29. The reaction $C_2H_4(g) + Br_2(g) \longrightarrow C_2H_4Br_2(g)$proceeds very fast at room temperature.

(a) Which of the following KE diagrams would best explain the rate of this reaction? ("ME" is the minimum KE required before a molecule can react.)

(b) If the temperature were increased by 10°C, would the reaction rate double? Explain.

30. What happens to the shape of the KE distribution curve if the:

(a) reactant is used up at a constant temperature?

(b) temperature is decreased?

(c) reactant surface area is increased?

(d) concentration of reactants is increased

31. The initial rate of consumption of A in the reaction A → B is very slow: 1.0×10^7 molls at 20°C. Estimate the rate of the reaction at 40°C.

32. If the rate of a slow reaction is 2.0×10^{-4} mol/s at 10°C, estimate the rate at 40°C.

33. Why don't the oceans convert to nitric acid?

34. (a) Draw a PE diagram for a fast exothermic reaction.

(b) Draw a PE diagram for a slow exothermic reaction.

(c) Draw a PE diagram for a fast endothermic reaction.

(d) Draw a PE diagram for a slow endothermic reaction.

(e) How is the size of the "energy hill" related to the number of molecules which have sufficient KE to pass over the top of the hill?

35. If two reactant molecules collide with sufficient KE, are they guaranteed to have collision?

36. (a) As two reactant particles approach each other, what happens to (i) their KE? Why? (ii) their PE? Why?

    (b) The total energy of a system is given by: E TOTAL = PE + KE. How does the value of E TOTAL before a collision compare to the value of E TOTAL after a collision?

37. The following is a PE diagram for a collision between molecules A2 and B2. The molecules collide with favorable geometry.

    (a) if A_2 and B_2 had collided with less favourable geometry how to that shown above? (b) Why does PE decrease when going from the activated complex to the products, AB? (c) Is the overall reaction exothermic or endothermic? (d) Write a balanced equation for the reaction, including the value for the enthalpy. (e) What is the value of the activation energy in the above reaction?

38. The bond energies of F2 and of l2 are almost identical. Would you expect the activation energy for $H_2 + F_2 \longrightarrow$ 2 HFto be equal to, greater than, or less than the activation energy for $H_2 + l_2 \longrightarrow$ 2 Hl?[Hint: why does an activation energy exist in the first place?]

39. Carbon exists in two forms, or ALLOTROPES, called graphite and diamond. The enthalpy for yet one can't simply heat black, opaque and reaction converting graphite to diamond is only 2 kJ, inexpensive graphite and turn it into transparent and precious diamond. Suggest a reason why the reaction is so difficult to carry out.

40. After a reaction, the product molecules have less kinetic energy than the original reactant molecules. Is the reaction endothermic or exothermic? Explain your answer.

41. If ΔH =-15 kJ and Ea(f) = 40 kJ, what is the value of Ea(r)?

42. A reaction has Ea(f) = 55 kJ and Ea(r) = 30 kJ. Is the reaction exothermic or endothermia?

43. Draw and label a PE diagram for the reaction: $2\ NOBr(g) \longrightarrow 2\ NO(g) + Br_2(g) + 50\ kJ$ in which Ea(f) = 30 kJ. Indicate on your diagram the point at which the activated complex exists.

44. Draw and label a PE diagram to show the enthalpy change and activation energies for a reaction in which: R + 25 kJ $\rightarrow$ P and Ea(r) = 10 kJ.

45. Draw and label a PE diagram showing the enthalpy change and activation energies for a reaction in which Ea(f) = 20 kJ and Ea(r) = 45 kJ.