CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0620 CHEMISTRY

0620/32 Paper 3 (Extended 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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October / November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

Page 2	Mark Scheme	Syllabus	Paper
	IGCSE – October/November 2013	0620	32

1 (a) C **and** F [1]

(b) A [1]

(c) B [1]

(d) D [1]

(e) E [1]

(f) A **and** D [1]

[Total: 6]

2 (a) (i) two atoms per molecule [1]

(ii) 7e in outer shell or level / same number of outer electrons / need to gain one electron [1]

(iii) different number of energy levels / different number of electrons [1]

(iv)

halogen	solid, liquid or gas at room temperature	colour
chlorine	gas	yellow / yellow green / green
bromine	liquid	brown / red-brown / orange-brown not: red / orange
iodine	solid	black / grey / silver-grey / purple / violet **NOT**: blue-black

NOTE: one mark for each vertical column [2]

(b) correct formula, AsF_3 [1]
3nbps and 1bp around all 3 fluorine atoms [1]
3bps and 1nbp around arsenic atom [1]

(c) (increased) light increases / causes forward reaction / light causes AgC*l* reacts with CuC*l* [1]
(increased) light increases the amount of silver (and so darkens glass) [1]
decrease in light reverses reaction / uses up silver / silver reacts (and so reduces darkness) [1]

[Total: 11]

3 (a) (i) the (forward) reaction is endothermic [1]

(ii) none [1]
volume of reactants and products the same [1]
ACCEPT: number of moles or molecules

(iii) the reaction (between oxygen and nitric oxide) is exothermic [1]
high temperatures push equilibrium to left / high temperatures decrease yield of products / low temperatures favour forward reaction [1]

(iv) $4NO_2 + O_2 + 2H_2O \rightarrow 4HNO_3$ [2]
not balanced = (1) only

(v) (cost of) high amount of electricity / energy [1]

(b) (i) contains more nitrogen [1]

(ii) photosynthesis [1]
chlorophyll is catalyst / chlorophyll absorbs light [1]
carbon dioxide and water react [1]
to make glucose / carbohydrates / starch / sugar / named sugar [1]

[Total: 13]

4 (a) Any one of:
$Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$
$2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$
$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
for correct equation (2)
not balanced = (1) only

any four of:

coke burns to form carbon dioxide / $C + O_2 \rightarrow CO_2$

this reacts with more carbon to form carbon monoxide / $C + CO_2 \rightarrow 2CO$

calcium carbonate decomposes to form calcium oxide and carbon dioxide / $CaCO_3 \rightarrow CaO + CO_2$

calcium oxide / calcium carbonate reacts with silica / silicon oxide / silicon(IV) oxide (in ore) to form calcium silicate / slag / $CaO + SiO_2 \rightarrow CaSiO_3$ **or** $CaCO_3 + SiO_2 \rightarrow CaSiO_3 + CO_2$

the reaction between carbon and oxygen is exothermic / produces heat / coke is used as a fuel / the slag floats on the (molten) iron / the slag and molten iron can be run off separately [6]

(b) (i) greenhouse effect / CO_2 is a greenhouse gas [1]
global warming / ice caps melting / suitable example [1]

(ii) burning or combustion of charcoal produces carbon dioxide [1]
trees use carbon dioxide (in photosynthesis) [1]

(iii) cathode reaction $Fe^{3+} + 3e \rightarrow Fe$ [1]

anode reaction $2O^{2-} \rightarrow O_2 + 4e$ [2]
not balanced = (1) only

[Total: 13]

5 (a) because they have more than one oxidation state or valency / form ions with different charges [1]

there are two iron oxides (iron(III) oxide and iron(II) oxide) / iron forms Fe^{2+} and Fe^{3+} compounds / iron forms iron(II) and iron(III) compounds [1]

(b) (i) to remove the precipitate / remove the silver(I) chromate(VI) / remove the residue [1]

(ii) to remove soluble impurities / remove named soluble salt e.g. potassium nitrate / remove reactants [1]

(iii) to dry solid / to remove water [1]

(c) (i) need one mole of potassium chromate(VI) for two moles of silver(I) nitrate / correct references to mole ratio [1]

(ii) mass of $AgNO_3$ needed is $170 \times 0.2 \times 0.1 = 3.4$g [2]
NOTE: if answer given is 34 they have omitted 0.1
ALLOW: (1) ecf

(iii) number of moles of $AgNO_3$ used = $0.02 \times 0.2 = 0.004$ [1]

number of moles of Ag_2CrO_4 formed = 0.002 [1]

mass of one mole of Ag_2CrO_4 = 332g

mass of Ag_2CrO_4 formed = 0.664g [1]
NOTE: use ecf when appropriate

[Total: 11]

6 **(a)** **(i)** $Cu(OH)_2 \rightarrow CuO + H_2O$ [1]

(ii) Rb [1]

(b) **(i)** electron loss [1]

(ii) because they can accept electrons [1]

(c) **(i)** copper and mercury [1]

(ii) add copper / mercury / metal to (named) acid **and** no reaction / no bubbles / no hydrogen [1]

(d) **(i)** Mn [1]

(ii) (solution) becomes colourless / decolourises
NOT: clear [1]

[Total: 8]

7 **(a)** **(i)** contains only carbon, hydrogen and oxygen [1]
hydrogen (atom) to oxygen (atom) ratio is 2:1 [1]
ALLOW: C:H:O as 1:2:1 or $C_n(H_2O)_n$

(ii) condensation [1]
polymerisation [1]

(b) **(i)** cells / micro-organisms / plants / animals / metabolic reactions [1]
obtaining energy from food / glucose / nutrients [1]

(ii) $2C_2H_5OH + 2CO_2$ [2]
allow: C_2H_6O for C_2H_5OH
not balanced = (1) only

(iii) to prevent aerobic respiration / to get anaerobic respiration / to prevent ethanoic acid / lactic acid / carboxylic acids being formed / to prevent oxidation of ethanol [1]

(c) displayed formula of methyl butanoate [2]
NOTE: all bonds must be shown
NOTE: award (1) if error in alkyl groups but correct displayed structure of –COO–

(d) **(i)** alcohol, e.g. glycerol, circled [1]
ALLOW: if only part of glycerol molecule is circled as long as it involves an OH group

(ii) saturated
correct reason based on group $C_{17}H_{35}$ / all C–C bonds / no C = C bonds [1]

(iii) salt / carboxylate / alkanoate [1]
(making) soap [1]
ACCEPT: detergent / washing

(e) at least one correct amide linkage –CONH– [1]
continuation shown at both ends of chain [1]
diagram showing three (different) amino acid residues [1]

[Total: 18]