

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2002

INTERNATIONAL GCSE

MARK SCHEME
MAXIMUM MARK : 80
SYLLABUS/COMPONENT : 0620/3 CHEMISTRY (EXTENDED)



UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

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In the mark scheme if a word or phrase is underlined it (or an equivalent) is required for the award of the mark.

(.....) is used to denote material that is not specifically required.

OR designates alternative and independent ways of gaining the marks for the question.

or indicates different ways of gaining the same mark.

COND indicates that the award of this mark is conditional upon a previous mark being gained.

- Unusual responses which include correct Chemistry that answers the question should always be rewarded—even if they are not mentioned in the marking scheme.

- 1 (a) (i) vanadium(V) oxide as catalyst - ignore oxidation state
and accept no oxidation state
temperature 300 to 600 °C
pressure up to 10 atmos, accept atmospheric pressure
volume ratio of gases either 2:1 **or** slight excess of oxygen
ANY three [3]
- (ii) decrease [1]
COND back reaction is endothermic or same argument based on
forward reaction is exothermic [1]
or increase in temp favours back reaction
- (iii) dissolve in (conc) sulphuric acid **NOT** dilute [1]
add water **or** dilute [1]
- (b) sodium hydroxide **or** carbonate **or** hydrogencarbonate [1]
zinc oxide **or** hydroxide **or** carbonate [1]
NOT zinc
barium nitrate **or** chloride **or** hydroxide **or** barium ions [1]
neutralisation **NOT** acid/base [1]
- (c) (i) copper sulphate **or** anhydrous copper sulphate [1]
accept “unhydrated”
NOT formula
(ii) goes blue **or** becomes hot **or** steam [1]
(iii) copper oxide [1]

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- (iv) $5/250 = 0.02$ moles [1]
 Mr = 80 [1]
 $80 \times 0.02 = 1.6$ g [1]
 NB (iv) to be marked **conseq** to (iii)
 Correct answer no working **ONLY** [1]

TOTAL = 17

- 2 (a) (i) high densities
 high fixed points mp or bp
 coloured compounds
 hardness
 complex ions
 ANY three [3]
- (ii) 13 [1]
- (b) (i) manganese chloride [1]
 water [1]
- (ii) manganese(III) and (IV) oxides [1]
- (c) (i) rate decreases or becomes zero [1]
 do **NOT** accept rate increases then decreases
COND concentration decreases [2]
 hydrogen peroxide used up **ONLY** [1]
- (ii) steeper initial gradient [1]
 double final volume [1]
- (iii) initial gradient less [1]
 final volume the same [1]
 must relate to shape of graph

TOTAL = 14

- 3 (a) (i) number of outer electrons increases [1]
 or number of electrons more than complete energy level
 or number of electrons to be lost
 or accept clear examples
NOT just different groups or valencies
- (ii) gain electrons [1]
 number of electrons to be gained is less across period [1]
 or number of outer electrons increases

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- (b) Al_2S_3 [1]
 Si_3P_4 [1]
- (c) (i) silicon [1]
(ii) sodium [1]
(iii) sulphur or chlorine [1]
- (d) unreactive or inert or does not react [1]
- (e) 3Na to 1P [1]
COND next two marks
correct charges [1]
8e around P [1]
If covalent then only one mark for 3Na to 1P
- (f) (i) $11.5/23 = 0.5$ [1]
(ii) 0.25 [1]
conseq to (i)
(iii) $0.25 \times 32 = 8 \text{ g}$ [1]
conseq
(iv) 2.0 g [1]
only conseq to (iii) if answer to (iii) is less than 10
NB If (ii) is 0.3(125), no excess is possible, (iv) **ZERO**

TOTAL = 16

- 4 (a) (i) wiring **NOT** good conductor
pipes
utensils
roofs
electroplating
lightning conductor
bi-metallic strips
NOT coinage metal or any other use than involves an alloy
TWO from above [2]

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- (ii) regular array [1]
different sizes [1]
delocalised or mobile or free electrons [1]
- (b) (i) copper deposited or mass increases [1]
(ii) copper goes into solution or mass decreases [1]
(iii) $\text{Cu}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Cu}$ [1]
(iv) oxygen [1]
sulphuric acid accept hydrogen sulphate [1]
- (c) (ii) cells produce electricity or exothermic or change
chemical energy into electrical energy [1]
electrolysis uses it or endothermic or change
electrical energy into chemical energy [1]
- (d) (i) $\text{CuO} + \text{C} \rightleftharpoons \text{Cu} + \text{CO}$
or $2\text{CuO} + \text{C} \rightleftharpoons 2\text{Cu} + \text{CO}_2$
or any other correct reductant – hydrogen or metal [1]
(ii) Copper(II) hydroxide = copper oxide + water [1]
accept symbols
(iii) $2\text{Cu}(\text{NO}_3)_2 \rightleftharpoons 2\text{CuO} + 4\text{NO}_2 + \text{O}_2$ [2]
unbalanced ONLY [1]
NOT word equation
- TOTAL = 16
- 5 (a) molecular formula [1]
Must be able to give isomers, need not be alkenes
two corresponding isomers [2]
If do not correspond then MAX [2] out of [3]
- (b) (i) ethanol [1]
structure [1]
(ii) ethane [1]
structure [1]
- (c) (i) many simple molecules or monomers [1]
form one large one or macromolecule or chain [1]

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- (ii) addition polymer only one product- the polymer [1]
condensation - polymer and water etc [1]
- (iii) correct unit [1]
COND evidence of polymer in structure eg shows
continuation such as terminal bonds [1]
- (d) (i) water proof **or** impervious **or** flexible **or**
good adhesion **or** non-biodegradable **or** unreactive [1]
- (ii) steel in contact with water **or** air [1]
- (iii) zinc more reactive
oxygen /water reacts with zinc not iron
sacrificial protection
zinc anodic
steel receives electrons from zinc
zinc forms cations
cell
TWO valid points [3]

TOTAL = 17