Lesson 2a rates

1) The ideal gas equation is given below
   PV=nRT
   a) Using this equation derive formulae for
      Density (g/L)_____
      Formula mass _____
      Mass (g)_____
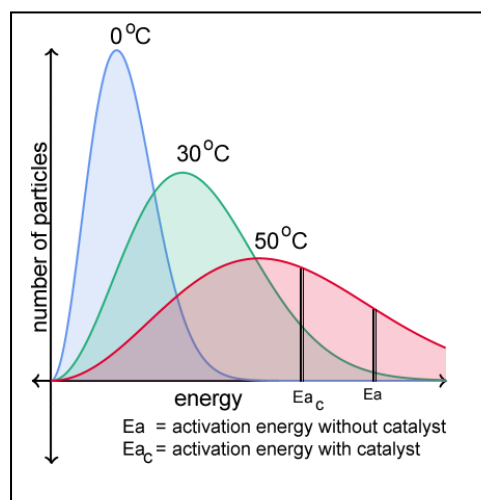   Concentration (mol/L)_____

   b) Fluorine gas (F_2) is kept in a 2.00 litre sealed vessel
      at 100.0 kPa at a temperature of 20.0 °C. Calculate the

      i.   Density of the gas in g/L

      ii.   Concentration in mol/L

      iii.   Mass of the gas in grams

2) A known quantity of gas is placed in a sealed container
   at 0 °C , it is then heated to 30 °C and then to 50 °C. The
   Maxwell-Boltzmann distribution curves for the gas at the
   three different temperatures are shown on the right.
   a) From the graphs shown on the right, how can we tell that
   the number of gas particles is the same at the three
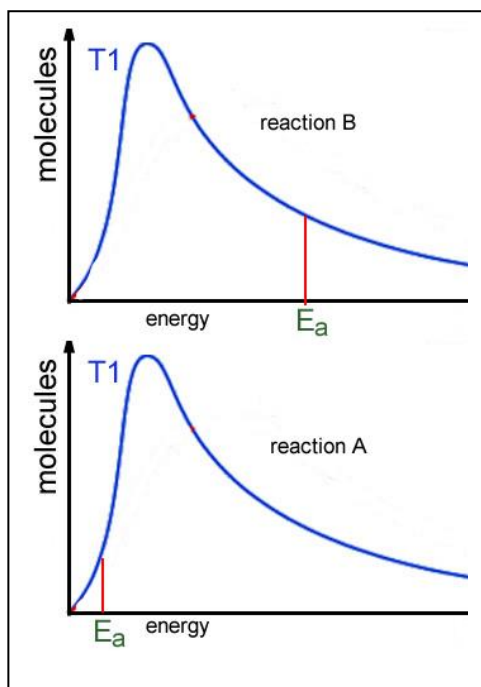   different temperatures.

   b) Using the information shown on the right, suggest why
   food kept at 0°C does not spoil as quickly as food kept at
   50°C.

3) The Maxwell-Boltzmann distribution curves of two reactions
   taking place at the same temperature are shown on the right.
   a) Which reaction will have the fastest reaction rate?
      Explain

   b) Explain what is meant by E_a

4) A reaction between a solution of 0.1M HCl and 5.00 grams of powdered $CaCO_3$ takes place under four different conditions. The mass loss from the reaction vessel is measured and plotted against time on a set of axes shown on the right.

    i.   Write a balanced chemical equation for the reaction taking place.

    ii.   Which reaction has the highest rate of reaction. Explain why.
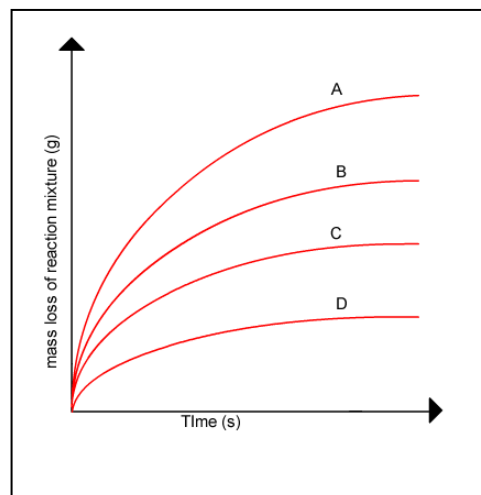
    iii.   Give one difference between the conditions of reactions C and D that could have resulted in the different shapes of the two graphs. Explain

    iv.   Give two differences between the conditions of reactions A and B that could have resulted in the different shapes of the two graphs assuming no catalysts were used. Explain

    v.   Looking at the shapes of each graph suggest one variable, apart from temperature, that was not kept constant?

    vi.   Sulfuric acid (H_2SO_4) instead of HCl was used. Write an equation for this reaction and suggest if this acid would work just as well as HCl.