**Advantages and Disadvantages of hydrogen fuel cells and rechargeable batteries. Help sheet**

**Use information available to you earlier in the lesson as well as books and websites such as**

**www.bbc.co.uk/bitesize**

**https://level8chem.wordpress.com/fuel-cells-and-rechargeable-batteries/ Fuel Cells see bitesize for simple stuff**

**In addition, here is some further information which can be used if you have no access to material for further research.**

**Hydrogen fuel cells.**

* They are very light
* They are very efficient (75% efficiency, compared to 20-25% in car *gasoline* engine and 35-40% in *coal* power plants)
* They are very clean (environmentally friendly) and portable – less pollution and no greenhouse gases released in process (as in the burning of fossil fuels)
* They cannot store electrical energy (must be used up right away)
* They need a continuous flow of fuel (reactants for redox reaction)
* They require hydrogen gas, which is dangerous to store and transport, as well as being harmful to the environment to produce (with the processes such as the cracking of ethane to produce it)
* They require expensive electrodes and other equipment
* They could result in corrosion or catalytic failures
* **Rechargeable batteries (NiCa) and Lead acid**
* They are rechargeable
* They are lightweight (compared to lead oxide batteries)
* The electrode material can be easily regenerated
* They have a longer life than lead-acid storage batteries
* Cadmium is extremely toxic, so batteries must be correctly disposed of with caution, as they have the potential to harm the environment
* They are more expensive than lead-acid storage batteries and produce a lower voltage
* They experience the memory effect: if NiCad batteries are charged while only partially discharged, an unreactive surface builds up on the electrode sheets, reducing their ability to react and produce electricity. Thus, these batteries will have a shorter life the more they are charged while partially discharged. This means that NiCad batteries should be completely used up before charging for maximum efficiency, which could cause inconveniences.