CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2013 series

0620 CHEMISTRY

0620/21 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) E [1]

(ii) B [1]

(iii) E [1]

(iv) A [1]

(v) A [1]

(vi) D [1]

(b) 1 mark for each correct word
atom;
two;
covalent **ALLOW**: atom;
transition; [4]

[Total: 10]

2 (a) melting point below (34 °C) and boiling point above (34 °C) [1]
ALLOW: its melting point is 29 °C and its boiling point is 669 °C

(b) **ALLOW**: 740–800 °C (actual is 760 °C)` [1]

(c) (i) increases (down the group) [1]
ALLOW: goes up / goes up except for potassium

(ii) sodium / Na [1]

(d) 1 mark for each of:

- shiny (when freshly cut) **ALLOW**: silvery / silver colour
- conducts heat / conducts electricity / conducts
- ductile / can be drawn into wires
- malleable / can be shaped **ALLOW**: can be bent
- **ALLOW**: solid at room temperature
- soft (for 1 mark) [3]

IGNORE: sonorous / it is a metal

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(e) (i) Any two of:

- bubbles
- moves (around)
- floats / on surface
- catches fire / flame
- lilac (flame) **ALLOW**: mauve or purple
- explodes / spits
- fizzing
- forms a ball
- beaker gets hotter
- gets smaller [2]

IGNORE: water goes cloudy / water goes purple or blue

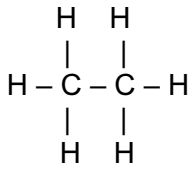
(ii) H_2 on right; [1]
2 on left (dependent on H_2 or 2H on right) [1]

[Total: 11]

3 (a) 1 mark for each correct line / indication

alkane → C_2H_6
alkene → C_2H_4
alcohol → C_2H_5OH
carboxylic acid → CH_3COOH [4]

(b) Full structural formula shown i.e.



[1]

ALLOW: correct dot and cross diagram

(c) saturated has <u>only</u> single bonds / no double bonds; [1]

unsaturated has double bond(s) [1]
IGNORE: one has single bonds and the other has double bonds

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(d) bromine water / aqueous bromine / bromine / **ALLOW**: correct formula; [1]
IGNORE: Br

(saturated hydrocarbon) no reaction / stays the same colour / remains orange / remains orange-brown [1]
ALLOW: remains brown
ALLOW: remains yellow (if aqueous bromine used) / remains red (if bromine used)
IGNORE: remains yellow (if bromine used)
REJECT: incorrect colour, e.g. stays same blue colour, does not score

(unsaturated hydrocarbon) decolourises / goes colourless [1]
IGNORE: goes clear
IGNORE: initial incorrect colour of bromine

(acidified) potassium permanganate / potassium manganate(VII) (1 mark)
goes colourless / purple to colourless (1 mark)

IF: incorrect reagent 0 for this question

[Total: 10]

4 (a) two marks for names of elements present: [2]
nitrogen + phosphorus + potassium (or correct symbols) = 2 marks
NOT: N_2
any two of nitrogen, phosphorus or potassium (or symbols) = 1 mark

two marks for reasons: [2]
any two of:

- soil depleted of minerals / depleted of essential elements / depleted of any of N or P or K
  ALLOW: plants use up minerals / use up essential elements / use up N or P or K
- to increase the nitrogen or phosphorus or potassium in the soil
  ALLOW: to increase the nitrates in the soil / to increase the phosphates in the soil
- increased growth / more growth / better growth (idea of <u>more</u> growth needed)
  ALLOW: more rapid growth / quicker growth
  ALLOW: produce more crops
  IGNORE: produce more unqualified
  IGNORE: for growth / to grow / to keep plants healthy / for healthier growth
- (for making) more protein

NOTE: to increase the nitrogen (or N) in the soil = 1
(0 mark for elements and 1 for increase of that element)
to increase the N + P in the soil = 2
(1 mark for two of the elements and one for idea of increase)

(b) (i) CON_2H_4 [1]
ALLOW: any order

(ii) 60 [2]
if 2 marks not scored: **ALLOW** 1 mark for correct atomic masses
N = 14, O = 16, H = 1, C = 12 anywhere in working
NOTE: no e.c.f.

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(c) regular arrangement; [1]
NOTE: minimum of 2 rows of 3 molecules required

molecules touching each other [1]
NOTE: minimum of 6 (O) are required all of which are touching or very close together.
REJECT: molecules in a single row touching

(d) (damp red) litmus (paper); [1]
ALLOW: pH paper

turns blue [1]
NOTE: second mark dependent on first being correct

ALLOW: universal indicator / full range indicator (paper) (1 mark)
turns purple / blue (1 mark)
ALLOW: hydrochloric acid (1) gives white fumes (1)

[Total: 11]

5 (a) (i) D [1]

(ii) C [1]

(iii) A [1]

(b) (i) loss of carbon dioxide / loss of gas [1]

(ii) accept values from 360–380 [1]
ALLOW: 6 min to 6 min 20 s / 6⅓ min

(iii) 0.5 (g) [1]

(iv) (initial) gradient greater / slope greater and starts at 0, 0; [1]
same final volume [1]

(v) (rate) increases [1]
IGNORE: more carbon dioxide per second
ALLOW : (rate) faster

[Total: 9]

6 (a) (i) Any three of: [3]

- add propanol to the mixture and shake (or stir)
- implication of filtration of solution / diagram of filter funnel and filter paper
  REJECT: diagram of filter paper circle on top of funnel
- sugar solution goes through the filter paper / sugar solution is the filtrate / diagram shows sugar solution (labelled) passing through filter paper
- salt or sodium chloride remains on filter paper / diagram shows salt or sodium chloride (labelled) remaining on filter paper

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(ii) evaporate the water / evaporation [1]
IGNORE: heat
ALLOW: distillation

(b) (i) NaCl [1]
ALLOW: $Na^+C l^-$
REJECT: Na^+ + $C l^-$ / multiples, e.g. 2NaCl

(ii) ionic [1]

(c) (i) **D** [1]

(ii) positive electrode → chlorine / Cl_2 [1]
IGNORE: Cl

negative electrode → hyrdrogen / H_2 [1]
IGNORE: H

IF: correct electrode products reversed = 1 mark

[Total: 9]

7 (a) Any four of:

- evaporates or evaporation (of hydrogen chloride)
- movement of particles
- hydrogen chloride particles (move) / HCl particles (move)
  ALLOW: hydrochloric acid particles (move)
- diffusion
- particles collide (with each other)
- spreading out of particles
- random (movement of particles)
- HCl particles hit litmus
- **ALLOW**: (HCl) particles (move from higher) to lower concentration

ALLOW: molecules or atoms in place of particles

NOTE: no mark for acid turning damp blue litmus red
NOTE: hydrogen chloride particles move = 2 mark
NOTE: random movement of hydrogen chloride particles = 3 marks [4]

(b) ammonium chloride [1]
REJECT: ammonia chloride

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(c) (i) iron + hydrochloric acid → iron(II) chloride + hydrogen [1]
IGNORE: symbol equation

REJECT: iron chloride

(ii) add sodium hydroxide (solution / aqueous) ammonia; [1]
ALLOW: add ammonium hydroxide

greyish-green precipitate [1]
ALLOW: green ppt.
IGNORE: what happens in excess reagent
NOTE: second mark dependent on first being correct

(d) (i) control / standard / idea of making fair comparison [1]

(ii) water / H_2O [1]

air / oxygen / O_2 [1]
IGNORE: O
APPLY: listing for other incorrect substances

(iii) air not present / oxygen not present / water not present [1]

(iv) air and water can get to the surface of the iron / oxygen and water can get to the iron [1]
IGNORE: ideas that not all surface is protected

[Total: 13]

8 (a) (i) better conductor ORA [1]
IGNORE: it conducts / good conductor
IGNORE: it is softer / easier to draw into wire

(ii) too expensive / higher cost [1]
IGNORE: it has a low melting point

(iii) higher melting point; [1]
IGNORE: high melting point

cheaper [1]

(iv) (plastic) is an insulator; [1]
explanation of insulator, e.g. does not conduct electricity [1]
ALLOW: so you don't get an electric shock

(b) B [1]

[Total: 7]

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