S342/Specimen

Data that you may require in this examination

You may need to use the following expressions in answering this paper:

$$\ln x = 2.303 \log x$$

$$\xi = \frac{n_Y - n_{Y,0}}{\nu_Y}$$

$$\ln [A]_0 - \ln [A] = ak_R t$$

$$\frac{1}{[A]} - \frac{1}{[A]_0} = ak_R t$$

$$\ln\left\{\frac{[A]}{[B]}\right\} = (b[A]_0 - a[B]_0)k_R t + \ln\left\{\frac{[A]_0}{[B]_0}\right\}$$

$$k_{\text{theory}} = \frac{1}{c^{\ominus}} \times \frac{kT}{h} \exp\left(-\frac{\Delta G^{\ddagger}}{RT}\right)$$

$$\theta_A = \frac{b_A p_A}{1 + \sum_i b_i p_i}$$

$$\Delta G_m^{\ominus} = -nFE^{\ominus}$$

$$E = E^{\ominus} - (RT/nF) \ln Q$$

$\eta = a + b \log i$, where $b = (2.303RT/\alpha_{ox}F)$ or $b = -(2.303RT/\alpha_{red}F)$

$$\eta = \Delta\phi - \Delta\phi_e$$

$$i = i_c\left[\exp\left\{\frac{\alpha_{ox}F\eta}{RT}\right\} - \exp\left\{\frac{-\alpha_{red}F\eta}{RT}\right\}\right]$$

$$\text{volt (V)} = \text{J A}^{-1}\text{s}^{-1} = \text{J C}^{-1}$$

Use the following values for physical constants in any calculations you may need to perform:

gas constant:	$R = 8.314\ \text{J K}^{-1}\ \text{mol}^{-1}$
Faraday constant:	$F = 96\,485\ \text{C mol}^{-1}$
Avogadro constant:	$N_A = 6.022 \times 10^{23}\ \text{mol}^{-1}$
Boltzmann constant:	$k = 1.381 \times 10^{-23}\ \text{J K}^{-1}$
Planck constant:	$h = 6.626 \times 10^{-34}\ \text{J s}$