CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0620 CHEMISTRY

0620/21 Paper 2 (Core Theory), maximum raw mark 80

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1 **(a)** **(i)** C / C_2H_4 / ethene; [1]

(ii) A / CO_2 / carbon dioxide; [1]

(iii) E / ethanol / correct formula for ethanol; [1]

(iv) D / CH_4 / methane; [1]

(v) A / CO_2 / carbon dioxide; [1]
allow: E

(vi) E / ethanol / correct formula for ethanol; [1]
allow: A

(b) C_2H_4; [1]

(c) compound: substance containing two or more different atoms joined / bonded together / substance containing 2 or more elements that can only be separated by chemical means; [1]
allow: different atoms joined / different elements joined / 2 elements react to form a molecule / molecule with 2 or more elements / substances chemically combined
ignore: two or more molecules combined / different elements react / substances made up of molecules
reject: if reference to a mixture

inert: unreactive / doesn't react; [1]

catalyst: substance which speeds up a reaction / it speeds up a reaction; [1]
allow: changes rate of reaction / changes speed of reaction

[Total: 10]

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

(b) **(i)** A: burette; [1]
B: flask / erlenmeyer; [1]

(ii) pH starts above 7 / stated value above 7; [1]
allow: high pH

decreases (on addition of acid); [1]

(pH) ends at below 7 / stated value below 7; [1]
allow: low pH
note: pH decreases to pH 7 = 2 marks
note: pH goes from alkali to acid = 1 mark

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(iii) ammonium chloride; [1]
reject: ammonia chloride

NH_3; [1]

(c) any 4 of: [4]
blue solution at start /
precipitate formed /
(light) blue (precipitate) /
precipitate redissolves (in excess ammonia) / solution formed (in excess ammonia) /
precipitate disappears
(solution is) deep blue / dark blue
allow: goes deep blue / dark blue / goes darker blue

[Total: 13]

3 **(a)** **(i)** magnesium → zinc → iron → lead / Mg > Zn > Fe > Pb;; [2]
if: one pair reversed / complete order reversed = 1 mark

(ii) no / it will not react **and** zinc is more reactive / iron is less reactive; [1]
ignore: zinc is reactive / iron is unreactive

(b) 1st box ticked; [1]
last box ticked; [1]

(c) **(i)** arrangement: regular / fixed pattern / any indication of regularity e.g. in layers; [1]
allow: close together / packed together
ignore: stick together / all together

motion: cannot move / fixed in position/ (only) vibrate; [1]
ignore: only move a little / move

(ii) any three of: [3]
dissolve sodium chloride / add water /
filtration / use a filter paper /
sand remains on filter paper /
ignore: residue on filter paper
salt solution goes through (filter paper) / salt solution is the filtrate / salt water goes into the collecting tube
allow: decanting for 1 mark (in place of filtration)
ignore: water goes through
ignore: distillation

(d) distillation; lower; volatile; condenser; vapour; (1 mark each) [5]

[Total: 15]

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4 **(a)** atoms with same number of protons but different number of neutrons; [1]
allow: atomic number for number of protons
allow: different mass number / nucleon number for different number of neutrons
allow: same (type of) atom with different mass numbers
ignore: atoms with different numbers of neutrons
ignore: element(s) with different numbers of neutrons
ignore: atoms with different relative atomic mass

(b) any 5 of: [5]
nucleus (need not be labelled) in middle of atom and electrons round outside (electrons can be shown as dots, crosses or e) /
protons in nucleus – labelled or shown by + or p /
3 (protons) /
neutrons in nucleus – labelled or shown by n /
4 (neutrons) /
3 electrons – labelled or shown by dots, crosses or e /
2 electrons in first shell and 1 in second

(c) $4Li + O_2 \rightarrow 2Li_2O$;;; [3]
allow: two marks for $2Li + O \rightarrow Li_2O$ / $4Li + 2O \rightarrow 2Li_2O$
allow: 1 mark for O_2 if no other marks scored

(d) **(i)** electrolyte correctly labelled; [1]
anode rod correctly labelled; [1]
ignore: label on circuit / label on + sign

(ii) dissolved in <u>water</u> / solution in <u>water</u>; [1]
allow: answers implying substance is mixed with water
ignore: hydrated / hydrous

(iii) ions can move; [1]
allow: ions are free
reject: electrons can move

[Total: 13]

5 **(a)** hydrogen → a fuel with RMM of 2; [1]
methane → the main constituent of natural gas; [1]
fuel oil → fuel for ships; [1]
kerosene → fuel for aircraft; [1]

(b) **(i)** amount or mass or volume of water / distance of flame from can / height of flame / same can; [1]
ignore: the water (unqualified) / same amount of fuel / time

(ii) to make sure that the water has the same temperature (throughout) / it is at the same temperature / so it is heated evenly / so there are no hot spots / so there are no cold spots; [1]
allow: so that all the particles are heated
ignore: so that particles mix

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(iii) petroleum spirit; [1]
highest temperature rise / highest increase in temperature; [1]
allow: calculation of all the temperature differences form the table
ignore: because it releases most heat / because it has the highest temperature
if fuel incorrect = 0 for the question

(c) A = nitrogen / N_2 / N; [1]
B = oxygen / O_2 / O; [1]

(d) **(i)** lamps / (to provide an) inert atmosphere / in welding / lasers etc [1]
allow: for lighting
ignore: for neon lights

(ii) 3 / third / III; [1]

(iii) inert / unreactive; [1]
ignore: it is stable

[Total: 13]

6 **(a)** any 4 of: [4]
crystals dissolve or go into solution /
diffusion /
random movement of ions or named particles (can be atoms or ions or particles or molecules) / particles move everywhere / particles spread out / particles mix
both ions and water in constant movement /
particles collide /
particles react / ions react / atoms react
Ag ions and iodide ions (react) /
(to make) precipitate of silver iodide /
ignore: particles move (unqualified)

(b) $2KI + Cl_2 \rightarrow 2KCl + I_2$; [2]
allow: 1 mark for $2KI + 2Cl \rightarrow 2KCl + I_2$;

[Total: 6]

7 **(a)** 24; [1]

(b) 256; [1]

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(c) any 4 of: [4]
coal / petroleum / crude oil / named fraction from crude oil
sulfur reacts with oxygen / air
(sulfur burns) to form sulfur dioxide
ignore: sulfur oxide
sulfur dioxide reacts (with gases) in the atmosphere / sulfur dioxide reacts with oxygen / nitrogen oxides
to form sulfur trioxide
sulfur dioxide / trioxide react with water / rain
allow: sulfur dioxide / trioxide dissolves in water / rain
allow: sulfur oxide(s) mix with water / rain
(to form) sulfurous/ sulfuric acid

(d) nitrogen / N_2 / N; phosphorus / P; [2]

(e) add (acidified) barium chloride / barium nitrate; [1]
white precipitate; [1]
note: second mark dependent on correct reagent

[Total: 10]

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