CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0620 CHEMISTRY

0620/23 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)** aluminium [1]

(ii) calcium and iron [1]

(iii) lithium [1]

(iv) silver [1]

(v) aluminium [1]

(b) Any 2 of: [2]

reacts with acids
rusts / reacts with water and oxygen / reacts with water and air
reacts with steam
reacts with oxygen
reacts with chlorine
acts as a catalyst
any other suitable e.g. reacts with nitrates of less reactive metal

(c) calcium oxide added / lime added [1]
oxygen / air (blown into molten iron) [1]

[Total: 9]

2 **(a)** Any five of: [5]

nucleus in centre of atom
protons and neutrons in nucleus / protons and neutrons in centre of atom
electrons outside the nucleus / idea of electrons in shells outside the centre of atom
2 protons
2 electrons
2 neutrons (in commonest isotope)
protons positively charged
electrons negatively charged
neutrons have no charge

(b) airships / blimps / balloons / diving / lasers / any other suitable [1]

(c) 223 [2]
Xe =131, O =16, F = 19 (for 1 mark)

(d) **(i)** (room temperature): gas [1]
(-200 °C): liquid [1]

(ii) has two atoms [1]
IGNORE: F_2 / Cl_2 (unqualified) / reference to same atoms or different atoms

[Total: 11]

3 **(a)** 2 electrons in outer shell [1]
8 electrons in middle two shells [1]

(b) calcium chloride [1]

(c) **(i)** $27\,cm^3$ [1]

(ii) lower initial gradient [1]
ends up at same volume of gas [1]

(iii) temperature: goes faster / increases [1]
hydrochloric acid: goes slower / decreases [1]

(d) **(i)** decomposition [1]

(ii) limewater [1]
ALLOW: calcium hydroxide solution

turns milky / cloudy / white ppt [1]
2nd mark dependent on first being correct

(e) **(i)** calcium nitrate [1]
water [1]

(ii) neutralise acidic soils / neutralise acidic lakes / making mortar / making calcium hydroxide / making limewater / whitewash [1]
ALLOW: making cement / making lines on roads (or games pitches) / in steel making

(iii) exothermic [1]

[Total: 15]

4 **(a)** Bunsen burner / source of heat [1]
ALLOW: heating / heat

(b) X at 'space' at top of test tube [1]

(c) speed up the reaction / increase rate of reaction / make reaction go faster [1]

(d) C_4H_8 / $2C_2H_4$ [1]

(e) **(i)** decolourises / goes colourless [1]
IGNORE: goes clear

(ii) B [1]

(iii) 4th box ticked (polymerisation) [1]

(f) **(i)** C_7H_{16} [1]

(ii) substance containing carbon and hydrogen only [1]

(g) carbon dioxide [1]
water [1]
ALLOW: correct formulae

[Total: 11]

5 **(a)** 3rd and 5th boxes ticked (sugar and water) (1 mark each) [2]

(b) (fractional) distillation [1]
IGNORE: fractionation

(c) O-H at right [1]
ALLOW: OH

(d) octanol [1]

(e) from ethene and steam [1]
ALLOW: from ethene and water
AND any two of: [2]
high temperature / heat / stated temperature between 150 and 1000 °C
catalyst / phosphoric acid
high pressure / stated pressure between 50-100 atm
NOTE: allow sulfuric acid (1) dilute with water (1) heat (1)

[Total: 8]

6 **(a)** **(i)** reversible reaction / equilibrium reaction / reaction can go both ways [1]
IGNORE: products go to reactants / it is a reverse reaction

(ii) add water to white copper sulfate / add water to anhydrous copper sulfate
ALLOW: add water to $CuSO_4$ [1]

turns it blue [1]

(iii) melt it / turn it to liquid [1]
dissolve it in water / make a solution of it [1]
ALLOW: add water

(b) (i) floats on top (of the mixture) / it is on top (of the mixture) [1]

(ii) S gains oxygen / it gains oxygen / S turns to SO_2 [1]
ALLOW: it / sulfur increases in oxidation number
ALLOW: it / sulfur loses electrons

(iii) cathode: C [1]
electrolyte: D [1]

[Total: 9]

7 (a) 112 (^{o}C) [1]

liquid [1]

(b) arrangement: go from regularly to irregularly arranged / become more irregularly arranged / go from regular to random [1]
ALLOW: idea of becoming less packed / less arranged / not so close together (but not implication of particles being apart from each other)
NOTE: do not allow implication of particles being 'apart' in solid
motion: start moving / start sliding over each other / go from no movement to movement / go from just vibrating to moving (over each other) [1]
ALLOW: idea of greater movement

(c) Any three of: [3]

(crystal) dissolves / idea of dissolving
particles (in crystal) become separated / solvent molecules get in between particles / mixing of particles / spreading out of particles
diffusion
movement of particles (in solution)
random (movement of particles)
particles collide
ALLOW: particles move from concentrated to dilute solution

[Total: 7]

8 **(a)** Any 2 of: [2]

compound has constant composition but mixture has variable composition
compound cannot be separated into different components (by physical means) but mixture can (be separated) / only the mixture can be separated
ALLOW: elements are chemically combined in compound but not in mixture
compound has properties different from elements it contains but mixture has the properties of the substances within it
ALLOW: compounds have sharp melting point (or boiling point) and mixture does not
energy change when compound formed but no (or very small) energy change when mixture formed

(b) Any two of: [2]

filtration / salts move to the clay pot and insoluble particles (remain) in the bowl
large particles (or insoluble particles) caught by leaves
the salts dissolve in the water / the salts are soluble
(dissolved) salts pass or through) the (holes in the) leaves /
IGNORE: salts pass through holes in the bowl

(c) **(i)** sodium carbonate [1]

(ii) chloride / Cl^- [1]
IGNORE: chlorine

(iii) K^+ [1]
SO_4^{2-} [1]

(d) 2 ($NaCl$) [1]

(e) electrons / an electron [1]
IGNORE: negative charge

[Total: 10]