

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**NOVEMBER 2002**

**INTERNATIONAL GCSE**

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



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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]  
 $M_r = 80$  [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 [1]  
continuation such as terminal bonds
- (d) (i) water proof **or** impervious **or** flexible **or** [1]  
good adhesion **or** non-biodegradable **or** unreactive
- (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