CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2015 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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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

(ii) A [1]

(iii) B [1]

(iv) C [1]

(v) D [1]

(b) It has only one type of atom / it cannot be broken down into any other substance by chemical means [1]

[6 marks]

2 **(a)** **(i)** Any value within the range: 190–490 °C (actual = 337 °C) [1]

(ii) gas [1]

(b) **(i)** chlorine + potassium iodide → iodine + potassium chloride. [2]

(ii) iodine is less reactive than chlorine / chlorine is more reactive than iodine [1]

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

(ii) sodium (atom) loses an (outer) electron; [1]
iodine (atom) gains an (outer) electron [1]
note: an electron is transferred from a sodium (atom) to an iodine atom scores 2 marks

[8 marks]

3 **(a)** Any **four** from: [4]
- column becomes eroded / column is being eaten away
- sulfur from burning of fossil fuels
- (forms) sulfur dioxide / nitrogen dioxide
- sulfur dioxide / nitrogen dioxide (dissolved in rainwater)
- to form acid rain / acidic solution formed
- acid reacts with the limestone / acid decomposes limestone
- carbon dioxide given off
- calcium sulfate formed

note: marks can be obtained from relevant equations e.g.
sulfur + oxygen → sulfur dioxide scores 1 mark
sulfur dioxide + water → (sulfurous) acid scores 1 mark
calcium carbonate + sulfuric acid → calcium sulfate + water + carbon dioxide scores 3 marks

(b) Any **two** from:
painting / oiling / covering with plastic / coating with zinc or another (more reactive) metal [2]

Prevents oxygen (air) and / or water getting to the surface [1]

(c) Any **two** from: [2]
- forms coloured compounds
- forms ions with different charges / variable valency
- catalytic activity
- forms complex ions
- (very) high density

(d) 26 electrons [1]
32 neutrons [1]
electron negatively charged / – [1]
proton positively charged / + [1]

(e) H_2 on right [1]
2(HC*l*) on left (dependent on H_2 or 2H on right) [1]

[15 marks]

4 **(a)** N and P / nitrogen and phosphorus [1]

(b) **(i)** burette [1]

(ii) **allow**: any pH value below pH7 [1]

(iii) pH decreases [1]

(iv) neutralisation [1]

(c) $3(NH_3)$ [1]
(3) H_2O [1]

[7 marks]

5 **(a)** **(i)** calcium / Ca^{2+} [1]

(ii) iodide [1]

(iii) calcium and magnesium / Ca^{2+} and Mg^{2+} [1]

(iv) Any **two** from: [2]
bromide / chloride / iodide / sulfate

(b) **(i)** graphite conducts electricity / graphite is inert / graphite is unreactive [1]

(ii) hydrogen [1]

(iii) structure of chlorine completely correct (1 bonding pair of electrons and 6 unbonded electrons the right hand chlorine atoms) [2]

(c) anode: bromine [1]
cathode: magnesium [1]

[11 marks]

6 **(a)** so as not to harm the skin / idea of causing harm or being poisonous [1]

(b) **(i)** removal of oxygen from a compound / gain of electrons / decrease in oxidation number [1]

(ii) zinc oxide + carbon → zinc + carbon monoxide [1]

(iii) poisonous gas formed / carbon monoxide formed [1]

(c) lead < nickel < zinc < magnesium [2]

(d) water [1]

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

(ii) Any **three** from: [3]
- evaporate until first crystals seen / heat to crystallisation point / evaporate of some of the water
- leave to crystallise / leave in a warm place
- pick out crystals / filter off crystals
- dry between filter paper

(iii) zinc carbonate / zinc hydroxide [1]

(f) (i) 64.4 g [1]

(ii) 161 [2]

[15 marks]

7 (a) (i) X placed in the bottom 'cell' of the column [1]

(ii) naphtha [1]

(iii) waxes / polishes [1]

(b) last two boxes ticked [2]

(c) (i) Any **two** from: [2]
- decomposition / breaking down (of alkanes)
- of alkanes / hydrocarbons
- idea of longer chains being converted to shorter chains / larger molecules being converted to smaller molecules
- alkenes formed / hydrogen formed

(ii) C_3H_6 [1]

(d) (i) structure of ethene correct [1]
structure of ethanol correct [1]

(ii) reversible reaction / equilibrium reaction [1]

[11 marks]

8 **(a)** Any **three** from: [3]

- particles in the crystal separate (in the water) / particles in the crystal dissolve
- particles of potassium manganate(VII) become free to move
- diffusion
- particles move randomly / in any direction / mix with the water
- particles collide with water molecules
- particles spread out
- particles move from where they are in high concentration to where they are in low concentration

(b) closeness: close together / touching / tightly packed [1]
motion: vibrating / do not move (from place to place) [1]

(c) X on the base line and solvent level below the base line and above the bottom of the chromatography paper [2]

[7 marks]