UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2010 question paper for the guidance of teachers

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 must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

UNIVERSITY of CAMBRIDGE
International Examinations

1 **(a)** E [1]

(b) A C E need all three [1]

(c) A [1]

(d) F [1]

(e) C [1]

(f) D F need both but not more [1]

[Total: 6]

2 **(a)** **(i)** heat / roast / combustion / high temperature [1]
accept burn
in air / oxygen [1]
any incorrect Chemistry MAX [1]

(ii) $ZnO + C \rightarrow Zn + CO$ [1]
OR $2ZnO + C \rightarrow 2Zn + CO_2$
the equation must balance, if not [0]
not carbon monoxide as a reactant /

(iii) fractional [1]
distillation [1]

(b) **(i)** making alloys / brass / named alloy which contains zinc [1]

galvanising / sacrificial protection / electroplating [1]
accept galvanising / one specific use which depends on galvanising
zinc coated screws / roofing / buckets / sinks
not just plating other metals

(ii) positive ions / cations [1]
not nuclei / atoms

delocalised / free / mobile or sea of electrons [1]

bond is attraction between (positive) ions and delocalised electrons [1]

it is a good conductor because there are delocalised / free / mobile electrons [1]
Note must be clear that electrons are moving / carry charge / reason why it is a good conductor

[Total: 11]

© UCLES 2010

3 **(a)** volume given off (in that 20 s interval) [1]
divided by 20 [1]
accept 48/20 for [2]
Answer to 3 (a) may appear twice, both in 3 (a) and 3 (b). Please ignore in 3 (b).

(b) 0.6 (cm^3/s) [1]

(c) concentration [1]
of hydrogen peroxide decreases [1]

for hydrogen peroxide used up ONLY [1]
not reagent / reactant

(d) rate increases / doubles [1]
catalyst has bigger surface area / more catalyst particles exposed [1]
more collisions [1]
not more catalyst / higher concentration of catalyst / more molecules of catalyst

OR

volume of oxygen the same [1]
oxygen from hydrogen peroxide (not catalyst) [1]
amount / number of moles the same [1]

OR

amount/mass/volume/number of moles of hydrogen peroxide the same [2]

catalyst chemically unchanged ONLY [1]
reactants have not changed (only the catalyst) [1]
accept catalyst does not react [1]

[Total: 11]

4 **(a)** **(i)** chromium is harder
has higher density
has higher melting point / boiling point / fixed points
stronger
any **TWO** [2]
accept sodium comments
must be comparison chromium is hard [0]

(ii) both chromium and sodium have to be mentioned explicitly or implicitly.
sodium is more reactive is **acceptable**
sodium is a reactive metal is **not acceptable**
chromium has more than one oxidation state, sodium has one
chromium forms coloured compounds, sodium compounds are white / sodium does not
sodium reacts with cold water, chromium does not
chromium forms complex ions, sodium does not
accept chromium has catalytic properties, sodium does not
any **TWO** [2]

© UCLES 2010

(b) (i) appearance/shiny/more attractive/decoration
resist corrosion / rusting
hard surface
any **TWO** [2]
NOT becomes harder / stronger

(ii) $Cr_2(SO_4)_3$ [1]
ignore correct charges on ions

(iii) $Cr^{3+} + 3e \rightarrow Cr$ [2]
Cr^{3+} to Cr only [1]
ignore comments about sulfate ion

(iv) oxygen / O_2 [1]

(v) to replace chromium ions (used to plate steel) / chromium sulfate used up [1]

copper ions replaced from copper anode / solution of copper sulfate does not change [1]
not just that anode is not made of chromium

[Total: 12]

5 (a) (i) contains carbon, hydrogen and oxygen [1]
accept example
ratio 2H : 1O [1]
not contains water
ignore comments about carbon

(ii) living organism / plants and animals / cells [1]
<u>obtain energy</u> from food [1]
not burn negates energy mark

(iii) carbohydrates contain oxygen [1]

(iv) as a fertiliser / manure [1]

(b) (i) 80 cm^3 of oxygen therefore 40 cm^3 of methane [1]
40/60 × 100 = 66.7 % [1]
accept 66 % and 67 %
no ecf

(ii) add sodium hydroxide(aq) / alkali [1]
carbon dioxide dissolves, leaving methane [1]

[Total: 10]

© UCLES 2010

6 **(a)** same general formula
consecutive members differ by CH_2
same chemical properties
same functional group
physical properties vary in predictable way / give trend – mp increases with n etc.
common methods of preparation
any **THREE** [3]

(b) **(i)** they have the same molecular formula [1]
not general formula
different structures / structural formulae [1]

(ii) CH_3-CH_2-CH(OH)-CH_3 / $(CH_3)_3$C-OH [1]
not ether-type structures
NOTE butan-2-ol and 2-methylpropan-2-ol acceptable

(c) **(i)** air/oxygen / (acidified) potassium chromate(VI) /
(acidified) potassium manganate(VII) [1]
must have oxidation states

(ii) carboxylic acid / alkanoic acid [1]
CH_3-CH_2-CH_2-COOH / C_3H_7COOH / $C_4H_8O_2$ [1]
accept C_4H_7OOH

(d) **(i)** measure <u>volume</u> of carbon dioxide [1]
time [1]
accept day / hour for time mark

(ii) increase in temperature / more yeast present / yeast multiplies [1]

(iii) glucose used up [1]
accept sugar **not** reagent / reactant

concentration of ethanol high enough to kill/poison yeast / denature enzymes [1]
not kill enzymes

(iv) to prevent aerobic respiration [1]
/ ethanol would be oxidised / ethanoic acid/ acid formed / lactic acid formed / carbon dioxide and water formed

[Total: 15]

© UCLES 2010

7 **(a)** **(i)** kills microbes / bacteria / fungi / micro-organisms etc. [1]

(ii) as a bleach [1]

(iii) burn / heat sulfur in air / oxygen [1]

(b) oxygen [1]
vanadium oxide / vanadium(V) oxide / vanadium pentoxide [1]
not an incorrect oxidation state
400 °C to 450 °C [1]
water [1]

(c) **(i)** proton donor [1]

(ii) measure pH / use pH paper [1]
sulfuric acid has the lower pH [1]
accept colours / appropriate numerical values

OR

measure electrical conductivity [1]
sulfuric acid is the better conductor [1]

OR

add magnesium / named fairly reactive metal [1]
ethanedioic acid gives the slower reaction [1]
NOTE result must refer to rate not amount

OR

add a carbonate [1]
ethanedioic acid gives the slower reaction [1]
NOTE result must refer to rate not amount

(d) **(i)** how many moles of H_2SO_4 were added = 0.02 × 0.3 = 0.006 [1]

(ii) how many moles of NaOH were used = 0.04 × 0.2 = 0.008 [1]

(iii) sulfuric acid [1]
only mark ecf if in accord with 1:2 ratio and with values from **(i)** and **(ii)**.
reason 0.006 > 0.008/2 [1]
for ecf mark candidate must use 1:2 ratio in answer

(iv) less than 7 [1]

[Total: 15]

© UCLES 2010