CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0620 CHEMISTRY

0620/22 Paper 2 (Core Theory), maximum raw mark 80

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1 **(a)** **(i)** C / carbon [1]

(ii) Pb / lead [1]

(iii) A*l* and O / aluminium and oxygen [1]
(both required)

(iv) Cs / Caesium [1]

(v) Fe / iron [1]

(vi) H / hydrogen / H_2 [1]

(b) O_2 [1]

4 (Rb) [1]
note: mark dependent on correct balance of O_2 (**allow:** 2O)

(c) affects nervous system (of children) / affects learning of children / affects brain development / poisonous / harmful / toxic / brain damage [1]

[Total: 9]

2 **(a)** A = flask [1]

B = measuring cylinder [1]

(b) calcium chloride ; [1]

water ; [1]

(c) 1st box ticked [1]

(d) **(i)** no oxygen present / carbon dioxide does not support combustion / flame requires oxygen to burn / not enough oxygen [1]
allow: carbon dioxide does not burn

(ii) denser than air ; [1]

(iii) oxygen present / oxygen increased / air present ; [1]

carbon dioxide has escaped / carbon dioxide has diffused [1]

[Total: 9]

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3 **(a)** Any **four** from: [4]

- filter funnel
- filter paper in filter funnel ;
  not: filter paper lying flat across top of funnel
- container below funnel to collect filtrate ;
- river water poured into filter funnel ;
- insoluble material / residue / solid on filter paper + labelled **OR** as written statement ;
- filtrate / solution collected in container **OR** as written statement

(b) **(i)** Mg^{2+} / magnesium ; [1]

(ii) sulfate ; [1]

(iii) 32 (mg) [1]

(iv) 1.6 (mg) [1]
allow: ecf from part **(i)**

(v) sodium chloride ; [1]
allow: NaC*l*

(c) **(i)** points all correctly plotted ; [2]
1 mark for 6 points correctly plotted

best curve (through the points) ; [1]

(ii) value from candidate's graph at 25°C to within ± 0.1 mg / dm^3 ; [1]

(iii) 21% / 20% ; [1]

[Total: 14]

4 **(a)** alkenes / cycloalkanes / arenes / alkynes ; [1]

(b) **(i)** increase lower for alkanes with odd number of C atoms / increase higher for alkanes with even number of C atoms ; [2]

1 mark for general increase / reference to zigzag increase / specific example of something on graph ;

(ii) both increase ; [1]

increase between the 8^{th} and 9^{th} C atoms lower than increase between 9^{th} and 10^{th} C atoms ; [1]

(c) **(i)** any suitable source e.g. animal flatulence / marshes / rice paddy fields ; [1]

(ii) global warming / greenhouse effect ; [1]

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(d) CO_2 as product ; [1]

2 (O_2) ; [1]
note: second mark dependent on the first being correct

[Total: 9]

5 **(a)** addition of oxygen / combining with oxygen / react with oxygen / increase in oxidation number / loss of electrons ; [1]

(b) they are gases / vapours ; [1]

(c) **(i)** 4 (P) ; [1]

(ii) acidic because P is a non-metal / non-metallic oxides are acidic ; [1]

(d) calcium oxide / lime added; [1]

(reacts to form a) slag ; [1]
slag floats on top of steel / slag skimmed off from surface ; [1]

(e) **(i)** mild steel: any suitable use e.g. bridges / car bodies / girders / cars / construction materials ; [1]

stainless steel: any suitable use e.g. chemical plant / cutlery / surgical instruments ; [1]

(ii) B ; [1]

(f) the more zinc, the stronger (the brass) / the less copper the stronger (the brass); [1]

(g) **(i)** copper + nitric acid → copper nitrate + nitrogen dioxide + water [2]
1 mark if one / two errors

(ii) any **three** from: [3]

- blue (solution) / blue (precipitate) ;
- precipitate / ppt ;
- in excess the precipitate redissolves ;
- dark blue solution (above precipitate) ;

(iii) car engines / car exhausts / lightning / high temperature furnaces ; [1]

[Total: 17]

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6 (a) (i) Any **three** suitable differences e.g.: [3]

- no noble gases / no group 0 / no group 8 / only 7 Groups ;
- hydrogen / H in same Group as halogens / H in same Group as F, C*l*; ORA (e.g. H on own / Period 1)
- some elements missing / named element present
- no transition elements (in middle of table / block) ; ORA transition element (block) present
- halogens / F and C*l* in first Group;
- not ordered according to atomic number;
- no proton numbers / atomic numbers ORA
- Groups / Periods different / comments on different numbers of elements in groups / periods
- metals and non-metals not grouped together ORA
- some transition elements in wrong Group / examples e.g. Mn placed with N
- no Actinoids / Lanthanoids

(ii) Any answer referring correctly to (some) elements being in the same Group e.g. Li, Na, K in same Group / vertical section / column ; [1]

(b) colour of astatine: black / <u>dark</u> grey / greyish-black ; [1]

boiling point of Br_2: **allow:** between 30–90 °C ; [1]
(actual = 59 °C)

state of iodine: gas / vapour ; [1]

(c) (i) (from light green / colourless to)
reddish brown / brown / orange / yellow ; [1]

(ii) potassium chloride ; [1]

(iii) bromine less reactive than chlorine ORA ; [1]

(iv) two atoms in the molecule ;

[Total: 11]

7 (a) rest of structure completed correctly including all atoms and all bonds ; [1]

(b) any **two** from:
carbon monoxide / carbon / water ; [2]

(c) (i) steam / water ; [1]

(ii) 1st and 3rd boxes ticked ; [2]
1 mark each

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(iii) Any **five** from: [5]

- flask with liquid mixture in it
- ethanol has lower boiling point than water / state boiling points of ethanol and water.
- on heating ethanol evaporates more easily / ethanol forms vapour more easily
- some idea of difference between fractional distillation and simple distillation e.g. long vertical tube / column (above flask)
- fractional distillation used to separate substances with boiling points which are fairly close to each other
- temperature gradient in the column / column colder at top than bottom
- ethanol separated (partly) from water in distillation column / ethanol moves further up column (than water) ORA
- condenser or long tube.
- ethanol vapour gets into condenser first / ethanol comes off first
- ethanol vapour goes to ethanol liquid in condenser
- ethanol collected in receiver
- water vapour condenses back into the flask / lower in the column

[Total: 11]

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