UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

0620 CHEMISTRY

0620/02 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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1 **(a)** bromine and fluorine / Br and F

(b) krypton / Kr [1]

(c) nitrogen and oxygen / N and O [1]

(d) 175 [1]

(e) **(i)** basic
ALLOW: metallic [1]

(ii) (burning) fossil fuels / fuels containing sulfur / volcanoes ; [1]

effect of SO_2 on environment e.g. destroys trees / kill plants / kills animals or plants in lakes or rivers / chemical erosion of (limestone) buildings / corrosion of metals ;
ALLOW: difficulty in breathing
NOT: kills plants / animal in seas / kills marine life [1]

(iii) any three of:

starts off high pH / pH above 7 / named pH above 7 / alkaline (pH) ;

as acid added pH goes down ;

neutralises / neutralisation / neutral / pH 7 ;

pH ends up below 7 / named pH below 7 / acid (pH) ; [3]

(iv) universal indicator paper / pH meter [1]

(v) potassium nitrate
ALLOW: KNO_3 [1]

2 **(a)** compound: top box ;

element: 2nd box ;

ion: 5th box ;

molecule: 4th box ; [4]

(b) air + steel / first and last boxes ticked [1]

(c) (i) any four of:

nucleus or particles on inside and electrons on outside ;

nucleus labelled ;

electrons on outside labelled ;
ALLOW: e for label

two electrons ;

protons + neutrons in nucleus + labels ;
ALLOW: p for proton and n for neutron
IGNORE: incorrect number of neutrons

two protons ; [4]

(ii) balloons / (arc) welding / (advertising) lights / growing Si or Ge crystals / making Ti or Zr / coolant (in nuclear reactors) / wind tunnels / for divers [1]
NOT: as an inert gas / in (hot) air balloons / in bulbs

(iii) helium unreactive / second box down ticked [1]

3 (a) structure of ethanol with all atoms and bonds shown
ALLOW: OH in place of O – H [1]

(b) (i) exothermic [1]

(ii) 16.2 (g) [1]

(iii) 2 (CO_2) + 3 (H_2O) [1]

(c) any two of:
(very) high melting / boiling points ;

(very) high density ;
ALLOW: harder

form coloured compounds ;
NOT: they are coloured

variable oxidation numbers / can form more than one type of ion / variable valency / form complex ions ;

are (good) catalysts ;
ALLOW: chemical differences e.g. do not react with cold water [2]

(d) **(i)** any two of:
bubbles / effervescence ;

copper carbonate / solid dissolves ;

solution becomes coloured / solution goes green / change of colour ;
NOT: wrong colour [2

(ii) aqueous / dissolved in water [1]

(e) polymer ; addition ; monomers ; [3]

4 **(a)** any two physical properties of group I metal e.g.
(fairly) low melting boiling point (for a metal) ;

solid ;

conducts heat or conducts electricity ;

malleable ;

soft ;
ALLOW: ductile / shiny (when cut)
NOT: hard / sonorous [2]

(b) 1 [1]

(c) **(i)** atoms of same element / same proton number with different numbers of neutrons / different number of nucleons [1]

(ii) 78 [1]

(d) boiling point 500 – 680 (actual = 669) ; [1]

reactivity: any idea of faster than rubidium e.g. explosion / very violent spitting ;
ALLOW: more reactive / increased reaction [1]

(e) CsCl [1]

(f) pH 7 [1]

(g) (aqueous) silver nitrate / aqueous lead nitrate ; [1]

white precipitate ;
(result conditional on correct reagent) [1]

5 **(a)** double bond(s) ringed

(b) $C_{10}H_{16}$ [1]

(c) red-brown / brown ; [1]
to colourless / loses its colour ;
NOT: becomes discoloured [1]

(d) **(i)** **A** thermometer ; **B** condenser ; **C** measuring cylinder ;
NOT: measuring tube [3]

(ii) arrangement: random ;
ALLOW: far apart [1]

movement: random / rapid / move everywhere ; [1]

(e) **(i)** idea of oxygen not in excess / carbon monoxide formed (instead of carbon dioxide)
ALLOW: doesn't burn completely / doesn't burn as much as it could
ALLOW: carbon or soot formed (instead of carbon dioxide) [1]

(ii) toxic / kills you / poisonous / asphyxiation / suffocation
NOT: harmful [1]

(f) **(i)** **A** [1]

(ii) **C** [1]

(iii) **B** [1]

6 **(a)** decomposition [1]

(b) ions must be able to move
NOT: charges must be able to move
REJECT: ions and electrons move = 0 [1]

(c) lower melting point of the electrolyte
ALLOW: helps dissolve the aluminium oxide [1]

(d) **B** [1]

(e) anode: oxygen ; [1]

cathode: aluminium ;
(both aluminium and oxygen but at wrong electrodes = 1) [1]

(f) oxygen reacts with them / oxygen reacts with carbon ;

'burns' them away / carbon dioxide formed / gas formed ;
ALLOW: the electrodes get used up [1]

(g) 3 [1]

(h) aircraft body / car body / saucepans/ electricity cables / food containers / window frames / cooking foil / other suitable uses
NOT: alloys unqualified [1]

7 **(a)** both parts required for each mark
A: yes – air and water present ; [1]

B: no – no water / there is only air ; [1]

C: no – coating protects / zinc protects (from air and water) / zinc corrodes instead / zinc is a sacrificial metal ; [1]

(b) any three of:

oxygen blown into molten iron ;

to oxidise sulphur / carbon / phsophorus / silicon ;

basic oxides / CaO / MgO added ;

react with phosphorus and silicon ;

(P and Si) removed as slag / slag formed ; [3]

(c) chemical plant / surgical instruments / cutlery [1]

(d) O removed (from iron oxide) / oxidation number (of iron) decreased [1]

(e) iron(II) oxide + hydrochloric acid → iron chloride + water
(1 for correct reactants, 1 for correct products) [2]