The rate constant of a reaction is 1.5 x 107 S-1 at 50 deg C. and 4.5 x 107 at 100 deg C. Calculate the Arrhenius activation energy Formula to remember is 2.303 log (K2 / K1)   = Ea/ R [T2 –T1 / T2T1] 2.303 x log [4.5 x 107 / 1.5 x 107] = Ea / 8.314 [373 - 323 / 373 x 323]Ea = 2.2 x 104 J mol-1A first order reaction is 10 % complete in 10 min . Calculate the time required for its 90 % completion   When t = 10 min, [A] = 100 -10 = 90 K = 1 /t ln [A]0 / [A] = 1 /10 ln 100 /10 When 90 % reaction is complete, [A] = 100 -90 = 10 K = 1 /t ln 100 /10 = 1/ t ln 10 Equating both the rate constants and solving for t, it is 217. 4 min The half life of a radioactive isotope is 150 years What fraction of it would remain unintegrated after 500 years ?ln [A]0 / [A] = kt   and k = 0.693 / t1/2 ln [A]0 / [A] = (0.693 / t1/2) x t =0.693 / 150 x 500 = log [A]0 / [A] = 1.0032 = [A]0 / [A] = anti log (1.0032) = 10Fraction unintegrated would be [A] / [A]0 = 0.10 Calculate the rate constant for the reaction having the activation energy 39.3 kcal mol -1 300 deg C. and the frequency constant (pre- exponential factor) 1.11 x 1011 S-1.Given A = 1.11 x 10 11 S -1,   R = 1.987 Cal Ea = 39.3 kcal mol -1   T = 573 K K = A e – Ea / RT   Substituting all the values in the formula K = 1.14 x 10 -4 S-1