

UNIT TEST C1

6241

MARK SCHEME

JUNE 2002

1 (a) Bromine - liquid (1)  
Iodine - solid (1) 2

(b) AgNO<sub>3</sub> (aq): yellow ppt / solid / suspension with  
NaI (1)  
Cream / pale yellow / off white / ivory  
ppt / solid / suspension with NaBr (1)  
*Not 'cloudy', not white.*

Add ammonia solution :  
ppt. insoluble / stays the same. NaI (1)  
ppt. (partially) soluble NaBr (1)

4

*If says dilute ammonia must say 'partially' soluble  
for AgBr. If says conc ammonia must say soluble  
for AgBr.*

**Total marks for question 6**

2 (a) (i)  $2\text{Ca} + \text{O}_2 \rightarrow 2\text{CaO}$  (1) 1

(ii)  $\text{Na}_2\text{O} + \text{H}_2\text{O} \rightarrow 2\text{NaOH}$  (1) 1

(iii)  $\text{Na}_2\text{O} + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2\text{O}$   
Species (1) Balancing (1) 2

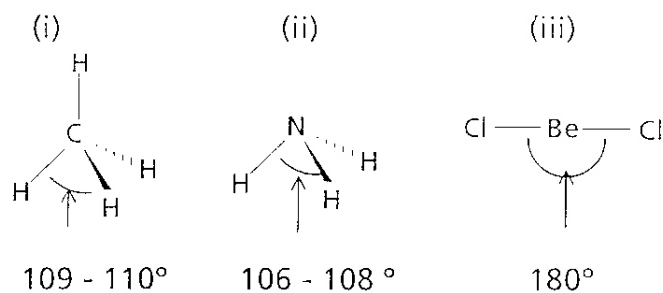
(b) (Thermal stability) increases (1) (with some  
attempt at a reason)

(cat)ion size increases / (cat)ion charge density  
decreases (1)  
polarises or distorts carbonate ion / anion /  
electron cloud less. (1)

3

**Total marks for question 7**

3 (a)



Shape: **1 mark x 3**

Angle marked on diagram in correct place: **1 mark x 3**

**6**

*Must be some attempt to show 3-D.*

*Poor diagram can be salvaged by correct name or correct bond angle.*

*Ignore a lone pair on ammonia if shown.*

*If angle just written alongside diagram, penalise once*

(b) (i) Temporary and/or induced dipole forces **(1)** allow 'instantaneous' in place of 'temporary' **1**  
*Allow London/dispersion/van der Waal's forces*

(ii) Hydrogen bonding **(1)** **1**

(c) HF **(1)** *consequential on some attempt at explanation.*  
hydrogen bonding stronger / requires more energy to overcome (than vdW forces) / HF has stronger intermolecular force **(1)**

**2**

**Total marks for question 10**

4 (a) Proton +1 **(1)**  
Electron 1/1800 → 1/2000 or 'negligible' **(1)**  
Neutron charge 0 / no charge **(1)** **3**

(b) Correct p n e in both C and H **(1)**  
Notes there are 4 H **(1)**  
Correct summation i.e 10p, 10e, 6n **(1)** **3**  
*If no or inadequate working 1 mark for 10 p & 10 e  
1 mark for 6 n.*

(c)  $(1s^2)2s^22p^63s^23p^5$  **(1)** **1**

- (d)  $^{37}\text{Cl}^+$   
 charge(stand alone) **(1)**  
 37 **(1)**  
 if incorrect number of protons / mass number  
*shown max 1 for charge* 2
- (e) (i)  $\text{S}(\text{g}) + \text{e}^- \rightarrow \text{S}^-(\text{g})$   
 species and charges **(1)**  
 state symbols in part (i) and (ii) equations **(1)** 2
- (ii)  $\text{S}(\text{g}) \rightarrow \text{S}^+(\text{g}) + \text{e}^-$   
 or  
 $\text{S}(\text{g}) - \text{e}^- \rightarrow \text{S}^+(\text{g})$  **(1)** 1  
 Species and charge **(1)**  
 No need to show negative charge on electron.  
*If use 'X' in place of 'S' penalise once only*
- (f) Chlorine nucleus has greater charge / is more  
 positive / has greater number of protons **(1)**
- outer electron / electron being removed, is in same  
 shell / has same shielding **(1)** 2

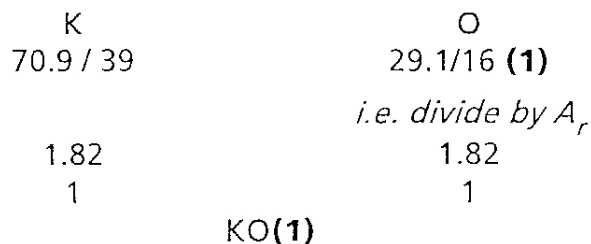
**Total marks for question 14**

- 5 (a) (i) moles of  $\text{KNO}_3 = 10.1/101 = 0.100$  **(1)** 1  
 Allow 0.1/0.10
- (ii) moles of  $\text{KOH} = 0.100$  **(1)**  
 or answer from (i) – could be shown in calculation  
*below.*  
 $\text{volume} = 0.1 \times 1000/2 = 50.0(\text{cm}^3)$  **(1)** 2
- Consequential on (i); allow 50

- (iii) moles of  $O_2 = 0.1/2 = 0.0500$  **(1)** i.e. *divide by 2*  
 vol  $O_2 = 0.05 \times 24 = 1.2$  ( $dm^3$ ) **(1)** i.e. *x by 24* **2**

*consequential on (ii) or (i)*  
*if use wrong unit eg mol  $dm^3$  max 1*

- (b) (i) Percentage of oxygen = 29.1% **(1)** *stand alone*



**3**

*If assume KO and prove it (max 2)*

- (ii)  $M_r (= 22/0.2) = 110$  **(1)**  
 ( $M_r$  of KO = 55 so) molecular formula =  $K_2O_2$  **(1)** **2**

**Total marks for question 10**

- 6 (a) (i) *Structure* - giant or macro + atomic / molecular / covalent **(1)**

*Bonding* - covalent **(1)** (ignore reference to vdW)

*Diagram* - layers **(1)**

of flat hexagons **(1)**

**4**

*(min of 2 hexagons correctly joined for the 'hexagon' mark)*

*If show links between layers there must be a clear difference between bonds in layer and bonds between layer.*

- (ii) *Structure* - lattice / giant ionic / cubic (allow face centred cubic) **(1)**

*Bonding* - ionic **(1)**

*Diagram* - lattice of alternate clearly identified /  $Na^+$  and  $Cl^-$  ions, must imply 3-D. **(1)**

**3**

(b) Graphite has covalent bonds/structure that need to be broken **(1)**  
 NaCl has attraction between oppositely charged ions **(1)**  
 In both structures a lot of energy is needed to overcome attractions or bonds. **(1)** **3**

(c) (i) Delocalised or sea of electrons **(1)**  
 (which can) flow / move / mobile **(1)** **2**

(ii) Ions (free to) move / mobile (in liquid state) **(1)** **1**

**Total marks for question 13**

**7** (a) (i)  $\text{H}_2\text{SO}_4$ : +6 / VI **(1)**  
 $\text{H}_2\text{S}$ : -2 **(1)**  
 $\text{SO}_2$ : +4 / IV **(1)** **3**  
*Allow 6+/2-/4+*  
*If + charges omitted penalise once only*

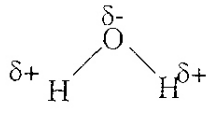
(ii) Iodide has greater reducing power **(1)**  
*with some attempt at using answer from part (i)*  
 Reduces sulphur by more oxidation numbers / or correctly uses their numbers from part (i) / or an 'electron gain' type argument **(1)** **2**  
*Allow error carried forward to argue for 'bromide' from (a) (i).*

(b) (i)  $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$   
 or  $\text{Cl}^- \rightarrow \frac{1}{2}\text{Cl}_2 + \text{e}^-$   
 or  $2\text{Cl}^- - 2\text{e}^- \rightarrow \text{Cl}_2$  **(1)** **1**

(ii)  $\text{OCl}^- + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{Cl}^- + \text{H}_2\text{O}$   
 or  $\text{OCl}^- + 2\text{H}^+ \rightarrow \text{Cl}^- + \text{H}_2\text{O} - 2\text{e}^-$  **(2)** **2**  
 all species **(1)**, balancing **(1)**

(iii)  $\text{OCl}^- + 2\text{H}^+ + \text{Cl}^- \rightarrow \text{Cl}_2 + \text{H}_2\text{O}$  **(1)** **1**  
*Allow*  
 $\text{OCl}^- + 2\text{H}^+ + 2\text{Cl}^- \rightarrow \text{Cl}_2 + \text{H}_2\text{O} + \text{Cl}^-$

**Total marks for question 9**

- 8 (a) (i) Hydrogen and oxygen **(1)**  
In parts (i) and (ii)..penalise use of symbols once. **1**
- (ii) Magnesium and oxygen **(1)** **1**
- (b) (i) 
  
Correct partial charges on oxygen and at least one hydrogen **(1)** **1**
- (ii) Oxygen has higher electronegativity (than hydrogen) **(1)**  
Oxygen attracts more or has greater share of...covalent / bonding / shared...electrons / pair **(1)** **2**
- (iii) Polar / yes because / bond polarities don't cancel / dipoles don't cancel / vectors don't cancel / centres of positive and negative charge don't cancel (or don't overlap) **(1)** **1**

**Total marks for question 6**

**Paper total 75 marks**

**UNIT TEST C2**

**6242**

**MARK SCHEME**

**JUNE 2002**



- 1 (a) Enthalpy / heat (energy) change on the neutralisation / reaction of one mole of a **monobasic** acid / hydrogen ions (by an alkali )  
or  
Enthalpy / heat (energy) change on the formation of one mole of water when an acid is neutralised  
Or  
Enthalpy change per mole for reaction  $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$  (1) 1
- (b)  $q = mc\Delta T$  (1) *other unambiguous symbols / names*  
=  $100 \times 4.18 \times 6.90$  (1)  
= 2884 J *including units* (1) 3  
*Consequential on sensible chemistry in line 2 i.e. use of 50 for mass or temp in K or data for temperature transposed(max2). Ignore sign of answer*  
*Allow 3 or 4 significant figures*
- (c)  $2884/0.05$  (1)  
*answer from (b)  $\div 0.05$  / allow answer from (b)  $\times 20$*   
 $= -57.7 \text{ kJ mol}^{-1}$  (1) *accept -57.6* 2  
*If wrong sign (max1)*  
*If wrong units (max 1)*
- (d) Ensures all acid reacts / neutralisation (of acid) completed / reaction (of acid) completed / all  $\text{H}^+$  reacted(1) 1

**Total marks for question 7**

- 2 (a) (i) any **two** from  
concentration  
pressure  
surface area / particle size (2 x 1) 2
- (ii) Pressure / concentration:  
Increase of pressure / concentration increases rate (1)  
The particles are closer together therefore more collisions / more collisions per unit volume per unit of time (1)  
*Allow more 'frequent' collision*  
or  
Surface area:  
Increase in surface area increase the rate (1)  
More collisions on surface of solid / more surface available for collisions (1) 2

- (b) (i) Similar curve with peak further **to the right (1)**  
and **lower** maximum**(1)** **2**  
*Max 1 mark if second line crosses the first more than once or crosses axis*
- (ii) Vertical line placed **to the right** of both of the peaks **(1)** **1**
- (iii) (At higher temperature average kinetic) energy of molecules is greater **(1)**  
More molecules / collisions have energy greater than / equal to the activation energy **(1)**  
Therefore more collisions are effective / result in reactions **(1)** **3**
- Total marks for question 10**

- 3 (a) (i) *Dynamic:*  
reaction occurring in both directions / rate of forward reaction and reverse reactions equal **(1)**  
*Equilibrium:*  
constant concentrations / no change in macroscopic properties**(1)** **2**
- (ii) all substances in same phase / are all in the gaseous state**(1)** **1**
- (b) (i) Higher yield of ammonia / (equilibrium position) moves to. r.h.s **(1)**  
Fewer product molecules **(1)** **2**
- (ii) Lower yield of ammonia / (equilibrium position) moves to l.h.s.**(1)**  
since this absorbs heat / shift in endothermic direction / the reaction is exothermic **(1)** **2**
- (c) (i) 350 – 500°C / 623 – 773 K **(1)** **1**

(ii) High temp favours high rate (1) } Or reverse argument  
 Low temp favours good yield (1) }  
 Temperature used compromise / balance between  
 yield and rate (1) 3  
*consequential on first two points correct*

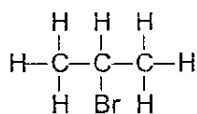
(d) (i) Iron (not Fe) (1) 1  
*ignore references to oxides*

(ii) Provides **alternative pathway** / route  
 or  
 Explanation of what happens at the surface(1)  
 of lower activation energy (1) 2  
*Second mark consequential on the first*

**Total marks for question 14**

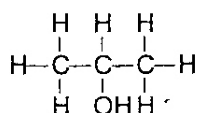
4 (a) (i) HBr (name or formula) (1)  
 gas phase or inert / organic solvent (1) 2  
*Ignore heat or temperature. Do not allow ethanol as  
 the organic solvent*

(ii)



Or CH<sub>3</sub>CHBrCH<sub>3</sub> (1) 1

(b) (i)



or CH<sub>3</sub>CH(OH)CH<sub>3</sub> (1) 1  
*This mark is **not** consequential on (a)(ii) i.e. this is the  
 only acceptable answer*

(ii) electrophilic(1) addition (1) 2

nucleophilic (1) substitution / hydrolysis (1) 2  
*All marks stand alone in this part of the question*

- (c) (i) **concentrated** sulphuric acid / phosphoric acid / aluminium oxide **(1)**

*Allow correct formula*

heat / 170°C ( for sulphuric acid) / 70°C ( for phosphoric acid ) **(1)**

**2**

*Consequential on sensible reactants. Not 'warm'*

- (ii) *Reagent – allow full names or correct formulae*

Potassium dichromate **(1)**

sulphuric acid or hydrochloric acid **(1)**

or

Potassium manganate(VII) **(1)**

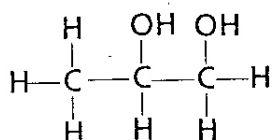
sulphuric acid or named alkali or stated neutral solution **(1)**

*Condition:*

Heat / warm **(1)**

**3**

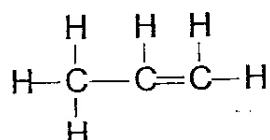
- (d)



or  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{OH}$  **(1)**

**1**

- (e)



**1**

*Must show the double bond carbon and attached hydrogen in displayed form*

**Total marks for question 15**

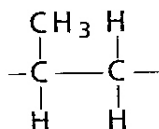
**5**

- (a) Group of compounds with the same general formula **(1)** that differ by  $-\text{CH}_2-$  **(1)**

Same or similar **chemical** properties / same functional group **(1)**

**3**

- (b) (i)



At least one repeat unit **(1)**

evidence of extension of chain **(1)**

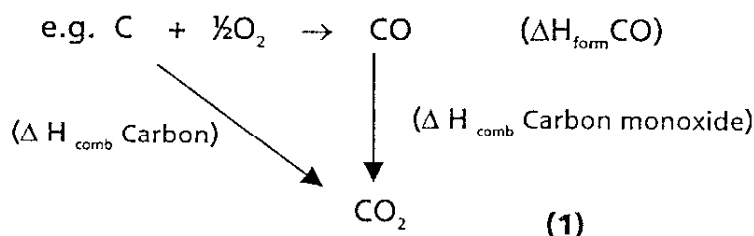
*consequential on correct repeat unit*

**2**

- (ii)  $\text{CH}_2$  (1)  
empirical formula of propene / the repeat unit(1)  
since polymer made by addition reaction / no loss of  
small molecules(1) 3
- (c) Different chain lengths / areas of crystalline and  
amorphous structure (1) 1
- (d) (i) C-F bond strong / high bond enthalpy / bond not  
easily broken / steric hindrance by fluorine around  
carbon(1) 1
- (ii) Non-stick coatings e.g. in saucepans, in pipes, on skis,  
stain-proofing of fabrics, waterproof clothing. (1) 1
- (e) **Only** single / sigma bonds in ethane (1)  
Ethene **also** has  $\pi$  bond (1)  
 $\pi$  bond weaker (and breaks) / electrons in  $\pi$  bond  
more accessible (1) 3

**Total marks for question 14**

- 6 (a) (i) Enthalpy or heat change / released when 1 mol of  
substance (1)  
is burned in excess oxygen / completely (1)  
all substances in standard states (at a specified temp)/  
at a pressure of 1 atm. (1) 3
- (ii) Suitable cycle (need not be labelled but if labelled,  
these must be correct) (1)  
working(1)  
answer (1)



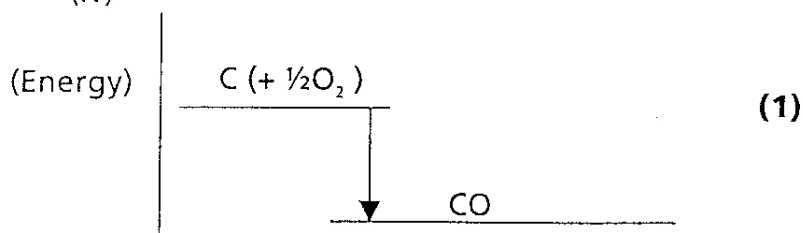
$$= -394 - (-283) \text{ (1)}$$

$$= -111 \text{ (kJ mol}^{-1}\text{) (1)}$$

*Penalise 1 mark if units incorrect*

3

- (iii) (some)  $\text{CO}_2$  is always produced in the reaction **(1)** **1**  
 (iv)



**1**

*Consequential on (a) (ii)*

*n.b. if no answer in (a) (ii), correct diagram can still score*

- (b) Methane (and oxygen) / reactants thermodynamically unstable w.r.t. products **(1)**

*Must be a comparison*

Since reactants are at a higher energy level (than products) **(1)**

*or reverse argument*

Reactants / methane, oxygen kinetically stable **(1)**

Due to high activation energy **(1)**

*If no reference to methane in the answer (max 3)*

**4**

- (c) Comparison of energy per unit volume **(1)**

*Positive comment on storage / transport of octane*

e.g. octane is a liquid therefore easy to store /

transport / transfer **(1)**

*Negative comment on storage / transport of methane*

e.g. methane is gas and will need to be stored under

pressure in a special container as a liquid / in a large

container as a gas **(1)**

**3**

**Total marks for question 15**

**Paper total 75 marks**

**UNIT TEST C3B**

**6243 B**

**MARK SCHEME**

**JUNE 2002**

1 (a) A - F - G - C - D - E - B (2) 2  
 1 mark if 1 letter out of sequence but rest correct.  
 0 mark if 2 or more letters out of sequence.  
 nb if adjacent pair inverted this is one error.

(b) **Little** – to produce a saturated solution / to prevent loss of solid / because all solid will not crystallise / to prevent loss of yield. (1) 2  
**Small** – (if large volume used) solid would be lost / dissolved (1) 2  
**Total marks for question 4**

2 (a)

Gas	Reagents or test	Observation
<i>Hydrogen</i>		(Squeaky) pop (1)
<i>Oxygen</i>		Relights/glows brighter (1)
<i>Carbon dioxide</i>	Limewater/ Calcium Hydroxide/ Ca(OH) <sub>2</sub>	Cloudy/white ppt/ milky (1)
<i>Sulphur dioxide</i>		Green (1)
Chlorine/Cl <sub>2</sub> (1) Not Cl Allow bromine/Br <sub>2</sub>		

6



- (b) *General marking points*  
Test/reagent **(1)**  
Result with alkene **(1)**  
Result with alkane **(1)**

*eg Reagent* bromine (solution) / bromine water / Br<sub>2</sub>  
or potassium manganate (VII) + sulphuric acid / acidified  
/ sodium hydroxide / alkaline (or correct formulae)  
Accept KMnO<sub>4</sub>/H<sup>+</sup> or KMnO<sub>4</sub>/OH<sup>-</sup> **(1)**

*Result* Br<sub>2</sub> yellow / red-brown / orange / orange-red / brown  
goes colourless / decolourised / goes colourless. **(1)**  
*eg orange solution decolourised, not just decolourised*  
*There must be some reference to the initial colour of the bromine. Not goes clear*

**KMnO<sub>4</sub> + acid/alkali**

If acid conditions purple to colourless / decolourised /  
goes colourless

*Not goes clear*

or

If alkaline conditions purple to brown ppt / solid **(1)**

**3**

*The answer may imply no change with alkane by saying  
only alkene reacts*

**Total marks for question 9**

**3** *General Principle*

**Either**

Common test on both compounds **(1)**

Correct observation for one compound **(1)**

Correct observation for second compound **(1)**

**OR**

Test on one compound **(1)**

Observation for this compound **(1)**

Different test on second compound and observation for this  
compound **(1)**

- (a) *Reagent:* Barium chloride + HCl / Barium nitrate + HNO<sub>3</sub> **(1)**  
*Obs:* Sulphate / SO<sub>4</sub><sup>2-</sup>: white ppt. insoluble in HCl/HNO<sub>3</sub> **(1)**  
 Sulphite / SO<sub>3</sub><sup>2-</sup>: white ppt. soluble in HCl/HNO<sub>3</sub> **(1)**  
 nb if add acid first no ppt with sulphite
- or
- Reagent:* Add named acid (and heat) **(1)**  
*Obs:* Sulphite / SO<sub>3</sub><sup>2-</sup>: colourless gas evolved turns potassium dichromate(VI) green / blue litmus red/smell **(1)**  
 Sulphate / SO<sub>4</sub><sup>2-</sup>: no gas / no sulphur dioxide evolved / no reaction **(1)**
- or
- Reagent:* Potassium manganate(VII) + acid **(1)**  
*Obs:* Sulphate / SO<sub>4</sub><sup>2-</sup>: no colour change **(1)**  
 Sulphite / SO<sub>3</sub><sup>2-</sup>: purple colour goes / solution goes colourless / mauve colour lost **(1)**
- (b) *Test* Flame test or description of test **(1)**  
*Obs:* Sodium salt: gives yellow / orange colour **(1)**  
 Ammonium salt: gives no colour **(1)**
- or
- Reagent* Add named alkali **(1)**  
*Obs:* Ammonium salt : gives colourless gas that turns red litmus blue **(1)**  
 Sodium salt : gives no gas / no gas evolved **(1)**
- or
- Test* Heat (solid) **(1)**  
*Obs:* Sodium Nitrate: gives gas that relights glowing splint **(1)**  
 Ammonium nitrate: obs or test for water / no effect on glowing splint **(1)**
- (c) *Reagent:* Heat / add boiling water **(1)**  
*Obs:* Carbonate / CO<sub>3</sub><sup>2-</sup> no gas evolved **(1)**  
 Hydrogen carbonate / HCO<sub>3</sub><sup>-</sup> colourless gas evolved turns limewater cloudy / test or observation for water vapour **(1)**
- or
- Reagent:* Add (solution) of calcium chloride or magnesium sulphate **(1)**

3

3

*Obs:* Carbonate /  $\text{CO}_3^{2-}$  white ppt (1)  
Hydrogen carbonate /  $\text{HCO}_3^-$  no ppt (1)

or

*Reagent* Measure pH / add universal indicator (1)

*Obs* Carbonate /  $\text{CO}_3^{2-}$  gives pH > 10 (1)

Hydrogen carbonate /  $\text{HCO}_3^-$  gives pH 8 to 9 (1)

3

**Total marks for question 9**

- 4 (a) **Note 1 mark for improvement 1 mark for related reason in each case to max 4 marks. Reason must relate to improvement. Max 2 for improvement Max 2 for reason.**

*Improvement* insulate beaker / polystyrene cup / plastic cup / use lid (1)

*Reason* Prevents / reduces heat loss or absorbs less heat (1)

*Improvement* Use pipette / burette (1)

*Reason* More accurate (than measuring cylinder) (1)

*Improvement* Measure temperature for several minutes before the addition (1)

*Reason* Allows more accurate value for the initial temperature (1)

*Improvement* Measure temperature more often (1)

*Reason* Allows for better extrapolation / more accurate temperature change from graph (1)

*Improvement* Read thermometer to 1dp / use more precise thermometer / digital thermometer (1)

*Reason* Gives more accurate temperature change (1)

*Improvement* Stir mixture (1)

*Reason* Ensure even temperature / reaction faster less heat loss with time (1)

*Improvement* Use finely divided iron / smaller pieces (1)

*Reason* Reaction faster less heat loss with time (1)  
Not speeds up alone

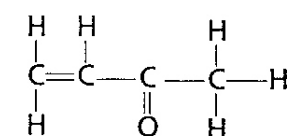
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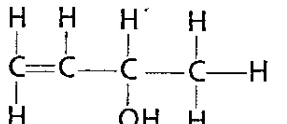
- (b) (i) Heat change =  $50.0 \times 4.18 \times 15.2$   
 =  $50.0 \times 4.18 \times 15.2 / 1000$  kJ  
 = 3.18 kJ or 3180 J **(1)**  
*Ignore sig. fig. Allow mark if units omitted*  
*If units quoted but wrong eg 3.18 J score 0.* **1**
- (ii) No of mols of copper sulphate =  $50.0 \times 0.500 / 1000$   
 = 0.025 **(1)** **1**
- (iii) Enthalpy change per mol =  $3.18 / 0.025 = -127$  kJ **(1)**  
 negative sign **(1)** stand alone  
 consequential on (i) and (ii)  
 max 4 sig fig and answer must be in kJ mol<sup>-1</sup> even if units omitted. **2**

**Total marks for question 8**

- 5 (a) (i) Contains an OH / alcohol / hydroxyl / hydroxy **(1)** **1**  
*not OH or hydroxide*  
*do not allow mark if reference to carboxylic acid.*

- (ii) (carbon)-carbon double bond / C=C / alkene **(1)** **1**  
*Allow just double bond or unsaturated if show C=C in part (iv)*

- (iii)   $\text{CH}_2=\text{CH}-\text{CO}-\text{CH}_3$  **(1)** **1**

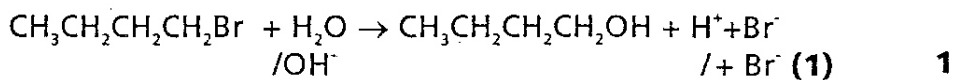
- (iv)  **(2)**

*allow (1) mark for isomer of this structure which shows C=C and O-H*

**X** must be a secondary alcohol because ketone formed / on oxidation carboxylic acid is not formed **(1)** **3**

- (b) (i) AgBr **(1)** **1**

- (ii)  $\text{C}_4\text{H}_9\text{Br} + \text{H}_2\text{O} \rightarrow \text{C}_4\text{H}_9\text{OH} + \text{H}^+ + \text{Br}^-$



- (iii) Solvent / silver nitrate solution in water and bromobutane not miscible / reactants do not mix **(1)** **1**
- (iv) Reaction very slow at room temperature / heat speeds up the reaction / increases rate / flammable **(1)** **1**

**Total marks for question 10**

6 (a) *nb these are the only points for which credit may be given*

**P** Pipette mark: use of pipette for NaOH **✓P**

**I** Indicator mark: add to NaOH named acid / base indicator **✓I**  
*not litmus or UI*

**T** Technique mark: some reference to technique eg add acid to alkali with swirling / dropwise at end point / slowly / use a white tile **✓T**

**E** End point mark: indicator colour changed by addition of one drop / colour at end point for indicator used **✓E**

**C** Consistency mark: consistent titres / within 0.2 or better / concordant results **✓C** **5**

(b) (i)  $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$  **(1)** **1**  
*Ignore state symbols*

(ii) Use of ratio 2 mols to 1 mol **(1)**

(Volume)  $12.5\text{ cm}^3 / 0.0125\text{ dm}^3$  **(1)** **1**  
*Must include units consequential on part (i)*

(iii) Error is  $0.2 \times 100 / 25$  **(1)**  
 $= 0.8\%$  **(1)** **2**  
or  
 $0.1 \times 100 / 12.5 = 0.8\%$   
*accept alternative method that gives same answer*

**Total marks for question 10**

**Paper total 50 marks**