edexcel

GCE

Edexcel GCE

Chemistry (8080, 9080)

6242/01

Summer 2005

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Mark Scheme (Results)

Edexcel GCE
Chemistry (8080, 9080)

1. (a) (i) Reacts to form a solution/forms sodium aluminate / $NaAlO_2$/ $NaAl(OH)_4$ / $Na_3Al(OH)_6$ / AlO_2^- / $Al(OH)_4^-$ / $Al(OH)_6^{3-}$/ aluminate ions **(1)**

NOT 'dissolves' **(1)** **(2 marks)**

NOT just "reacts"

Because amphoteric / acidic

OR an explanation of these terms

ALLOW correct equation

(ii) Remains as a solid / is insoluble / no reaction / no change **(1)**

because it is basic / only reacts with acids **(1)** **(2 marks)**

(b) (i) melting point of Al_2O_3 is too high / the solution has a lower melting point than Al_2O_3 / dissolves to produce electrolyte /allows ions to move more freely /increases conductivity **(1 mark)**

ALLOW cryolite lowers the melting point

(ii) carbon / graphite /C **(1 mark)**

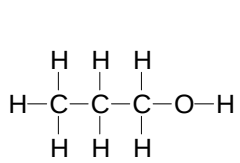
(iii) $Al^{3+} + 3e^- \rightarrow Al$

IGNORE all state symbols apart from (aq) **(1 mark)**

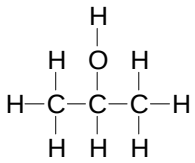
(iv) electricity / electrical energy **(1 mark)**

Total 8 marks

2. (a) (i) Isomer 1 Isomer 2



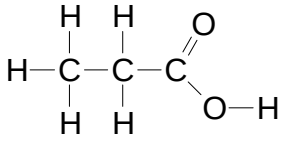
(1)



(1)

propan-1-ol /1-propanol **(1)** propan-2-ol / 2-propanol **(1)**
NOT propanol **(4 marks)**
ALLOW –OH
Penalise sticks once : penalise CH_3 once

(ii)



(1)

ALLOW CH_3CH_2 and C_2H_5 but not COOH
Colour change orange to green / blue / brown **(1)** **(2 marks)**

(b) (i) PBr_5 / PBr_3 / red phosphorus + Br_2
or
sodium/potassium bromide and (conc) H_2SO_4 /50% sulphuric acid/
(conc) phosphoric acid / KBr + H_2SO_4 **(1 mark)**
NOT dilute

(ii) 2- bromopropane / $CH_3CHBrCH_3$ *NOT* Bromo-2-propane **(1 mark)**

(iii) $CH_3CH(OH)CH_3$ **(1)**
$CH_3CH=CH_2$ must show double bond
ACCEPT full structural formulae **(1)**
ALLOW T.E based on X If 1-bromopropane **(2 marks)**

Total 10 marks

3. (a) vanadium(V) oxide/V_2O_5 / divanadium pentoxide / vanadium pentoxide **(1 mark)**
NOT vanadium oxide

(b) (i) 400-500°C / 673-773 K
[any temperature or range of temperatures within these ranges] **(1 mark)**

Q (ii) rate increases **(1)**
W molecules/particles (NOT atoms) have higher (kinetic) energy **(1)**
C more molecules / particles / collisions have activation energy /enough energy to react **(1)**
Greater proportion / more collisions are successful / results in a reaction / higher frequency of effective collisions **(1)**
4th mark not stand alone and must be linked to 3rd mark
If no reference to E_a **max 2** **(4 marks)**
If just talk about increase in number of collisions **max 2**

(iii) yield decreases **(1)**
because reaction is exothermic /equilibrium shifts to endothermic direction / moves to absorb heat / reverse reaction is endothermic **(1)** **(2 marks)**
ALLOW K decreases with increase in temperature

(c) (i) 2-5 atm (any number or range within this range) / just above atmospheric **(1 mark)**

(ii) Pushing it through the system **(1)** **(1)**
Higher pressure would increase yield **(1)**
But yield is high even at this pressure **(1)** **Max 3** **(1)**
Higher pressure too expensive **(1)** **(1)**

Increased cost of the extra pressure is not justified by the extra SO_3 produced **(2)** **(3 marks)**
IGNORE reference to rate

(d) (SO_3) dissolved/ absorbed in conc. H_2SO_4 *OR* dissolved in H_2SO_4 to form oleum **(1)**
if % acid given, must be 95 or above **(1)**
water added – *not stand alone*

$H_2SO_4 + SO_3 \rightarrow H_2S_2O_7$ and $H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$ for both marks
OR **(2 marks)**
SO_3 reacts with the water in conc. H_2SO_4 for both marks

(e) $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$ **(1 mark)**
Allow correct equation based on NH_4OH

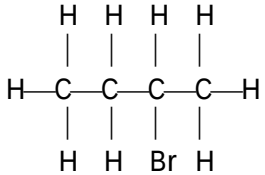
(f) any one use:
making detergent / soap / paint / pigment inc TiO_2 / dyestuffs / fibres / plastics / pharmaceuticals
(in) car batteries, pickling metal / anodising Al / electrolytic refining of copper **(1 mark)**

Total 16 marks

4. (a) H_2 / hydrogen *NOT* H **(1)**
Ni / nickel **(1)**
OR platinum / Pt / palladium / Pd **(1)**
(Ni) 140 – 180 °C / heat **(3 marks)**
OR (Pt / Pd) room temperature

If no reagent but other parts correct **(1)**
Incorrect reagent **(0)**

(b) (i)

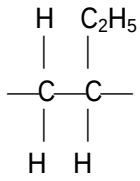


(1 mark)

(ii) electrophile / electrophilic *IGNORE any reference to addition* **(1 mark)**

(c) potassium manganate(VII) / potassium permanganate / MnO_4^- /
manganate(VII) ions *IGNORE* acid or alkali **(1 mark)**
ACCEPT name or formula

(d)



Correct structure **(1)** - *only one repeat unit identified*
Continuation **(1)**
IGNORE $(\ )_n$ **(2 marks)**

Total 8 marks

5. (a) (i) $\frac{1664}{4}$ = 416 (kJ mol^{-1}) *IGNORE* "+" *signs* **(1 mark)**

(ii) energy needed to break bonds:
2x436 + 193 = (+)1065 **(1)**

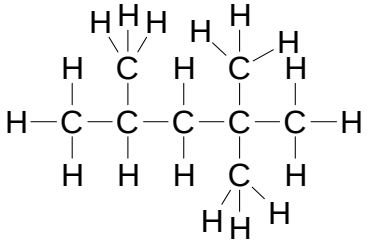
energy change in making bonds:
-348 + 4x-416 + 2x -276 = (-)2564 **(1)**

enthalpy change = 1065 – 2564 = -1499 (kJ mol^{-1}) **(1)**
[value and –ve sign needed for 3rd mark] **(3 marks)**
ALLOW T.E.
+1499 with working scores **(2)**

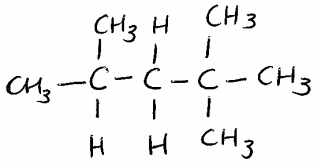
(b) C not in standard state / C not solid **(1 mark)**

Total 5 marks

6. (a) (i)



ALLOW - CH_3



ALLOW any correct representation that shows the structure **(1 mark)**

(ii) alkanes **(1 mark)**

(b) (i) enthalpy / heat / energy change when 1 mole of substance / element or compound (both) **(1)**
is burnt in excess oxygen (NOT air) / completely / reacts completely with oxygen **(1)**
at 1 atm pressure and specified or stated temperature **(1)** **(3 marks)**

(ii) $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$
correct formulae **(1)**
balancing (allow multiples or half values) **(1)** **(2 marks)**

(c) (i) M_r of butane is 58($g\ mol^{-1}$) **(1)**

$\frac{-2877}{58} = -49.6$ / - 50 ($kJ\ g^{-1}$) - consequential on M_r **(1)** **(2 marks)**

(ii) **(1)**
A comparison of any two or three fuels by mass
E.g. C_4H_{10} gives out most energy per gram
(1)

A comparison of any two or three fuels by volume
E.g. C_8H_{18} gives out more heat than ethanol per cm^3
(1)

A comparison of states e.g. C_4H_{10} gas, C_2H_5OH and C_8H_{18} liquids
(1)

and consequence of state on use as fuel in motor vehicle **(4 marks)**
E.g. gases need big fuel tank to be stored at high pressure
OR liquids need smaller tank

Total 13 marks

TOTAL FOR PAPER: 60 MARKS