CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

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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CAMBRIDGE
International Examinations

1 (a) (i) nitrogen [1]

(ii) sulfur [1]

(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]

(d) (i) values from 215 to 245 (s) [1]

(ii) 22 (cm^3) [1]

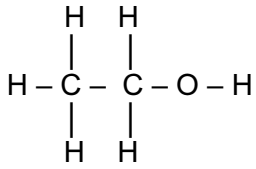
(iii) Any 2 of: [2]

temperature / mass of magnesium / particle size of magnesium / surface area of magnesium

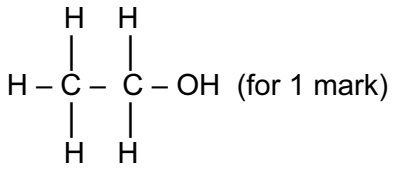
[Total: 13]

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)



[2]



(for 1 mark)

(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]

4 **(a)** Any 4 of: [4]

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]
2nd 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)** 2nd box down ticked / aqueous nickel(II) sulfate [1]

(ii) nickel [1]

(iii) cathode [1]

(e) protection from corrosion / make it less reactive / make it unreactive [1]
better appearance / more shiny [1]

(f) **(i)** $6H_2O$ [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) 1st box ticked /aqueous ammonium chloride [1]

(e) **(i)** LiOH on right [1]
2 on left (mark dependent on LiOH being correct) [1]

(ii) 20 g [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

(iii) does not conduct (electricity) [1]

(iv) lead [1]

(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) $CuCl_2$ [1]
ALLOW: Cl_2Cu

(e) positive electrode: chlorine [1]
negative electrode: copper [1]
ALLOW: 1 mark for chlorine and copper reversed

(f) chlorine / Cl_2 [1]

[Total: 13]