

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.

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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – October/November 2010	0620	32

- 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 [1]  
in air / oxygen [1]  
any incorrect Chemistry MAX [1]
- (ii)  $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$  [1]  
**OR**  $2\text{ZnO} + \text{C} \rightarrow 2\text{Zn} + \text{CO}_2$   
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]

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – October/November 2010	0620	32

- 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<sup>3</sup>/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]

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – October/November 2010	0620	32

- (b) (i) appearance/shiny/more attractive/decoration  
resist corrosion / rusting  
hard surface  
any **TWO** [2]  
**NOT** becomes harder / stronger
- (ii)  $\text{Cr}_2(\text{SO}_4)_3$  [1]  
**ignore** correct charges on ions
- (iii)  $\text{Cr}^{3+} + 3\text{e} \rightarrow \text{Cr}$  [2]  
 $\text{Cr}^{3+}$  to Cr only [1]  
**ignore** comments about sulfate ion
- (iv) oxygen /  $\text{O}_2$  [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]  
obtain energy from food [1]  
**not** burn negates energy mark
- (iii) carbohydrates contain oxygen [1]
- (iv) as a fertiliser / manure [1]
- (b) (i)  $80 \text{ cm}^3$  of oxygen therefore  $40 \text{ cm}^3$  of methane [1]  
 $40/60 \times 100 = 66.7\%$  [1]  
**accept** 66% and 67%  
**no ecf**
- (ii) add sodium hydroxide(aq) / alkali [1]  
carbon dioxide dissolves, leaving methane [1]

[Total: 10]

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – October/November 2010	0620	32

- 6 (a) same general formula  
consecutive members differ by  $\text{CH}_2$   
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)  $\text{CH}_3\text{-CH}_2\text{-CH(OH)-CH}_3$  /  $(\text{CH}_3)_3\text{C-OH}$  [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 / alkanolic acid [1]  
 $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COOH}$  /  $\text{C}_3\text{H}_7\text{COOH}$  /  $\text{C}_4\text{H}_8\text{O}_2$  [1]  
**accept**  $\text{C}_4\text{H}_7\text{OOH}$
- (d) (i) measure volume 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]

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – October/November 2010	0620	32

- 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<sub>2</sub>SO<sub>4</sub> 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 [1]
- (iv) less than 7 [1]

[Total: 15]