

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Mark Schemes

Q1.

(a) $\Delta H = \Sigma(\Delta H_f \text{ products}) - \Sigma(\Delta H_f \text{ reactants})$

Allow correct cycle

1

$$/ = +34 - +90$$

$$= -56 \text{ kJ mol}^{-1}$$

Ignore no units, penalise incorrect units

1

(b) $\Delta S = \Sigma(S \text{ products}) - \Sigma(S \text{ reactants})$

1

$$/ = 240 - (205 + 211/2)$$

$$= -70.5 \text{ J K}^{-1} \text{ mol}^{-1} / -0.0705 \text{ kJ K}^{-1} \text{ mol}^{-1}$$

*Ignore no units, penalise incorrect units**Allow -70 to -71 / -0.070 to -0.071*

1

(c) $T = \Delta H / \Delta S$ / $T = (\text{Ans to part(a)} \times 1000) / \text{ans to part(b)}$

Mark consequentially on answers to parts (a) and (b)

1

$$/ = -56 / (-70.5 \div 1000)$$

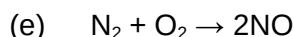
$$= 794 \text{ K (789 to 800 K)}$$

*Must have correct units**Ignore signs; allow + or – and –ve temps*

1

(d) Temperatures exceed this value

1

*Allow multiples*

1

(f) there is no change in the number of moles (of gases)

*Can only score these marks if the equation in (e) has equal number of moles on each side**Numbers, if stated must match equation*

1

So entropy/disorder stays (approximately) constant / entropy/disorder change is very small / $\Delta S = 0$ / $T\Delta S = 0$

1

Q2.

- (a) Standard pressure (100 kPa) (and a stated temperature)
Allow standard conditions. Do not allow standard states
Allow any temperature
Allow 1 bar but not 1atm
Apply list principle if extra wrong conditions given
Penalise reference to concentrations

1

- (b) Hydrogen bonds between water molecules

1

Energy must be supplied in order to break (or loosen) them

Allow M2 if intermolecular forces mentioned

Otherwise cannot score M2

CE = 0/2 if covalent or ionic bonds broken

1

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

1

$$= (6.03 \times 1000) / 22.1$$

1

$$= 273 \text{ K}$$

Allow 272 to 273; units K must be given

Allow 0°C if units given

0.273 (with or without units) scores 1/3 only

Must score M2 in order to score M3

Negative temperature can score M1 only

1

- (d) The heat given out escapes

1

- (e) (Red end of white) light (in visible spectrum) absorbed by ice

Allow complementary colour to blue absorbed

1

Blue light / observed light is reflected / transmitted / left

Penalise emission of blue light

1

[9]