CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0620 CHEMISTRY

0620/23 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)** Ar / argon; [1]
allow: Ne / neon

(ii) S / sulphur; [1]

(iii) I / I_2 / iodine; [1]
allow: P / phosphorus

(iv) N / N_2 / nitrogen; [1]

(v) He / Ne / Ar / helium / neon / argon; [1]

(vi) H / H_2 / hydrogen; [1]

(b) **(i)** $H_2 + Cl_2 \rightarrow 2HCl$;; [2]
if 2 marks not scored: Cl_2 on left / $H_2 + 2Cl \rightarrow 2HCl$ (1 mark)

(ii) correct dots and cross diagram for Cl_2;; [2]
allow: 1 pair of shared electrons between 2 (Cl) atoms for 1 mark is 2 marks not scored

[Total: 10]

2 **(a)** **(i)** ring around –COOH group; [1]

(ii) $C_2H_4O_2$; [1]
(atoms can be in any order)
ignore: CH_3COOH / CH_2O

(b) neutralisation / acid-base; [1]
allow: acid-alkali reaction
ignore: exothermic / endothermic

(c) dissolves (in water / liquid); [1]
ignore: mixes / solute
reject: reacts with water

(d) pH3; [1]

(e) carbon dioxide; water; [2]
allow: correct formulae
apply: listing

(f) Na_2CO_3; [1]
allow: CO_3Na_2

[Total: 8]

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3 **(a)** solvent line shown below the spot and above the bottom of the paper; [1]

(b) **(i)** chromatography; [1]

(ii) 4 spots shown above position of original spot; [1]
allow: one spot drawn in on base line

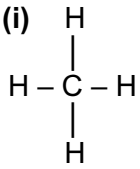
spots vertically above the position of the original spot; [1]

solvent front as horizontal line above all the spots; [1]
allow: solvent front near the top of the paper as horizontal line if no spots drawn
allow: top spot on solvent front

(c) unsaturated **and** because it has a (C=C) double bond; [1]

[Total: 6]

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



(ii) gas which causes global warming / increases temperature of atmosphere; [1]
allow: it causes the atmosphere to heat up / causes Earth's temperature to increase / traps heat in

(iii) from digestion of cows / sheep etc. / marshes / rice paddy fields / bacteria; [1]
allow: (animal or bacterial or plant) decay / from animals / from petroleum deposits underground / from natural gas
ignore: from decomposition

(iv) 800 (g); [1]

(b) **(i)** has a double headed arrow / has ⇌ sign; [1]
allow: arrows go both ways / has the reversible symbol
allow: can change reaction (conditions) to go from one side or another

(ii) reaction which goes backwards as well as forwards / goes both ways; [1]
allow: goes backwards as well
ignore: goes backwards unqualified / a reaction that can be undone / A reaction that can be reversed

(iii) car exhausts / car engines / product of incomplete combustion of fuels / any named heating appliance burning carbon-containing fuels / zinc extraction / iron extraction; [1]
ignore: fuels (unqualified) / cars (unqualified)

(iv) acidic **and** because oxides of non-metals are acidic / carbon is a non-metal [1]

[Total: 8]

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5 (a) (i) steam / water; [1]

(ii) high temperature / heat / stated temperature 200 °C or above; [1]
catalyst; [1]
ignore: names of catalysts
ignore: pressure

(b) (i) glucose (on left); [1]
allow: sugar / carbohydrates
ignore: starch
ignore: formulae

carbon dioxide (on right); [1]
ignore: formulae

(ii) catalyst / description of catalyst; [1]

biological / protein / from living things; [1]
note: second mark is dependent on the first being correct

(c) (i) increase up to 40 °C then decreases; [3]
if full marks not scored:
increases then decreases / best at 40 ° and slower when cold and very hot = 2 marks
maximum at 40 °C / decreases above 40 °C / maximum at 40 ° = 1 mark

(ii) any two of: [2]
amount of yeast / catalyst / enzyme
amount (or concentration) of glucose / sugar
ignore: amount of food available
amount (or volume) of water / amount (or volume) of solution
allow: temperature (during each experiment)
ignore: room temperature
allow: pH
ignore: particle size of sugar
ignore: time / size of container

(d) (i) points correctly plotted;; [2]
(–1 per error / omission)
single gently curved line between the points and not extrapolated to 0 [1]

(ii) line drawn in part **(i)** correctly extrapolated with correct value from the extrapolation [1]
(value if part **(i)** correct is 138 (°C))

[Total: 16]

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6 **(a)** **(i)** petrol (in a few countries) / paints / (old) water pipes; [1]
allow: zinc refining / cars / fuels in cars / car exhausts / car engines

(ii) poisonous / damage to nerves / brain / learning difficulties; [1]

(b) **(i)** lead(II) oxide + carbon → lead + carbon monoxide; [1]
allow: lead oxide on left
ignore: carbon oxide / symbol equation
reject: wrong oxidation numbers

(ii) it loses oxygen / the lead decreases in oxidation number / the lead gains electrons; [1]
ignore: carbon is oxidised / lead oxide goes to lead

(iii) it needs heat / absorbs heat; [1]
allow: absorbs energy / products have more energy than reactants

(c) filter funnel + filter paper (in drawings or words); [1]
lead iodide shown on filter paper; [1]

(d) 82 protons + 82 electrons; [1]
122 neutrons; [1]

[Total: 9]

7 **(a)** silver rod; [1]

(b) silver rod: gets smaller / gets thinner / loses mass; [1]
allow: corrodes

iron spoon: gets coated with silver / increases in mass / gets thicker; [1]
allow: gets bigger

(c) to prevent corrosion / to make them look nicer (or shiny) / to make (the surface) harder / to make (the surface) more resistant to chemicals; [1]
allow: to prevent rusting / to prevent reactions / to reduce reactivity / to make more durable
ignore: protective layer

(d) silver atoms lose electrons / 3rd box down ticked; [1]

(e) add nitric acid to the solution; [1]
allow: acidify the solution
reject: add hydrochloric acid / sulfuric acid / phosphoric acid

(on addition of silver nitrate) precipitate formed; [1]

white (precipitate); [1]
note: second and third marks are independent of the fist mark

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(f) any 2 of: [2]
conducts heat / conducts electricity /
malleable / can be beaten into different shapes / can be bent (without breaking)
ductile / can be drawn into wires
high density / dense
sonorous / rings when hit
allow: high density
ignore: solid
ignore: shiny / high melting point / high boiling point / hard / strong

[Total: 10]

8 **(a)** **(i)** A / at the top; [1]

(ii) C; [1]

(iii) D; [1]
allow: E

(b) any 5 of: [5]
haematite / other named ore of iron
limestone / calcium carbonate
coke / carbon / coal
(coke) burns in air / oxygen
carbon monoxide formed
carbon monoxide (or carbon) converts the iron ore (or iron oxide)
(this is a) reduction reaction
iron oxide / haematite reacts with carbon monoxide
to form iron and carbon dioxide
limestone forms calcium oxide (on heating)
calcium oxide reacts with impurities in ore
(to form a) slag / calcium silicate
ignore: air
note: to gain the marks, the answers must be in the correct context.
marks can also be scored from word equations or symbol equations (which do not have to be correctly balanced)
carbon + oxygen → carbon monoxide = 3
carbon dioxide + carbon → carbon monoxide = 2
calcium carbonate → calcium oxide + carbon dioxide = 2
calcium oxide + silicon dioxide → calcium silicate / slag = 2
iron oxide + carbon monoxide → iron + carbon dioxide = 2

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(c) (i) iron chloride; [1]
ignore: oxidation numbers
hydrogen; [1]
apply: listing

(ii) sodium hydroxide; [1]

(grey)-green precipitate; [1]
note: second mark is dependent on the correct reagent

(d) steel made by blowing oxygen through molten iron / last box ticked; [1]

[Total: 13]

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