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

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1 **(a)** bromine and fluorine / Br and F [1]

(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 [1]

(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 ; [1]

'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]