Practice Question Set For A-Level
**Subject : Chemistry**
**Paper-2 Topic: Physical**

Merit Minds
www.merit-minds.com
Exam Preparation and Free Resources

**Name of the Student**:_____
**Max. Marks : 25 Marks** **Time : 25 Minutes**

Mark Schemes

Q1.

(a) Amount of hexane = $\frac{2}{86}$ = 0.0233 mol

**1**

$q$ = 4154 x 0.0233 ( = 96.6 - 96.8 kJ)
*ecf = M1 x 4154*

**1**

$C_{cal}$ = $\frac{96.6}{12.4}$ = 7.79 - 7.81 (kJ $K^{-1}$)
*ecf = M2/12.4*
*If no other marks awarded, allow one mark for 4154/12.4 = 335*

**1**

(b) $q = C_{cal}\Delta T$ = 7.79 x 12.2 = 95.0 kJ
*Ecf for (a) x 12.2*
*If candidate converted 12.4 into kelvin in (a), ignore conversion to kelvin in (b)*

**1**

(amount of octane = $\frac{2}{114}$ = 0.0175 mol)

heat change per mole = $\frac{95.0}{0.0175}$ = 5417 kJ $mol^{-1}$
*Allow 5420 kJ $mol^{-1}$*
*Using the value given:*
*6.52 x 12.2 = 79.54(4)*
*79.54/0.0175 = 4545*

**1**

(c) pressure not constant in bomb calorimeter
*Allow enthalpy change requires constant pressure*

**1**

(d) 100 × $\frac{0.2}{12.2}$ = 1.64%
*Allow 1.6%*
*Allow 2% if working shown*
*NOT 2.0%*

**1**

use bigger mass of fuel (so $\Delta T$ greater)

Downloaded from www.merit-minds.com

*Allow octane or hexane as the fuel*

*Allow more / greater volume of fuel*

**1**

**[8]**

Q2.

**D**

**[1]**

Q3.

(a) **M1** Temperature on the y-axis and uses sensible scales (i.e. minimum 20 little squares for each °C on y-axis)

*Lose mark if temperature scale starts at 0°C*

*This mark scores if all points fit on the grid. Do not penalise M1 if extrapolation to 4 mins goes off the grid – this is penalised in **M3**.*

**1**

**M2** Plots all the points correctly (± half a small square)

*Lose mark if the points go off the grid Ignore a plotted point at 4 mins used to work out $\Delta T$*

**1**

**M3** Draws two best fit lines (0-3 mins) and (6-12 mins)

*Both lines must be straight and through all points except 5th minute; lose mark if the lines are kinked/doubled. Any line through 5th minute loses mark*

*"S-shaped curve" through points loses **M3** and **M4***

**1**

**M4** Extrapolates both lines to at least the 4th minute

*Lose mark if the extrapolation goes off the grid.*

**1**

**M5** 21.9 – 19.8 = 2.1 (°C)

*Allow calculation of $\Delta T$ from S-shaped curve as: Value at 4th minute – 19.8 but not if 0 (°C)*

*$\Delta T$ value ecf from incorrect lines/extrapolation*

*$\Delta T$ must be to at least 1dp*

*If value of $\Delta T$ = 2.1, then award M5*

**1**

(b) 0.2 / 2.1 × 100 = 9.5 %

*Conseq on (a)*

*Ignore no of sfs.*

**1**

(c) Replace the glass beaker with a polystyrene cup / insulate the glass beaker / use a lid

*Ignore use more dilute solutions*

*Ignore suggested materials for insulation*

*Do not allow copper calorimeter / bomb calorimeter*

**1**

(d) Increase magnitude of temperature change

*Ignore references to volume changes*

**1**

Downloaded from www.merit-minds.com

by increasing the concentration of the acid/alkali

*Mark independently*

**1**

(e) **M1** $HOOCCOOH + 2KOH \rightarrow K_2(OOCCOO) + 2H_2O$

***M1** – equation (allow ionic KOH / $_2C_2O_4$)*

*$H_2C_2O_4$ + 2KOH → $K_2C_2O_4$ + $2H_2O$*

*ignore state symbols*

*allow multiples*

*Mark independently*

**M2** q ( = mc∆T) = 100 × 4.2 × 3.2 = 1344 J

***M2** – process*

*(ignore sign here)*

*(allow calculations involving 4.18 which leads to 1338 J)*

**1**

**M3** n HOOCCOOH = 25 × 0.800 / 1000 = 0.020

n KOH = 75 × 0.6 / 1000 = 0.045

*M3 – calculations of amounts, in moles, of both the ethanedioic acid and potassium hydroxide (both calculations needed)*

**1**

**M4** Moles of water = 0.040 moles

***M4** – answer (stated or used in calculation of ∆H)*

**1**

**M5** ∆H = –1.344/0.04

= – 33.6 ( kJ $mol^{-1}$)

***M5** – ecf on **M2** and **M4***

*Answer must be negative and to at least 2sf*

*∆H = – **M2** (in kJ) / M4*

*–32.5 - –34 scores 4/4 (**M2**-**M5** + equation)*

*+32.5 - +34 scores 3/4 (**M2**, **M3**, **M4** + equation)*

*–65 - –68 scores 3/4 (+ equation)*

*+65 - +68 scores 2/4 (+ equation)*

*–52 - –54 scores 3/4 (+ equation)*

*+52 - +54 scores 2/4 (+ equation)*

**2**

(f) HOOCCOOH is a weak acid / not fully dissociated

*$H_2SO_4$ is a strong(er)acid / fully dissociated / dissociates more*

**1**

(more) energy needed to break bonds/complete dissociation / dissociation is endothermic

*So less energy is needed for dissociation of sulfuric acid*

*Ignore references to heat loss*

**1**

**[16]**

Downloaded from www.merit-minds.com