

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the October/November 2008 question paper

0620 CHEMISTRY

0620/31

Paper 31 (Extended Theory), maximum raw mark 80

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- 1 red litmus paper blue [1]
 OR white fumes/smoke with HCl (g) **or** (aq)
- chlorine [1]
- “pop” with a lighted splint **or** burn with a pop **or** goes pop and extinguishes flame [1]
NOT glowing splint
- oxygen [1]
- carbon dioxide [1]
ACCEPT correct formulae
- [Total: 5]**
- 2 (a) 3Na : 1N correct ratio [1]
 correct charges [1]
 8e around N [1]
- if no symbols then must have correct key
 if covalent only mark 1
 ignore electrons around sodium
 if the response includes both a correct and an incorrect answer
 do not select correct one, mark = [0]
- (b) (i) positive ions **or** cations [1]
NOT atoms **or** cores **or** nuclei
 layers **or** lattice **or** regular pattern [1]
 delocalised **or** free **or** mobile electrons **or** sea [1]
- OR** positive ions **or** cations [1]
NOT atoms **or** cores **or** nuclei
 attraction between ions and electrons [1]
 delocalised **or** free **or** mobile electrons **or** sea [1]
 the attraction/electrostatic bonding must be between ions and
 delocalised electrons, between cations and anions does not score
ACCEPT bond if qualified - electrostatic bond, etc.
 if molecular **or** molecules then cannot score cation mark
- (ii) delocalised/free/mobile electrons
or electrons can move [1]
- layers **or** ions **or** atoms **or** particles [1]
NB more flexible than 2(b)(i)
 can slip **or** move past each other **or** bonding non-directional [1]

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- (c) (i) tetrahedral [1]
 1Si : 4O bonded/surrounded, etc. [1]
 1O : 2 Si [1]

NOT molecules of oxygen, etc.

NOT intermolecular forces

ONLY tetrahedral can score for either of the above

Despite what the question states, **ACCEPT** a clear accurate diagram which shows the above three points.

- (ii) hard
 high mp **or** bp
 colourless (**NOT** clear) **or** shiny **or** translucent
 non/poor conductor (of electricity)
 brittle
 insoluble
 any **TWO** [2]
NOT crystalline **or** strong

[Total: 14]

- 3 (a) (i) water **or** moisture **ACCEPT** salty water [1]
 air **or** oxygen [1]

- (ii) galvanising **or** coat with zinc
 tin plate
 chromium plate
 nickel plate
 cobalt plate
 copper plate
 cover with aluminium
 anodic protection **or** sacrificial protection
 cathodic protection
 cover with plastic
 alloying (ignore any named metal)
 any **TWO** [2]
NOT just plate **or** electroplate need electroplate with suitable metal
NOT oil
ACCEPT both galvanising and sacrificial protection

- (b) (i) hydrogen **or** carbon **or** carbon monoxide **or** methane [1]
or more reactive metal **NOT** Group I

- (ii) any correct equation [2]
 only error not balanced [1]

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(c) (i) 196 [1]

(ii) $112/196 \times 100$ [1]

= 57(.1)% **ACCEPT** 57 to nearest whole number [1]

mark **e.c.f.** to (c)(i) provided percentage not greater than 100%

ONLY ACCEPT $112/\text{answer (c)(i)} \times 100$

otherwise [0]

(d) (i) forms carbon dioxide/carbon monoxide (which escapes) [1]

(ii) forms silicon(IV) oxide **or** silicon oxide **or** silica [1]

OR CaO reacts with SiO₂

to form slag **or** calcium silicate [1]

ignore an incorrect formula if a correct name "slag" given

NOT Si + O₂ + CaO form slag, this gains mark for slag only

[Total: 13]

4 (a) (i) C₆H₅COOH **or** C₆H₅CO₂H [1]
NOT C₇H₆O₂ / C₆H₆COO

(ii) sodium hydroxide + benzoic acid = sodium benzoate + water [1]

correct spelling needed **NOT** benzenoate

ACCEPT correct symbol equation

(iii) sodium carbonate **or** oxide **or** hydrogencarbonate [2]
any **TWO**

NOT Na

(b) (i) 7.7% [1]

(ii) for any number: equal number ratio [2]

for example 1:1 **or** 6:6

(iii) empirical formula is CH [1]

molecular formula is C₆H₆ [1]

no e.c.f., award of marks not dependent on (ii)

(c) (i) C₆H₈O₆ [1]

(ii) carbon – carbon double bond **or** alkene [1]

alcohol **or** hydroxyl **or** hydroxy [1]

NOT hydroxide

hydroxide and alcohol = 0

[Total: 12]

Page 5	Mark Scheme	Syllabus	Paper
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- 5 (a) (i) $2\text{H}^+ + 2\text{e} \rightarrow \text{H}_2$ [1]
- (ii) $2\text{Cl}^- - 2\text{e} \rightarrow \text{Cl}_2$ or $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}$ [1]
- (iii) Na^+ and OH^- are left [1]
 OR Cl^- removed OH^- left
NB ions by name or formula essential
NOT any reaction of Na or Na^+
NOT Na^+ and OH^- combine
- (b) (i) sterilise/disinfect water or kill microbes/germs bacteria, etc. [1]
NOT just to make it safe to drink or purify it or clean it
 treat above as neutral they do not negate a correct response
- (ii) ammonia or methanol or hydrogen chloride or margarine [1]
NOT nylon
- (iii) fat or lipid or triester or named fat or glyceryl stearate [1]
 or vegetable oil [1]
 heat [1]
- [Total: 7]**

6 (a) (i)

aqueous solution	tin Sn	manganese Mn	silver Ag	zinc Zn
tin(II) nitrate		R	NR	R
manganese(II) nitrate	NR		NR	NR
silver(I) nitrate	R	R		R
zinc nitrate	NR	R	NR	

[1] for each row [3]

ignore anything written in blank space

- (ii) $\text{Sn} + 2\text{Ag}^+ \rightarrow \text{Sn}^{2+} + 2\text{Ag}$ [2]
 all species correct [1]
 accept equation with Sn^{4+}
- (iii) Mn to Mn^{2+} need both species [1]
 electron loss or oxidation number increases [1]
- (iv) covered with oxide layer [1]
 makes it unreactive or protects or aluminium oxide unreactive [1]
- (b) (i) potassium has one valency electron [1]
 or loses one electron
 calcium has two valency electrons [1]
 or loses two electrons
- (ii) potassium hydroxide \rightarrow no reaction [1]
 calcium hydroxide \rightarrow calcium oxide and water [1]
ACCEPT metal oxide

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(iii) $2\text{KNO}_3 \rightarrow 2\text{KNO}_2 + \text{O}_2$ [2]
 [1] for **formula** of either product

$2\text{Ca}(\text{NO}_3)_2 \rightarrow 2\text{CaO} + 4\text{NO}_2 + \text{O}_2$ [2]
 [1] for **formulae** of any **TWO** products

[Total: 17]

7 (a) (i) 35 cm^3 [1]
 40 cm^3 [1]

(ii) forms carbon monoxide [1]

poisonous **or** toxic **or** lethal **or** prevents blood carrying oxygen
or effect on haemoglobin [1]
NOT just harmful

(b) (i) chlorobutane **or** butyl chloride [1]
 number not required but if given must be 1, it must be in correct position

(ii) light **or** UV **or** 200°C **or** lead tetraethyl [1]

(iii) any correct equation for example 2-chlorobutane
or dichlorobutane [1]

(c) (i) correct repeat unit [1]
COND continuation [1]
 $-(\text{CH}(\text{CH}_3)-\text{CH}_2)-$

(ii) butan-1-ol **or** butan-2-ol **or** butanol [1]
 if number given then formula must correspond for second mark and number must be in correct position

structural formula of above [1]
 $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2\text{OH}$ **or** $\text{CH}_3-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_3$
NOT $\text{C}_4\text{H}_9\text{OH}$
 if first mark not awarded then either formula will gain mark [1]
ACCEPT either formula for "butanol"

(iii) $\text{CH}_3-\text{CH}(\text{Cl})-\text{CH}_3$ **or** $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{Cl}$ [1]
NOT $\text{C}_3\text{H}_7\text{Cl}$
 response must not include HCl
 if equation given look at RHS only

[Total: 12]