1. (20 %) The chemical reactions which may serve as the basis for titrimetric determinations are conveniently grouped into four types; (acid-base, oxidation-reduction, precipitation, complex). Please give examples and explain these reactions, respectively.

2. (20 %) $\Delta G = \Delta H - T\Delta S$ is an equation of the second thermodynamics. Please (i) define the meaning of G, H, S, respectively.
(ii) describe the relationship between this equation and chemical reaction.

3. (20 %) Derive the integrated rate equation for a parallel first reaction, and then have equations for [A], [B], [C] in exponential form. (assume; only A is present initially)

$$A \xrightarrow{k_1} B$$
$$A \xrightarrow{k_2} C$$

4. (20 %) (i) State the Arrhenius law. (ii) A second-order reaction in solution has a rate constant (k) of 5.7×10^{-5} dm^3 mol^{-1} s^{-1} at 25 °C and of 16.4×10^{-5} dm^3 mol^{-1} s^{-1} at 40 °C. Calculate the activation energy (E) and the preexponential factor (A), assuming the Arrhenius law to apply.
(R is the gas constant, equal to 8.314 J K^{-1} mol^{-1})

5. (10 %) Describe the following problems:
(i) what is the enzyme catalysis?
(ii) what is the coenzyme reaction?

6. (10 %) Calculate E^o at 25°C for the cell $Cd \mid Cd^{2+} \parallel Cu^{2+} \mid Cu$ and determine the cell reaction and its equilibrium constant.
Here $1/2\ Cd^{2+} + e^- = 1/2\ Cd$ $E^o = -0.4020$ V
$1/2\ Cu^{2+} + e^- = 1/2\ Cu$ $E^o = +0.3394$ V