LONDON'S GLOBAL UNIVERSITY

ARTS AND SCIENCES (BASc)

Sciences and Engineering

Below are examples of questions used for a previous Sciences and Engineering test, so please disregard any references to a lecture.

In the new test, you must answer the compulsory Maths question plus one of the other three questions available.

Please note, the questions below are for demonstration purposes only and the questions in the final test may take a different format.

EXAMPLE COMPULSORY QUESTION

Here we will derive an equation to allow us to use experimental data to evaluate the change in volume (V) when ice melts to form liquid water. Each part carries 4 marks and each part can be done independently from the other parts.

The gradient of the phase boundaries on a phase diagram plotting pressure p against temperature T are given by the Clapeyron equation:

$$\frac{}{} = \frac{\Delta}{\Delta} \qquad \text{(Eq1)}$$

Here H is the energy change on melting.

(a) Rearrange Eq. (1) and integrate both sides to show:

$$\int \quad = \frac{\Delta}{\Delta} \int \frac{1}{} \qquad \text{(Eq2)}$$

What are you assuming about V and H in performing this rearrangement?

(b) If the temperature is T_1 when the pressure is p_1 and T_2 when the pressure is p_2 integrate both sides of Eq. 2 to show:

$$_2 - \ _1 = \frac{\Delta}{\Delta} \ln \left(\frac{2}{1}\right) \qquad \text{(Eq3)}$$

(c) Simplify Eq. (3) further, by showing that $\ln \left(\frac{2}{1}\right) = \ln \left(1 + \frac{2 - 1}{1}\right)$ and hence:

$$_2 - \ _1 = \frac{\Delta}{\Delta} \ln \left(1 + \frac{2 - 1}{1}\right) \qquad \text{(Eq4)}$$

(d) It can be shown that:

$$(1 + \quad) \approx \quad (1) + \quad '(1) \qquad \text{(Eq5)}$$

where $'(\ ) = \quad /$ and *a* is small..

If T_2-T_1 is small, use Eq. (5) with $= (\ _2 - \ _1)/\ _1$ and (