

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
TWENTY FIRST CENTURY SCIENCE  
CHEMISTRY A**

**A323/02/RB**

Unit 3: Ideas in Context plus C7 (Higher Tier)

**RESOURCE BOOKLET**

**JUNE 2010**

**To be opened on receipt**



**INSTRUCTIONS TO CANDIDATES**

- This booklet contains the article required to answer question 1.
- Take this article away and read it through carefully.
- Spend some time looking up any technical terms or phrases you do not understand.
- For the examination on **Friday 28 May 2010** you will be given a fresh copy of this article, together with a question paper.
- You will **not** be able to take your original copy into the examination with you.

**INFORMATION FOR CANDIDATES**

- This document consists of **4** pages. Any blank pages are indicated.

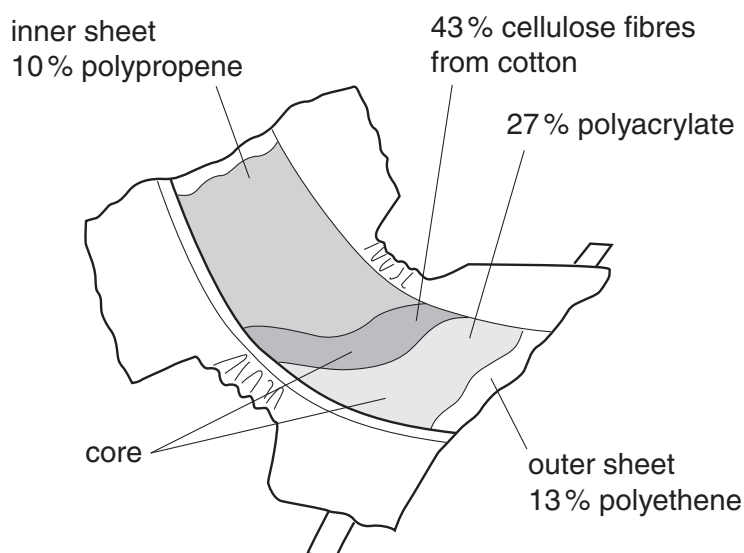
## Which nappy is best for the environment?

Babies wear nappies to keep themselves and their surroundings clean. Parents now have a choice between different types of nappy, but this choice might affect the environment.

### Disposable nappies

Disposable nappies are used only once. When they have been soiled they are thrown away into dustbins. Most disposable nappies used in the UK contain a core. This core consists of a fluffy pulp of cellulose fibres from cotton together with a layer of superabsorbent polymer (SAP) made from sodium polyacrylate. The core absorbs and retains urine. An inner sheet made of polypropene protects the baby's skin from wetness and an outer sheet of polyethene prevents leakage from the core.

Polymers can be made with different properties. The properties of the polymers used are very important for the nappy to be effective.



UK households produce about 25 million tons of waste material each year. Of this about 18% is recycled but most of the remainder goes into landfill sites. Disposable nappies make up about 2% of the household waste going to landfill, a contribution of about 400 000 tons each year.

### Reusable nappies

An alternative is to use reusable nappies, also known as 'terry' nappies. These are made from a square of cotton cloth that is folded to fit the baby. When soiled they are laundered in a washing machine and used again many times. The faeces from these nappies are usually disposed of in the sewerage system before the nappy is washed. To make this easier, most parents use a disposable nappy liner to contain the faeces. This is usually made from a thin layer of polypropene.

### Life Cycle Assessment

Both disposable and reusable nappies create environmental impacts. These can be assessed in a Life Cycle Assessment, which follows the lifetime of each product 'from cradle to grave'. Each Life Cycle Assessment takes into account the sustainability of making the materials for the nappies. It also includes the environmental impact of making the products from these materials, using the products and disposing of the products. The requirements for energy input at each stage of manufacture also have an effect on the environment.

### Environmental impact

Many people take it for granted that reusable nappies must have less environmental impact than disposable nappies. But most parents choose to use disposable nappies, which account for over 95% of the market.

Reusable nappies reduce the demands on landfill, but they impact on the environment in other ways such as the water and energy used in washing and drying them. Terry nappies are made entirely from cotton, which is the crop that is treated with the most fertiliser and pesticides in the world. Also, the majority of cotton is bleached, using chemicals that are potentially harmful to the environment.

### **Comparing the main environmental impacts**

Scientists working for a manufacturer of nappies compared Life Cycle Assessments on their leading brand of disposable nappy and on reusable 'terry' nappies. Although the impacts were found to be similar, the stages of the Life Cycle Assessment that are the main source of these impacts were found to be different for each type of nappy.

For disposable nappies the main sources of environmental impact are raw material production and use of these materials to manufacture the components of the nappies.

For reusable nappies the main sources of environmental impact are the generation of electricity used in washing and drying the nappies and the manufacture of the detergent used in washing.

### **Recycling**

A company has developed a process for the recycling of disposable nappies. In a UK factory planned by the company, nappies will be washed before they are separated into plastics, pulp and sludge. Once separated, pulp and sludge can be used as a biomass fuel. Products such as house cladding and roof tiles can be made by melting and re-moulding the recycled plastics. If this process becomes widely used it will change the outcome of the Life Cycle Assessment for disposable nappies, and may make them more environmentally friendly than reusable nappies.

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