

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0620 CHEMISTRY

0620/32

Paper 3 (Extended Theory), maximum raw mark 80

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- 1 (a) foodstuffs or drugs [1]
- (b) (i) simple distillation
fractional distillation **or** diffusion
fractional distillation
filtration **or** evaporation
chromatography [5]
- (ii) M1 dissolving
M2 filtration
M3 evaporation or heat (to crystallisation point)
M4 crystallisation or allow leave to cool [4]
or
M3 crystallisation
M4 filtration
- OR:** Adding to H₂SO₄ method
- M1 Add excess mixture to acid (or until no more dissolves)
M2 Filtration
or
M1 Add excess acid to mixture
M2 With heat
- M3 evaporation or heat (to crystallisation point) Stop marking if heated to dryness.
M4 crystallisation or allow leave to cool
or
M3 crystallisation
M4 filtration
- [Total: 10]**
- 2 (a) $Al^{3+} + 3e^{-} \rightarrow Al$ [2]
species (1) balancing (1)
- (b) (i) $AlCl_3 + 3Na \rightarrow 3NaCl + Al$ [2]
species (1) balancing (1)
- (ii) M1 electrolysis [1]
M2 molten sodium chloride [1]
or
M1 Add named more reactive metal (e.g. K)
M2 Molten sodium chloride
- (c) (i) bauxite [1]
- (ii) M1 aluminium oxide / amphoteric oxide dissolves **OR** iron(III) oxide / basic oxide does not [1]
M2 Filter **COND** on M1 [1]

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(iii) Any **two** from:
 Lowers (working) temperature or lowers mpt (of mixture)
 increases conductivity
 reduces cost OR energy need [2]

(iv) M1 = Any one correct equation.

M2 Oxygen mark
 Oxygen comes from oxide ions
 or $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$

M3 Carbon dioxide mark
 Anode reacts with oxygen / burns to form CO_2
 or $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$

M4 Carbon monoxide mark
 Anode reacts with limited oxygen / incompletely burns to form carbon monoxide
 or $2\text{C} + \text{O}_2 \rightarrow 2\text{CO}$
 or CO_2 reacts with the anode to form carbon monoxide
 or $\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$

M5 Fluorine mark
 Fluorine comes from cryolite or fluoride ions
 or $2\text{F}^- \rightarrow \text{F}_2 + 2\text{e}^-$ [5]

(d) (i) Has an impervious **or** non-porous **or** passive **or** unreactive **or** protective oxide layer [1]

(ii) Any **two** from:
 good conductor of heat
 high melting point
 Unreactive towards foods [2]

3 (a) (i) C_4H_8 only
 CH_2 (Allow C_1H_2) [2]

(ii) Any unambiguous structural formula of methyl cyclopropane or but-1-ene or but-2-ene or methyl propene [1]

(iii) M1 same molecular formula [1]

M2 different structural formulae or different structures
 or different arrangement of atoms [1]

(iv) If 'No':
 one an alkane, the other an alkene
or
 one is saturated / has single bonds, the other is unsaturated / has a double bond
 ignore: references to the 'functional group'

If 'yes'
 both alkanes **or** both saturated
 ignore: references to the 'functional group' [1]

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(b) (i) M1 Action of heat or catalyst or thermal decomposition (on an alkane) [1]
Ignore steam. Ignore pressure.

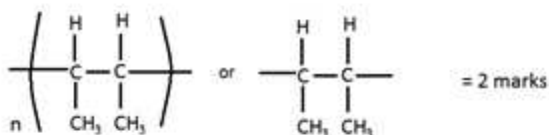
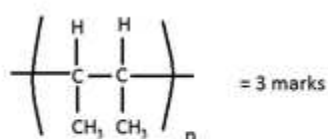
M2 Long-chained molecules or alkanes form smaller molecules (not smaller fraction) or forms smaller alkenes (or alkanes) [1]

(ii) C₁₀H₂₂ [1]

(c) (i) M1 Correct structure of one repeat unit [1]

M2 Continuation bonds **COND** on M1 [1]

M3 use of brackets and subscript 'n' **COND** on M1 and M2 [1]



(ii) dibromoethane or 1,2-dibromoethane [1]

4 (a) M1 brass [1]

M2 copper **COND** on M1 [1]

(b) (i) $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$ [2]
species (1) balancing (1)

(ii) Manufacture of sulfuric acid
or bleach or making wood pulp or making paper
or food or fruit juice or wine preservative
or fumigant or sterilising [1]

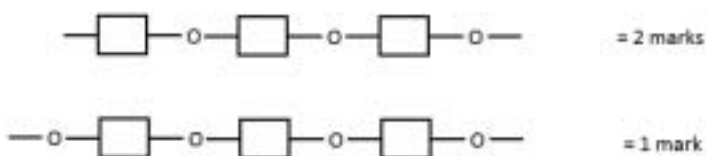
(c) (i) sulfuric acid [1]

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- 4 (c) (ii) $Zn^{2+} + 2e \rightarrow Zn$ [1]
oxygen or water Allow O_2 and H_2O if no name seen [1]
sulfuric acid [1]
Allow: H_2SO_4 if no name seen
- 4 (d) (i) from zinc to carbon [1]
(clockwise direction on or near the wire)
- (ii) to allow ions to flow [1]
- (iii) oxidation [1]
and loss of electron(s) or increase in oxidation number/state
- reduction [1]
and decrease in oxidation number/state or gain of electron(s)

[Total: 13]

- 5 (a) (i) M1 Contain carbon, hydrogen and oxygen (only) [1]
M2 hydrogen and oxygen is in a 2:1 ratio (or in the same ratio as water) [1]
- (ii) M1 -O- linkage [1]
M2 3 monomer units with 3 blocks and 3 Oxygen atoms **Cond** [1]



- 5 (b) catalyst [1]
biological or protein [1]
- 5 (c) (i) C A B [2]
ABC = 1 ACB = 1 BCA = 1 CBA = 1 BAC = 0
Allow 70 for C, 40 for B and 20 for A
- (ii) M1 Energy mark: at higher temperature particles/molecules more have more energy or move faster [1]
M2 Collision frequency mark: collide more frequently/often **or** more collisions per unit time **or** higher rate of collisions. [1]
Ignore: 'more collisions'
- M3 Collision energy mark: more molecules have enough energy to react or more collisions are above activation energy or successful [1]

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(iii) C rate zero or enzymes denatured [1]

[Total: 12]

6 (a) making fertilisers or pickling metals or making fibres or making phosphoric acid/phosphates making dyes or making paints/pigments/dyes or making paper making plastics or making detergents or tanning leather or battery acid. [1]

(b) (i) add water (to yellow solid or to (anhydrous) iron(II) sulfate or to FeSO_4 or to products goes green [1]

(ii) M1 Sulfur trioxide reacts with water to make sulfuric acid or equation [1]

M2 sulfur dioxide reacts with oxygen to form sulfur trioxide or equation [1]

(iii) M1 = 2.07 Allow 2.1 or 2.0666...7

M2 = 62.8.g

M3 =(M2/152 =) 0.41(3)

M4 (=M1/M3) rounded to the nearest whole number $\times = 5$ [4]

6 (c) (i) nitric acid or nitric(V) acid or HNO_3 [1]

(ii) $2\text{KNO}_3 = 2\text{KNO}_2 + \text{O}_2$ [2]
Species (1)
Balance (1)

[Total: 12]