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Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0620 CHEMISTRY

0620/23 Paper 2 (Core Theory), maximum raw mark 80

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1 **(a)** **(i)** B and D [2]

(ii) A [1]

(iii) C [1]

(iv) A [1]

(v) D [1]

(b) KBr [1]
allow: K^+Br^-

(c) 146 [2]
allow: 1 mark for correct atomic masses 19 and 32

[Total: 9]

2 **(a)** Any **four** from: [4]
solids: particles close together / no space between particles / particles arranged regularly / particles touching
solids: particles only vibrate
allow: particles cannot move / particles in fixed positions
liquids particles can slide over each other / particles have limited movement
ignore: particles can move unqualified
liquids: particles close together / particles not arranged regularly / particles arranged randomly / particles not in fixed positions
ignore: particles further apart than in solids
gases: particles far apart / particles arranged randomly
gases: particles can move everywhere / particles move anywhere / particles move randomly
note: It must be clear which state is being referred to
note: there must be reference to particles (or atoms / molecules / ions) in the answer to gain marks

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

(ii) E and F [2]
allow: B

(iii) C and E [2]

(iv) B and F [2]

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(c) (i) 4^{th} box down (last box) ticked [1]

(ii) argon is unreactive / inert [1]

air (or oxygen) may oxidise metals / air (or oxygen) may react with the (hot) metals / to prevent the air (or oxygen) reacting with the metals [1]

[Total: 14]

3 (a) (i) mortar [1]
allow: mortar and pestle

(ii) any suitable solvent other than water e.g. ethanol [1]
allow: ethanoic acid / aqueous ammonia
ignore: hydrochloric / sulfuric / nitric acids / strong alkalis / aqueous solutions of salts

(iii) evaporate some of the solvent [1]
allow: evaporate / heat
allow: add more rhubarb

(b) (i) it would dissolve / it would mix with the solvent / solvent would wash it off / so that the spot / Y didn't dissolve in the solvent / Z would dissolve in the solvent [1]

(ii) any **two** from: [2]

dip paper into the solvent
put lid on jar
let solvent run up paper / let solvent separate spots
ignore: wait for spots to appear / spots start to spread (unqualified)
take paper out before solvent reaches the top / record solvent front
ignore: reference to R_f values / locating agents

(c) (i) ring around one or both carboxylic acid groups; [1]
do not allow: ring around whole structure

(ii) $C_2H_2O_4$ [1]
ignore: $(COOH)_2$

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(d) (i) H_2O [1]

(ii) CO and CO_2 are gases / CO and CO_2 are given off / the products are gases (and water) [1]
ignore: other substances evaporated

(iii) any suitable source e.g. respiration / burning fuels / burning named carbon-containing fuel / from limekilns or other suitable decomposition reaction [1]
ignore: from burning (unqualified) / exhaled air / animals (unqualified)
allow: from car exhausts

(iv) any two of: [2]
it is a greenhouse gas / absorbs infrared radiation
allow: warms the atmosphere / traps heat in the atmosphere

causes global warming / increase temperature of the atmosphere
allow: warms the atmosphere / traps heat in the atmosphere
reject: absorbs heat from the Sun

effects of global warming e.g. desertification / rise in sea level / more extreme weather / climate change
ignore: references to ozone layer

[Total: 13]

4 (a) filter funnel with filter paper + container to collect filtrate [1]

correct labels for two of: (filter) funnel, filter paper, baker or flask [1]
ignore: incorrect labels
ignore: filtrate / water / sand

(b) (i) potassium nitrate [1]

(ii) Na^+ and CO_3^{2-} (both required) [1]

(iii) sodium chloride [1]

(iv) total mass = 20 g [1]
% by mass = 14% [1]
allow: error carried forward from incorrect total mass

(c) (i) CO_2 [1]

(ii) pH 12 [1]

[Total: 9]

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5 **(a)** alcohol(s) / alkanol [1]

(b) O–H [1]
allow: OH

(c) **(i)** 3 (H_2) [1]

(ii) (hydrogen is) flammable / explosive [1]
allow: fire hazard

(CO is) poisonous / toxic [1]
ignore: CO harmful

(d) **(i)** decreases [1]
then remains constant [1]

(ii) 0.28 (mol / dm^3) [1]

(iii) **allow:** values between 44–46 (hours) [1]

(iv) curve steeper at start; [1]

curve levels out at same level and before 45 hrs [1]

(e) bonding pair of electrons between H and C*l* [1]
do not allow: if extra electrons on the H atom

Six non-bonding electrons around the C*l* [1]
ignore: inner shell electrons in C*l*

[Total: 13]

6 **(a)** **(i)** <u>acidic</u> oxide because oxide of non-metal [1]

(ii) Any **three** from: [3]
sulfur dioxide reacts with water in air / reacts with water on surface of building / forms acid rain
allow: sulfur dioxide is acidic / it is acidic
limestone is a carbonate
idea of reaction of acid with limestone / carbonate
carbon dioxide (+ salt + water) formed

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(b) (i) carry out in fume cupboard [1]

(ii) speeds up reaction [1]

(iii) O_2 (on left) [1]

correct balance (2 on right) [1]
note: second mark dependent on O_2 or 2O on left

(iv) to prevent it turning into liquid / vapour [1]
allow: so temperature is below melting point / so that it can form crystals

(v) 200 g [1]

(c) (i) 4th box down ticked (pipette) [1]

(ii) indication that indicator changes colour [1]
allow: any stated colour change

(d) water absorbed [1]

[Total: 13]

7 (a) Any **four** from: [4]
colour gets darker down the Group
correct colours of two of the halogens (chlorine green / yellow green + bromine brown / reddish-brown + iodine grey / grey-black / black)
note: all three halogen colours correct is 2 marks
correct state of two of the halogens (chlorine gas, bromine liquid, iodine solid)
note: all three states correct is 2 marks
reactivity decreases down the Group
allow: any two differences in reactivity correctly compared e.g. chlorine is more reactive than bromine (1 mark maximum)
do not allow: mention of incorrect difference in reactivity
example of reactivity of pair of halogens / halides e.g. chlorine reacts with potassium bromide
allow: density increases down Group
allow: boiling points / melting points get higher down the Group

(b) diatomic [1]

(c) 7 electrons in the outer shell [1]

2 electrons in inner shell [1]
note: this mark cannot be obtained if other inner shells are drawn

(d) bromine + potassium iodide → iodine + potassium bromide [2]

[Total: 9]

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