CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2001

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK : 80

SYLLABUS/COMPONENT : 0620/3

CHEMISTRY
(EXTENDED)

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

An incorrectly written symbol, e.g. NA or CL, should be penalised once in a question.

In the mark scheme if a word or phrase is underlined, it (or 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.
All the candidate's work must show evidence of being marked by the examiner.

1 (a) (i) incomplete combustion **or** oxidation [1]
carbon [1]
or fuel
or named fuel that could be used in a vehicle - petrol, etc.

(ii) (carbon monoxide) reacts with oxide of nitrogen [1]
to form carbon dioxide **or** complete combustion [1]

OR equation of type below for both marks
$2NO + 2CO \Rightarrow 2CO_2 + N_2$

OR forms carbon dioxide
or uses carbon monoxide faster

(iii) reduction [1]
COND electron gain **or** decrease in oxidation number [1]

(iv) bromine (water) [1]
colourless **NOT** clear [1]

OR potassium manganate(VII)
pink **or** purple to colourless
OR pink to green

(b) (i) high temperature **or** heat [1]
back reaction endothermic **or** moves to left [1]

OR low pressure
left side has higher volume of gases or more moles of gas

OR remove carbon monoxide
reaction try to replace it

OR energy needed
bonds breaking **or** to decompose $Ni(CO)_4$

(ii) electrolysis [1]

(c) (i) saturated only single bonds **or** substitution reactions [1]
unsaturated contains double bonds **or** addition reactions [1]
accept examples

(ii) ester [1]

(iii) hydrolysis **or** saponification (1)
sodium hydroxide (solution) (1)
heat **or** form glycerol (and soap) (1)
ONLY allow heat if sodium hydroxide given [Max 2]
Any TWO

[Total 16]

2 (a) (i) liquefaction **or** liquid air [1]
fractional distillation [1]

(ii) medical use **or** welding **or** cutting metals **or** diving **or** making steel etc [1]
NOT just respiration or breathing

(b) (i) carbon dioxide + water = glucose and oxygen [1]
Accept carbohydrate NOT starch
If all formulae are correct accept symbol equation

(ii) chlorophyll [1]

(iii) rate of photosynthesis depends [1]
on intensity **or** brightness of light [1]
more light more oxygen **ONLY** [1]

(iv) greater slope [1]
through origin [1]

(v) silver salt or Ag^+ [1]
reduction **or** decomposition **or** silver, Ag, forms [1]
any reference to photography [1]

OR plastics
biodegradable
prevent littler **or** more easily disposed
OR chlorine **or** bromine
alkane
to make chloroalkanes **or** bromoalkanes
OR solar panels to make electricity **ONLY** [2]

(c) *0.02 [1]
0.03 **not conseq** [1]
*0.06 **conseq to above** [1]
3 accept either as ratio or on n = [1]
Accept ratio conseq to answers designated by *

[Total 16]

3 (a) 5 [1]
25 [1]

(b) (i) correct equation [1]
$C_3H_8 + Cl_2 \rightarrow C_3H_7Cl + HCl$

(ii) substitution **or** chlorination **or** halogenation [1]
NOT exothermic

(c) (i) same molecular formula (C_3H_8O) [1]
THEN different structural formulae [1]
some detail about structure - functional group on different carbons [1]

(ii) different boiling points [1]

(iii) (acidified) potassium dichromate **or** potassium manganate [1]
ignore oxidation states

(iv) name of any ester [1]

COND correct structure must relate to name [2]
SF of any ester that does not relate to name only [1]
correct SF of any ester but name mark above not awarded [2]

(d) (i) heat
catalyst (if specified must be correct)
cracking
details of chemistry forms shorter alkane and alkene
any **TWO** [2]

(ii) water / steam accept hydration but not hydrolysis [1]
COND catalyst (if specified must be correct) **or** heat [1]

OR bubble into conc sulphuric acid
add water

[Total 16]

4 (a) (i) heat (ignore air) **or** roast **NOT** burn [1]

(ii) zinc sulphide **or** roast **or** burn **or** sulphur dioxide formed [1]
zinc oxide [1]
reduce with carbon **or** dissolve zinc oxide in sulphuric acid and electrolyse [1]
NOT electrolysis of blende **or** oxide

(b) hydrochloric acid [1]
excess zinc oxide [1]
filter [1]

OR add hydrochloric acid forms (zinc chloride and) water

[Max 2]

(c) (i) brass bronze (2% zinc) diecast alloy [1]

(ii) copper copper aluminium [1]

(d) (i) zinc more reactive than iron [1]
oxygen / water [1]
zinc reacts first [1]

OR any coherent explanation of the type below that has three valid points:
zinc reacts in preference to iron
zinc loses electrons more easily
zinc forms ions more easily
protective layer of zinc oxide
it is more easily oxidised
forms a cell
electron flow from zinc to iron
steel cannot lose electrons
zinc is anodic
sacrificial protection

(e) (i) $Zn - 2e \Rightarrow Zn^{2+}$ [1]

(ii) Higher reactivity metal instead of Zn
or lower instead of iron **or** bigger difference in reactivity **or** increase concentration of acid [1]

(f) (i) hydroxide [1]

(ii) $O_2 + 2H_2O + 4e \Rightarrow 4OH^-$ [2]
unbalanced only [1]
$O_2 + 2H_2O + 2Fe \rightarrow 2Fe(OH)_2$ [2]

[Total 17]

5 (a) (i) bleach [1]

(ii) kills bacteria or germs or micro organisms [1]

(b) (i) double [1]

(ii) both electrons from sulphur or equivalent [1]

(c) 2+ on Mg [1]
2- and 8e on sulphur [1]
1Mg : 1S [1]

(d) (i) completely ionized **or** good proton donor [2]
for explanation based on high concentration of H^+ **or** low pH or proton donor **ONLY** [1]

(ii) word equation correct [2]
water missing **ONLY** [1]
accept correct symbol equation

(iii) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$ [2]
unbalanced [1] **NOT** word equation
or $NaOH + H_2SO_4 \rightarrow NaHSO_4 + H_2O$

(iv) $Mg + 2H^+ \rightarrow Mg^{2+} + H_2$ [2]
molecular equation ONLY [1] **NOT** word equation

[Total 15]