CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0620 CHEMISTRY

0620/22 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)** **(i)** D / phosphorus / P; [1]

(ii) E / helium / He; [1]

(iii) C / chlorine / Cl_2 / Cl; [1]

(iv) A / copper / Cu; [1]

(v) A / copper / Cu; [1]

(b) C; D; [2]

(c) giant; covalent; [2]

(d) substance containing only 1 type of atom / substance which cannot be broken down into a simpler one; [1]
allow: substance which can't be separated by chemical means
ignore: substance with one atom / substance with similar types of atom

[Total: 10]

2 **(a)** (damp) red litmus (paper); [1]
turns blue; [1]
note: second mark dependent on correct reagent
allow: universal indicator (1 mark); turns blue / purple (1 mark)
allow: 1 mark for litmus paper turns blue / pH paper turns blue
allow: white fumes (1 mark); with hydrochloric acid vapour (1 mark)
ignore: other chemicals added as long as it is clear that ammonia is the gas being tested

(b) pH 9; [1]

(c) **(i)** NH_4Cl on right; [1]

(ii) structure completely correct;; [2]
allow: 1 mark for 1 pair of electrons bonded between H and Cl
ignore: inner shell electrons

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(d) (i) any 4 of: [4]
use of burette
add indicator to flask
add acid to alkali (or vice versa)
until indicator changes colour
record volume (of acid or alkali added) **ignore:** amount of acid or alkali added
repeat without indicator
using same volume of acid and ammonia as in previous experiment

(ii) heat to crystallisation (point) / evaporate some of the water / leave to crystallise [1]
allow: heat then cool
ignore: heat (unqualified) / heat to dryness / heat to get rid of all the water

[Total: 11]

3 (a) (i) get darker / deeper colour; [1]

(ii) gas; [1]
allow: answer written in table

(iii) any value between –180 to –20 °C (actual = –101 °C); [1]
allow: answer written in table

(b) (i) chlorine → bromine → iodine → astatine;; [2]
allow: 1 mark if one pair incorrect way round / order completely reversed

(ii) no **and** chlorine is more reactive (than bromine) / bromine is less reactive; [1]
ignore: chlorine is very reactive / bromine is not very reactive
ignore: chloride is more reactive

(c) H_2O (on right); [1]
2 on left (this is dependent on H_2O being the product); [1]

(d) (i) to kill bacteria / to kill microbes / to disinfect it [1]
allow: to kill germs / to get rid of bacteria
ignore: to clean water

(ii) any two of: [2]
minerals or (dead) remains insoluble in water
these particles are large / water particles (molecules) are very small
(larger particles) get stuck (between the sand particles) / (larger particles) remain in the sand / trapped by sand
water (molecules) drain through / water comes out the bottom
ignore: water is filtered

[Total: 11]

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4 **(a)** groups of hydrocarbons / molecules; [1]
with similar (range of) boiling points / sizes / masses; [1]
allow: 1 mark for idea of separating molecules for particular fuels
ignore: petroleum broken down / smaller molecules formed / mixture of fuels

(b) **(i)** gasoline; diesel; [2]

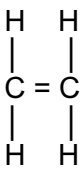
(ii) refinery gas: heating / cooking; [1]
allow: fuel
bitumen: roads / roofing; [1]

(c) high temperature; [1]
allow: heat / stated temperature of 200 °C or more
catalyst; [1]
ignore: name of catalyst
ignore: pressure

(d) **(i)** substance containing hydrogen and carbon <u>only;</u> [1]

(ii) C_4H_8 / $2C_2H_4$; [1]

(e) **(i)** [1]



(ii) monomers; addition; polymers; [3]

[Total: 14]

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5 **(a)** any two of; [2]
Al has low density / iron has high density
allow: lightweight or light for density)
Al does not form coloured compounds / iron formed coloured compounds
Al has only one oxidation state / iron has several oxidation states
Al does not act as a catalyst / iron can act as a catalyst
Al is softer / iron is harder (comparative needed)
Al has lower density / iron has higher density (comparative needed)
Al is a better conductor / iron is not as good a conductor (comparative needed)
Al is weaker / iron is stronger (comparative needed)
ignore: melting and boiling points

(b) any suitable use e.g. aircraft or car (bodies) / food containers / pots and pans / electrical wiring / drinks cans; [1]

(c) precipitate formed; [1]
which is white in colour; [1]
dissolves (in excess sodium hydroxide); [1]
allow: precipitate disappears

[Total: 6]

6 **(a)** **(i)** limestone / chalk; [1]

(ii) the other product is a gas / carbon dioxide escapes; [1]
allow: carbon dioxide is a gas / waste gases are gone / CO_2 formed
allow: reaction goes completely to the right

(b) **(i)** $C + O_2 \rightarrow CO_2$;; [2]
allow: 1 mark for O_2 as reactant / $C + 2O \rightarrow CO_2$

(ii) limited; air; monoxide; poisonous; [4]
allow: oxygen in place of air
note: if dioxide put in third position allow 1 mark for harmless in 4th position

(c) calcium chloride; [1]
water; [1]

(d) **(i)** idea of measure the (decrease in) mass / weight; [1]
idea of measuring time (intervals); [1]

(ii) increases / faster; [1]
decreases / slower; [1]
increases / faster; [1]
note: the answers above must be comparative
allow: 1 mark for fast; slow; fast
ignore: reference to time taken

[Total: 15]

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7 **(a)** **(i)** any 4 of: [4]
(at 20 °C / at the start) particles are close together / touching / arranged regularly
(at 20 °C / at the start) particles are vibrating / not moving
as temperature rises / then particles vibrate more / gain energy
at 114 °C / then particles begin to move
forces between particles weaken / molecules start to break away (from each other)
at 114 °C / then particles become more randomly arranged / slide over each other
when liquid / above 114 °C / then particles slide over each other/ move
when liquid / above 114 °C then particles are randomly arranged
ignore: particles further apart / particles (move) faster

(ii) 254; [1]

(b) **(i)** ionic; [1]

(ii) KI; [1]

(c) (1 each) [4]
insoluble / does not dissolve; doesn't conduct;
soluble / dissolves; doesn't conduct;
ignore: low / high / not very well

(d) + electrode: iodine / I_2 / I; [1]
– electrode: potassium / K; [1]
allow: 1 mark if correct electrode products reversed
ignore: iodide

[Total: 13]

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