

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2015 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 March 2015 series for most Cambridge IGCSE® components.

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- 1 (a) chlorine/argon
- (b) chlorine
- (c) magnesium [1]
- (d) argon [1]
- (e) aluminium [1]
- (f) sodium [1]
- [Total:6]

- 2 (a) Atoms of the same element/ atoms with same proton number/ atoms with same atomic number [1]
- different neutron number/ nucleon number/ mass number [1]

(b)

particle	number of protons	number of electrons	number of neutrons	nucleon number	symbol or formula
A					
B				23 (1)	Na(1) ⁺ (1)
C		10(1)		16(1)	
D	13 (1)		15 (1)		

[7]

[Total:9]

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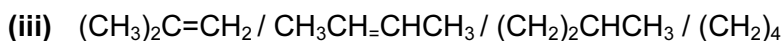
- 3 (a) (making) fertilisers / nitric acid / nylon / explosives / urea
(for) cleaning products (allow oven cleaner) / refrigeration
- (b) equilibrium / reversible [1]
- (c) (nitrogen) air / atmosphere [1]
(hydrogen) methane / water / steam / alkane / named alkane / hydrocarbon / crude oil
or petroleum / natural gas [1]
- (d) iron [1]
- (e) (i) rate increases / faster [1]
More (effective) collisions [1]
(ii) yield decreases [1]
(forward reaction) exothermic / reverse reaction endothermic / high temp
favours endothermic reaction [1]
- (f) (i) yield increases [1]
less / fewer molecules or moles or volume on RHS OR / high pressure
favours reaction which produces fewer molecules or moles or volume [1]
(ii) particles / molecules closer / more particles per unit area or volume / more
molecules per unit area or volume / more concentration / particles have less
space between them **and** more collisions [1]
(iii) safety issues / higher cost [1]
- (g) 3 bond pairs between N & H [1]
Lone pair on N [1]
- (h) (i) proton / H^+ acceptor [1]
(ii) $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$ [2]
Formula of $(NH_4)_2SO_4$ (1)
The rest (1)

[Total:18]

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- 4 (a) (i) 82.76/12 and 17.2(4)/(1)
or evaluation: 6.89 / 6.9(0) and 17.2(4)
- C₂H₅
- OR**
82.76/100 × 58 = 48 and 17.24/100 × 58 = 10
or evaluation i.e. 48 and 10 [1]
- C₂H₅ [1]
- (ii) (C₂H₅ =) 29 [1]
- (58/29 = 2) C₄H₁₀ [1]
- OR:
82.76/100 × 58 = 48 and 17.24/100 × 58 = 10
or evaluation i.e. 48 and 10 [1]
- 48/12 = 4 10/1 = 10 (therefore) C₄H₁₀ [1]
- (b) (i) C_nH_{2n} [1]
- (ii) CH₂ [1]
- (c) (contains) double bond / triple bond / multiple bond(s) / not all bonds are single [1]
- (contains) carbon and hydrogen **only** [1]
- (d) bromine / bromine water [1]
- no change / stays brown / orange / yellow / red-brown or only changes in UV [1]
- (brown / orange / yellow) to colourless / decolourised [1]
- (e) (i) circle / brackets around any 2 consecutive carbon atoms in the main chain and all attached atoms [1]
- e.g.
- The diagram shows the structural formula of butane, CH₃CH₂CH₂CH₃. The first two carbon atoms and their attached hydrogen atoms are enclosed in a rectangular box. The first carbon is bonded to three hydrogens, and the second carbon is bonded to two hydrogens. The third and fourth carbons are each bonded to two hydrogens. The chain continues to the left and right of the first and last carbons, respectively.
- (ii) CH₃CH₂CH=CH₂ / C₂H₅CH=CH₂ (double bond must be shown) [1]
- butene / but-1-ene [1]

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[Total

- 5 (a) Bauxite [1]
- (b) carbon/graphite [1]
- (c) improves conductivity/better conductor [1]
Lower (operating) temperature/save energy/saves electricity/saves heat [1]
- (d) anode: $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^- / 2\text{O}^{2-} - 4\text{e}^- \rightarrow \text{O}_2$ [1]
cathode: $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al} / \text{Al}^{3+} \rightarrow \text{Al} - 3\text{e}^-$ [1]
- (e) (i) Iron carbon aluminium/Fe, C, Al [1]
(ii) Aluminium oxide is not reduced by carbon but iron(III) oxide is [1]
- (f) haematite/hematite [1]
- (g) **Allow:** multiples in (i) to (iv)
- (i) $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$ [1]
- (ii) $\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$ [1]
- (iii) $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2 / \text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow 2\text{Fe} + 3\text{CO} /$
 $2\text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow 4\text{Fe} + 3\text{CO}_2$ [1]
- (iv) $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3 / \text{CaCO}_3 + \text{SiO}_2 \rightarrow \text{CaSiO}_3 + \text{CO}_2$ [1]

[Total:13]

- 6 (a) Any **two** from:
- bubbles/effervescence/fizzing
 - (some of the) solid/copper carbonate dissolves/disappears **or** some (brown) solid seen (undissolved)
 - (colourless) solution or liquid turns blue
- [2]

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(b) filter / centrifuge / decant
 wash with (distilled) water
 (dry with) filter paper / tissues / warm windowsill / in sun / oven / fan / heat [1]

(c) (i) Blue precipitate / ppt [1]

(ii) $\text{Cu}^{2+} + 2\text{OH}^- \rightarrow \text{Cu}(\text{OH})_2$ [1]

(d) (i) $\text{Cu}(\text{OH})_2(\text{s}) \rightarrow \text{CuO}(\text{s}) + \text{H}_2\text{O}(\text{g})$
 Equation [1]

State symbols of correct chemical equation [1]

(ii) carbon / hydrogen [1]

[Total:10]

7 (a) Any **two** from:
 yeast / 20–40 °C / anaerobic or without oxygen or without air / (aqueous)
 solution or water or aqueous [2]

(b) (i) $M_r = 180 (1) (30/180) = 0.167 (1)$ [2]

(ii) 2×0.167 or 2×46 or 0.333 or 92 [1]

$(2 \times 0.167 \times 46) = 15.3(33) (g)$ [1]

(iii) $(2 \times 0.167 \times 24) = 8 (dm^3)$ [1]

(c) (i) Crude oil / petroleum [1]

(ii) $\text{C}_2\text{H}_4 + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{OH} / \text{CH}_3\text{CH}_2\text{OH}$ [1]

[Total:9]