**Additional questions on explaining** endothermic and exothermic reactions

1. The equation for Photosynthesis is

light

6CO2(g) + 6H2O(g) C6H12O6(s) + 6O2(g)*∆rH* = +2820 kJ mol–1

The diagram below is an energy level diagram for the Photosynthesis reaction

C6H12O6(s)+ 6O2(g)

Enthalpy

6CO2(g)+ 6H2O(g)

Reaction coordinate

i) Complete the labelling of the energy profile using the labels: *∆r*H  and EA

ii) Give three pieces of information that indicate that this reaction is endothermic.

2. Hydrogen peroxide decomposes to for oxygen gas and water, this is a very slow reaction which can be sped up by a catalyst, manganese dioxide MnO2

2H2O2 🡪 2H2O + O2 ΔH = -189 kJ mol-1

i) Is energy absorbed or released during the above reaction?

ii) Complete the energy profile for the decomposition of hydrogen peroxide

|  |
| --- |
| Enthalpy  Reaction coordinate |

iii) Add a dotted line into your diagram which represents the change in energy if the MnO2 catalyst is used.

iv) Will the overall yield of oxygen gas increase or decrease with the use of the MnO2 catalyst, explain.

3. Complete the energy level diagrams for

|  |  |
| --- | --- |
| i) the boiling of water | ii) the condensation of water vapour |
| Enthalpy  Reaction coordinate | Enthalpy  Reaction coordinate |

4. Answer and explain your answers for each of the reactions below

i) N2(g) + 3H2(g) 🡪 NH3(g) ΔrH  *=* - 92 kJmol–1

ii) C(s) + 2H2(g) 🡪 CH4 (g) ΔrH  *=* + 75 kJmol–1

iii)C12H22O11(s) + 12O2(g) arrow 12CO2(g) + 11H2O(l)∆rH = -5645 kJ mol–1

iv) 2C4H10(g) + 13O2(g) arrow 8CO2(g) + 10H2O(l) Δr*H* = –2623 kJmol–1

• draw an energy level diagram

• state whether the reaction takes in or gives out heat

• state whether the reactions are exothermic or endothermic

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