**ANSWERS**

1. **C**
2. **A**
3. **B**
4. **Divide both equations by 2  
   flip the bottom equation   
   -838 + 412.5 = -425∙5 kJmol-1**
5. **a) regenerates HCl used in step 1**

**b) 2 H2O → 2H2 + O2**

**c) only water is used up in reaction or similar**

1. **(a)High temp favours endothermic reaction**

**More moles on R H S 🡪 favoured by low pressure**

**(b) 30g ethane** 🡪 **2g hydrogen**

**100 tonnes 🡪 (2 / 30) x 100 = 6.67 tonnes**

**% yield = (6 ÷ 6.67) × 100 = 90%**

1. **bonds broken**

**C=O 743**

**C-H 412**

**C-C 348**

**Total = 1503**

**Bonds formed**

**C-O -360**

**O-H -463**

**C=C -612**

**Total = -1435**

**ΔH = 1503 - 1435 kJ mol-1 = 68 kJ mol-1**

1. **C2H3Br3: n = mass/FM = 76.4/266.74 = 0.286   
   oxygen: n = mass/FM = 49.1/32 = 1.53  
    Assuming that all of the oxygen is used up, 1.53 × (4 / 11) or 0.556 moles of C2H3Br3 are required. Because there are only 0.286 moles of C2H3Br3 available.  
   C2H3Br3 is the limiting reagent!**
2. **mols of NO: n = v / MV = 0.06 l / 22.4 lmol-1 = 0.0027 mols  
   NO – O22 mols – 1 mol  
   moles of O2 = 0.00267 / 2 = 0.001 mols  
   volume of O2 = n x MV = 0.001 x 22.4 = 0.03 litres = 30cm3**
3. **ClO3- + I2 🡪 Cl- + IO3-oxidation numbers: +5 -2**  0 -1 +5 -2   
     
   **ClO3- + 6e- 🡪 Cl-   
    I2 🡪 2IO3- + 10e-Multiply equations to cancel out electrons.  
     
   5ClO3- + 30e- 🡪 5Cl-   
    3I2 🡪 6IO3- + 30e-add equations together and cancel out electrons**  
   **5ClO3- + 3I2 🡪 5Cl- + 6IO3-  
     
   Add H2O to whichever side doesn’t have enough oxygen**  
   **15 oxygens on left 🡪 18 oxygens on right**  
     
   **need 3 on the left hand side  
     
   3H2O + 5ClO3- + 3I2 🡪 5Cl- + 6IO3-**  
   **Balance the hydrogen by adding H+**   
     
   **3H2O + 5ClO3- + 3I2 🡪 5Cl- + 6IO3-  + 6H+**  
   **Check that the charges balance on each side. -5 on each side. Balanced!**