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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

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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]

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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]

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(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]

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(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]

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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]

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