive electrode: chlorine [1]  
negative electrode: copper [1]  
**ALLOW:** 1 mark for chlorine and copper reversed
  
- (f) chlorine /  $\text{Cl}_2$  [1]

[Total: 13]