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

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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]

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]

(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) [1]
/ chromium sulfate used up

copper ions replaced from copper anode [1]
/ solution of copper sulfate does not change
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]

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]

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]