

Name of the Student: \_\_\_\_\_

Max. Marks : 15 Marks

Time : 15 Minutes

## Mark Schemes

Q1.

(a)  $\Delta G = \Delta H - T\Delta S$

*Or expression  $\Delta H - T\Delta S$  must be evaluated*

1

If  $\Delta G$  / expression  $\leq 0$  reaction is feasible*Or any explanation that this expression  $\leq 0$* *Do not allow just  $\Delta G = 0$* 

1

- (b) The molecules become more disordered / random when water changes from a liquid to a gas / evaporates

*For M1 must refer to change in state AND increase in disorder*

1

Therefore the entropy change is positive / Entropy increases

*Only score M2 if M1 awarded*

1

$T\Delta S > \Delta H$

*Allow M3 for T is large / high (provided M2 is scored)*

1

$\Delta G < 0$

*Mark M3, M4 independently*

1

- (c) (i) Condition is
- $T = \Delta H / \Delta S$

1

$\Delta S = 189 - 205 / 2 - 131 = -44.5;$

1

$\Delta H = -242$  therefore  $T = (-242 \times 1000) / -44.5)$

1

$= 5438 \text{ K (allow } 5400 - 5500 \text{ K)}$

*Units essential (so 5438 alone scores 3 out of 4)**2719 K allow score of 2**5.4 (K) scores 2 for M1 and M2 only**1646 (K) scores 1 for M1 only*

1

- (ii) It would decompose into
- hydrogen and oxygen
- / its elements

*Can score this mark if mentioned in M2*

1

Because  $\Delta G$  for this reaction would be  $\leq 0$

*Allow the reverse reaction / decomposition is feasible*

*Only score M2 if M1 awarded*

1

(d)  $\Delta H = T\Delta S$

*Allow correct substituted values instead of symbols*

1

$$\Delta S = 70 - 189 = -119 \text{ JK}^{-1} \text{ mol}^{-1}$$

1

$$\Delta H = (-119 \times 373) / 1000 = -44.4 \text{ kJ (mol}^{-1}\text{)} \text{ (allow } -44 \text{ to } -45)$$

*Allow -44000 to -45000 J (mol<sup>-1</sup>)*

*Answer must have correct units of kJ or J*

1

[15]