

HPAS PRELIMINARY EXAM 2013

GENERAL SCIENCE(PAPER I)

EXPECTED FACTS

Glass

Glass is used for various purposes. You must have seen glasses fitted in windows and doors, looking mirrors, windscreens of vehicles, reading glasses, sunglasses, etc. Have you ever wondered how is glass prepared? What are the raw materials required for manufacturing of different types of glasses?

Raw materials required: The basic raw materials needed for making glass are:

- **Washing soda** which is sodium carbonate, Na_2CO_3
- Limestone which is calcium carbonate, CaCO_2
- Sand which is silica, SiO_2

Types of glass and their uses: There are various types of glasses depending upon their composition and the purpose of their use.

- **Soda-lime glass:** The glass produced as given above is called sodalime Glass or **soft glass**. It is used for manufacture of **bottles** ordinary **crocery**, ordinary laboratory glass apparatus like soda glass, **test tubes** etc.
- **Hard glass:** If instead of sodium carbonate, **potassium carbonate** is used for making glass another variety of glass known as hard glass is produced. It can withstand very high temperatures. It is used for making hard glass laboratory apparatus like hard glass **test tubes, beakers, conical flasks** etc.
 - **Borosilicate glass /Borosil /Pyrex :** It is sodium aluminium borosilicate. It can withstand rapid heating and cooling without breaking. It is used for making **kitchenware** and laboratory apparatus. It is sold under the trade names Borosil and Pyrex
 - **Flint or optical glass:** It is used for making lenses, prisms, spectacles, etc. because of its excellent optical properties. It is composed of alkalis, lead oxide and silica. It is also known as **flint glass**. A superior variety of optical glasses is made by adding **cerium oxide**.

- It cuts harmful ultra **violet rays** that are harmful to eyes. It is known as **Crooke's glass**. Flint glass is used for making **lenses, prisms, spectacles**, etc.
- **Coloured glass**: It is made by adding small quantities of oxides of different metals to basic ingredients. **Blue glass** contains traces of cobalt or copper oxide, **green glass** contains chromium ferrous oxide, **red glass** contains **selenium oxide**.
- **Fibre glass**: It is produced by passing molten glass through rotating spinners when it gets converted into fine threads. It is used as an insulating material for heat, electricity and sound in different **equipment like electric ovens, geysers, refrigerators**, etc. It is also used for reinforcing plastics and rubber to make bodies of **cars and scooters and safety helmets**.
 - **Candles** are made from a mixture of paraffin wax and **stearic acid**.
 - Safety matches have a mixture of potassium chlorate and antimony trisulphide and glue at the head of match sticks and a mixture of red phosphorus and powdered glass on the striking surface.
 - Soaps are sodium or potassium salts of long chain fatty acids while detergents are sodium or potassium salts of long chain sulphonic acids.
 - **Washing soda** ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) is prepared by **Solvay process**. It is used in the manufacture of glass, caustic soda, borax and soap powders. It is used for softening of water, as a laboratory reagent and as a starting material for many sodium compounds.
 - Baking soda (**NaHCO_2**) is the primary product of Solvay process. It is mainly used in baking industry and in fire extinguishers.
 - Baking powder is a mixture of baking soda and tartaric acid.
 - Bleaching powder (CaOCl) is prepared by mixing chlorine and slaked lime. It is used for bleaching cotton, linen and wood pulp and for sterilization of water.
 - Plaster of Paris ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$) is prepared by heating **gypsum** It is used for making casts and patterns and for plastering the walls, pillars and ceilings and to make ornamental patterns on them.

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