KINETICS REVIEW - KEY.

1a) $\frac{43.2g \mid 1 mol\ H_2O \mid 7 moles\ O_2 \mid 32.0g\ O_2}{\mid 18.0g\ H_2O \mid 6 moles\ H_2O \mid 1 mol\ O_2} = 89.6g\ O_2$

$3.00 mins = 1.80 \times 10^2 seconds$

$\frac{89.6g\ O_2}{1.80 \times 10^2 s} = 0.498 \frac{g}{s}$ O_2 consumed

1b) $\frac{0.045 mol\ NH_3 \mid 4 moles\ NO_2}{\mid 4 Moles\ NH_3} = 0.045 \frac{moles}{s} \times 15s = 0.675$ moles NO_2 produced in 15s

2a) (i) increase the surface area of solid Fe ⇒ more particles exposed for collision ∴ more overall collisions ∴ more effective collisions ∴ increased rxn rate

(ii) increase the conc of $HCl_{(aq)}$ → more particles in a given volume ∴ more overall collisions ∴ more effective collisions ∴ increased rxn rate

(iii) increase temperature
- more KE in particles ∴ moving faster ∴ more overall and effective coll ∴ inc. rxn rate
- more KE in particles ∴ collisions harder ∴ higher % of effective coll ∴ inc. rxn rate.

(iv) add a catalyst ⇒ higher % of effective collisions ∴ inc rxn rate due to lowered Ea

b) (i) get mass of $Fe_{(s)}$ before rxn, time the rxn, get mass of Fe after (if any left). Divide the Δmass of Fe by time

(ii) use a eudiometer tube to collect H_2 gas, time the reaction, and divide the volume of H_2 gas formed by time.

3(a) $rate = \frac{\Delta quantity}{\Delta time} = \frac{167.12 - 164.51}{30.0 - 0.00} = \frac{2.61}{30.0} = 0.0870 \frac{g\ H_2}{s}$

(b) $\frac{167.12 - 163.32}{60.0 - 0.00} = \frac{3.80}{60.0} = 0.063333 \frac{g\ H_2}{s} = 0.0633 \frac{g\ H_2}{s}$

(c) rate is always decreasing, so the rate early in a reaction is always greater than a rate later in a reaction.

(d) $\frac{0.063333g\ H_2 \mid 1 mol\ H_2 \mid 2 mol\ Fe \mid 55.8g\ Fe}{\mid 2.0g\ H_2 \mid 3 mol\ H_2 \mid 1 mol\ Fe} = 1.2 \frac{g\ Fe}{s}$

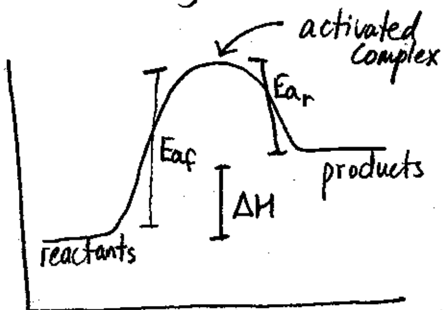
4) A decrease in temperature causes a decrease in particle KE
- particles move slower ∴ less overall collisions ∴ less effective collisions ∴ lower rxn rate
- particles move slower ∴ collisions not as hard ∴ lower % of effective coll ∴ lower rxn rate

5) as particles approach:
- KE decreasing due to electron-electron repulsion
- PE increasing

at collision:
- PE at highest and KE at lowest

as particles move away:
- PE decreasing as KE increases

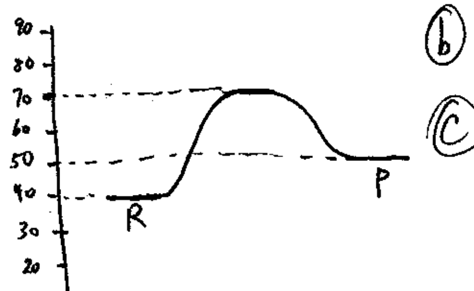
6) a)



b) ΔH positive for fwd rxn (endo)
∴ ΔH is negative for reverse rxn.

7) a) Ea doesn't change and ΔH doesn't change
b) Ea decreases and ΔH doesn't change

8) a)

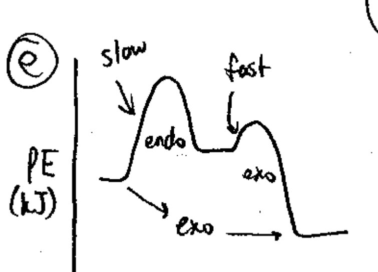


b) $Ea_r = 20kJ$
c) 70kJ

9) gases have more KE than liquids
∴ more overall collisions per unit time AND harder collisions
∴ more effective collisions per unit time ∴ faster reactions.

10) a) $2H_2O_2 \longrightarrow 2H_2O + O_2$
b) IO^-
c) Yes, I^-
d) Step 1 (slowest step)

e)



11) a) $O_3 + NO \rightarrow NO_2 + O_2$
b) No as it's not a reactant in the rate determining step (step 1)
c) Inc $[O_3]$ does increase the rate as it's a reactant in step 1 (slowest step).