

**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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- 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]

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- 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 (cm³/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]

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- (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]
 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]
obtain energy 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]
 $40/60 \times 100 = 66.7\%$ [1]
accept 66% and 67%
no ecf
- (ii) add sodium hydroxide(aq) / alkali [1]
carbon dioxide dissolves, leaving methane [1]

[Total: 10]

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- 6 (a) same general formula
consecutive members differ by CH₂
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) CH₃-CH₂-CH(OH)-CH₃ / (CH₃)₃C-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]
CH₃-CH₂-CH₂-COOH / C₃H₇COOH / C₄H₈O₂ [1]
accept C₄H₇OOH
- (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]

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- 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 H₂SO₄ 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]