Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

(a) (i) *Standard enthalpy change*:
$\Delta H_R = \Sigma\Delta H_f$(products) - $\Sigma\Delta H_f$(reactants) **(1)**
or cycle

ΔH_R = ([2 × 0] + [3 × –393.5]) - (-824.2 + [3 × -110.5]) **(1)**
= -24.8 (kJ mol^{-1}) **(1)**
Allow + 24.8 max one

Standard entropy change: $\Delta S = \Sigma S$(products) - ΣS(reactants) **(1)**

ΔS = ([2 × 27.3] + [3 × 213.6]) - (87.4 + [3 × 197.6]) **(1)**
= (54.6 + 640.8) - (87.4 + 592.8) **(1)**
= 15.2 ($JK^{-1}mol^{-1}$) **(1)**
Allow -15.2 max one

(ii) $\Delta G = \Delta H - T\Delta S$ **(1)**
ΔH negative and $-T\Delta S$ is negative **(or ΔS positive or or correct calc) (1)**
Hence ΔG is always negative
(or feasible when ΔG ≤ 0) (1)

9

(b) $\Delta G = O = \Delta H - T\Delta S$ Hence $\Delta H = T\Delta S$ **(1)**
T **=** $\Delta H / \Delta S$ = 492.7 × 1000 / 542.6 **(1)**
= 908 K **(1)**
penalise missing 1000 by one mark

3

(c) ΔG (b) = ΔG (a)
(492.7 × 10^3 - T × 542.6) = (-24.8 × 10^3 - T × 15.2) **(1)**
517.5 × 10^3 = 527.4 T **(1)**
T = 981.2 K**(1)**
Allow 980 - 982
Penalise missing 1000 by one mark

3

[15]

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Q2.

C

[1]

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Q3.

D

[1]

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