# CHEMISTRY AND INDUSTRY

## Important points

1. Cement was invented in the year 1824 buy J.Aspin.
2. Cement is a mixture of calcium silicates and calcium aluminates.
3. Raw materials for cement are limestone and clay.
4. Cement is prepared by two methods. They are dry method and wet method.
5. At the time of preparing cement temperature maintain is 1700 - 1900°C
6. Hard greyish balls of calcium silicate and Aluminium silicates are called as "Clinker Cement"
7. Glass is a mixture of sodium silicate, calcium silicate and sand.
8. Heating temperature of glass is 1000°C
9. Liquid glass is cooled by a special method known as annealing.
10. Ceramics are the products made from clay, felspar and sand.
11. Pottery or Terra-cotta are products of porous nature such as pots/jugs etc.
12. earthenware are glazed articles such as porcelain wall tiles crucibles and dishes.
13. Plastics are polymeric organic materials
14. Plastics are synthesized by addition or condensation polymerisation
15. Adhesives hold solid materials together by surface attachment
16. Gum-arabic, Shellac, animal glue etc are natural adhesives.
17. Urea formaldehyde, epoxy resins and silicons are some synthetic adhesives.
18. Plastics with certain properties are spun into fibres known as man-made fibres.
19. Melt spinning and dry spinning are two methods of spinning fibres from plastics.
20. Nylon, decoron, cellulose acetate and orion are some examples for man-made fibres.
21. Cosmetics are meant for improving attraction of a person.
22. Cold creams mainly contain almond-oil, bees-wax and rose water.
23. Dyes are useful for colouring textiles.
24. Chromophore and auxochrome are two groups that must present in a dye.
25. Dyes are classified into acidic, basic, direct, mordant, vat etc depending upon the method of application of dye to the fibre.
26. Depending upon chromophores in dyes they are classified as nitro dyes, nitrosodyes, Azo dyes and Quinon dyes etc.
27. Drugs are substances used in prevention, diagnosis treatment or cure of a disease.
28. Drugs are classified into six types based on therapeutic action. They are
    i) Drugs working on central nervous system
    ii) Drugs working on cardiovascualr system
    iii) Drugs working on foreign organisms
    iv) Chemo therapy drugs,
    v) Vitamins,
    vi) Hormones (Insulin, cartisone)
29. Pharmaceuticals are modified from of drugs such as tablets, capsules, lotions, syrups, tonics and injections.
30. Aspirin and paracetamol are the common drugs used in our daily life.
31. Petroleum products are converted into organic chemicals called pertochemicals, petrochemical in turn are converted into many useful products.
32. Petrol is a mixture of hydrocarbons with 5 to 9 carbon atoms.
33. Cooking gas in a mixture of butane, propane and propene compressed to liquid form

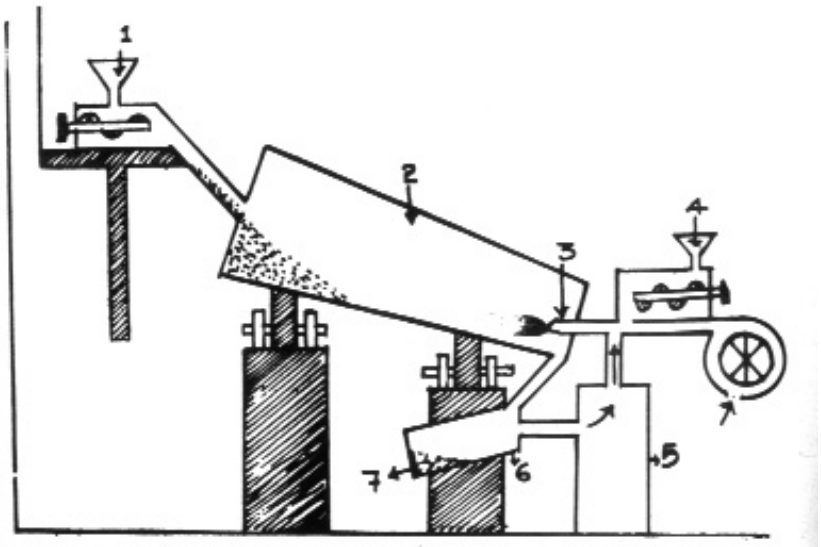
called "liquefied petroleum gas LPG".

33. Plants derive nutrients from soil, water, air
34. Required nutrients must be added to the soil in the form of manure or fertilizer.
35. Fertilizer provide N, P and K to the plants.
36. Urea, Ammonium Phosphates, Super Phosphates are common examples of fertilizers.
37. Plants require certain nutrients in micro quantities which are known as micronutrients.
    **Example:** B, Cr, Mo, Mn, CO, Zn, Fe

**Note:** Maximum items are covered from this chapter in every public exam. One must be through with the chapter.

## 5 Marks Questions

**1. Sketch of cement manufacturing plant ?**




**Manufacture of Cement**

1. Hopper for raw material; 2. Rotary Kiln; 3. Burner;
4. Hopper for Coal dust; 5. Dust Chamber; 6. Cooler; 7. Clinker Cement

## 4 Marks Questions

**1. Describe the manufacture of Cement.** **(March 2010)**

**1. Raw material required for the manufacture of cement:**

a. Limestone - $CaCO_3$

b. Clay - $Al_2O_3Fe_2O_3SiO_2$

c. Coke - C

d. Gypsum - $CaSO_4\ 2H_2O$

Cement is manufactured by two methods

i) Wet Process

ii) Dry Process

**2. Wet Process:**

- The clay is purified by washing in a wash mill. The lime stone is crushed into small particles and mixed with purified clay in proper proportion to get raw slurry

**3. Dry Process:**

- The raw materials are mixed in proper proportions. The mixture is dried, pulverized and made uniform to get 'raw meal'.

4. The raw slurry or raw meal, obtained by one of the above process called change is introduced into a rotary kiln.
   The rotary kiln consists of a steel cylinder about 150m long and 4m diameter and rotates 30-60 turns per hour.
5. At one end of the cylinder a screw conveyer is arranged which slowly allows the charge into cylinder.
6. At the other end of cylinder, a burners is arranged. Coal or burning oil or gas is burnt at this end.
7. During its passage slowly towards the hot end, it losses water in the beginning and then carbondioxide.
8. The temperature at the burning end of the kiln is around 1700-1900°C
9. Chemical reactions take place between calcium oxide and aluminium silicates as a result a mixture of calcium silicates and calcium aluminates is formed in the form of hard gray balls called clinker cement.
10. The clinker is cooled, ground to fine powder and mixed with 2-3% of gypsum and is transported in air tight bags.

**2. Describe how glass is manufactured.**

- Manufacture of glass involves three steps
  a. Fusion of raw materials
  b. Working with molten mass and
  c. Annealing

**a. Fusion of raw materials :**

1. Raw materials used for glass are soda ash ($Na_2CO_3$), limestone ($CaCO_3$) and sand ($SiO_2$)
2. The materials are taken in required proportion and thoroughly mixed and ground to get fine powder called batch.
3. Batch is mixed with some broken glass called cullet. Cullet helps in lowering the melting temperature of raw materials.
4. The whole mass is heated to 1000°C in a furnace. At this stage the following chemical reaction takes place.
   $Na_2CO_3 + CaCO_3 + 4SIO_2 \rightarrow Na_2SIO_3CaSIO_34SIO_2 + 2CO_2$
5. Impurities called glass-gall-rise to the surface and are removed. At this stage metal salts are added to get coloured glasses.

**b. Working with molten mass:**

Fused mass obtained in the above process is allowed to cool but still maintained in the liquid state.
liquid glass is poured into moulds of required shapes

**c. Annealing:**

- Usually, glass obtained by rapid cooling in brittle 50 glass in passed through a high temperature zone is a long narrow chamber by a conveyer belt where it cools slowly giving transparent glass.
- This process is called Annealing. Annealing strengthness the glass.

## 3. Mention the different types of glasses, their properties and uses.

| Types of Glass | Properties and Uses |
|---|---|
| 1. Sodaglass or Salt glass | 1. Easily fusible, used for window glass and bottles |
| 2. Pyrex Glass | 2. Used for Laboratory glass ware |
| 3. Quartz glass | 3. Electrical bulbs and optical instruments |
| 4. Fluit - Glass | 4. Optics |
| 5. Hard Glass | 5. Fuses with difficulty, resistant to water and acids, used for hard glass apparatus. |
| 6. Borosilieate Glass | 6. How expansion, resistant to shock and chemicals, used for backing dishes, labortory glassware and pipelins |

## 4. Write a short notes on a) Synthetic adhesives - uses b) Pottery and earthenware (June 01)

**adhesives:** adhesives are substances capable of holding materials together by surface attachment adhesives are of two types, viz (1) Natural adhesives, 2) Synthetic adhesives.

**Synthetic Adhesives:** Synthetic adhesives are resins such as epoxy resins, silicons, phenol, urea, formaldehyde resin, poly vinyls, poly styrenes and poly amides.

**Uses:** Urea formaldehyde resins, a synthetic adhesive and water resistant, is used for wood work, ply-wood and lamination work.

**Simple Pottery:** The articles are made from clay. The articles are not glazed. The Articles after drying are heated to 1100°C only and are not very string. This circular porous pottery like jugs, common bricks, tiles etc.

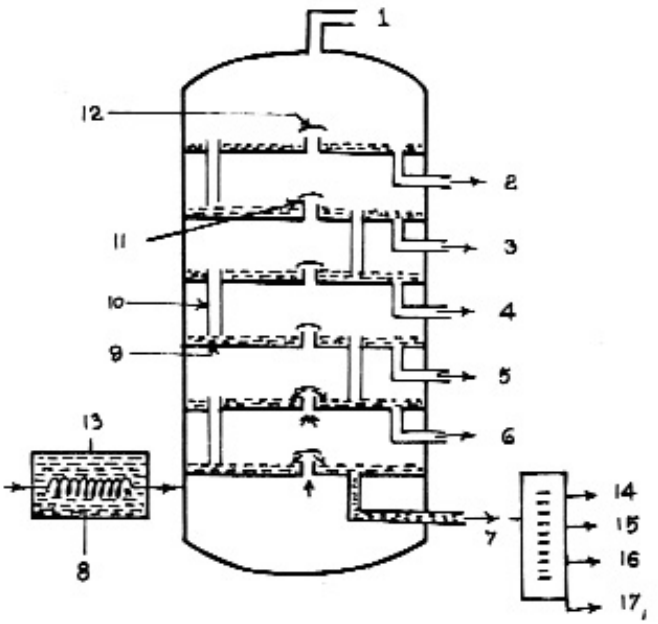
**Earthenware:** These articles are made from red clays, gray clays etc are harder than simple pottery as these are subjected to high temperature of 1450°C-1800°C. The glazing material like quartz, felspar, a little borax and a little borax and a little lead oxide are finely ground and then mixed with water to get a slurry. The articles are dipped into the slurry and fired at high temperature to get the glaze. The earthenware includes spark plugs, electrical insulators, crucibles, dishes, Porcelain, pots, glazed wall tiles etc.

## 5. Give an account of different plastic materials and their uses.

| Name of the plastic Material | Uses |
|---|---|
| Polythyene low density | Milk Cartoon, carry bags, rain coats |
| Polythene high density | Toys, electrical insulation containers. |
| Polystyerene | Insulation, Combs, Ceiling tiles, TV, refrigerator lining |
| Polyvinyl | Pipes hand bags, gram phone records electrical insulation, floor coverings |
| Poly estor | Films, recording tapes, packing and fibres for textiles. |
| Nylon 66 | Make up bristles and brushes, carpets, fabrics elastic hosiery. |

## 6. What is refining of petroleum? (june 03)

1. Crude petroleum is dark greenish brown, viscous oil found in the earths crust.
2. It is a mixture of many organic compounds such as straight chain paraffins, olefins, aromatic hydrocarbons and naphtha.
3. Purification of petroleum and seperation of its constituents into useful products is called refining of petroleum.




**Fractionation of Petroleum**

1. Uncondensed gases; 2. Petroleum ether; 3. Petrol ; 4. Naphtha ; 5. Kerosene ; 6. Diesel ; 7. Heavy Oil ; 8. Crude Oil ; 9. Tray ; 10. Pipe ; 11. Chemistry ; 12. Loose cap ; 13. Heater ; 14. Lubricating OIl ; 15. Petroleum Jelly ; 16. Grease ; 17. Paraffin-wax

**Refining of Petroleum:** Refining of Petroleum is carried out into the following steps.

A. **Seperation of Water:** Water present in crude petroleum is separated by passing it between two highly charged electrodes.

B. **Removed of Sulphur compounds:** Sulphur is removed by treating the oil with copper oxide. When copper sulphide is precipitated, its is seperated by filtration.

**C. Fractionation:**

i. Crude oil is heated upto 400°C. At this temperature all contents of crude oil except "asphalt" are evaporated.

ii. These vapours are sent into a fractionating column, which is a tall cylindrical tower having stainless.

iii. Each tray is provides with a chimney covered buy a loose cap.

iv. As the vapours of up, they are gradually cooled and condensed at different parts of the fractionating column depending upon their building points.

v. Components with high boiling points condense at low parts and components with low boiling points condense in the upper part.

vi. After fracitonation the various products obtained are
   a) Uncondensed Fuel gas
   b) Petroleum Ether.
   c) Naphtha
   d) Kerosene
   e) Diesel oil
   f) Heavy oil
   g) Road tar.

## 7. What is a drug? What are the requisites of an ideal drug?

**(June 2006, March 2003, Oct 99)**

**Drug:** A drug may be defined as a substance used in prevented, diagnosis, treatment of cure of a disease. An ideal drug should be satisfy the following requirements.

i. Its action should be located at the site of ailment.

ii. Its action should be efficient.

iii. It should not be toxic

iv. It should not have side effects

v. It should not injure patients body tissues or disturb normal physiological processes. In practice no drug is ideal and each one has its advantages and disadvantages.

## 8. What is a drug? Classify drugs depending upon their therapeutic action.

**(March-2004, 2000)**

A. A drug may be defined as a substance used in the prevention, diagnosis, treatment or cure of disease.

**Classification of drugs based on Therapeutic action:**

Broadly drugs are classified into six types depending upon the therapeutic action.

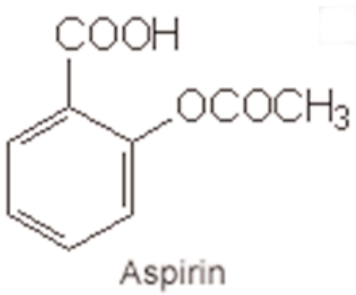
1. Drugs acting on central nervous system (acting on brain and spinal cord).
2. Drugs acting on peripheral nervous system (acting on body nerves).
3. Cardiovascular drugs (acting on heart and blood circulation).
4. Chemotherapeutic drugs (acting on foreign bodies like protozoan, bacteria, fungi and helminths)
5. Vitamins (A, B, C, D, E and K)

6. Hormones (Insulin, Cortisone)

**9. List out the sources of drugs. (Oct-1999)**

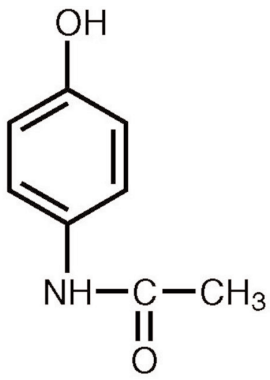
1. Drugs may be obtained from natural sources and micro-organisms.
2. Natural sources include plants, animals and micro-organisms.
3. Synthetic drugs are manufactures from coal based chemicals and petro chemicals.
4. Drugs like alkaloids, vitamins, hormones and antibiotics are obtained from natural sources.
5. Most of the drugs working on nervous system, heart and blood circulation and some antibodies are examples of synthetic drugs.

**10. Draw the sketch of Aspirin molecule and Paracetamol.**



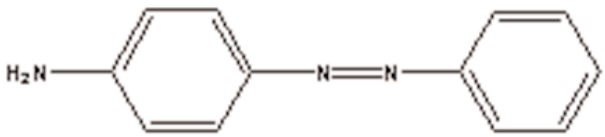
Aspirin

**(June-05, 04, 01, April-2008)**




**(June-2002)**

**11. Sketch the structure of aniline yellow dye molecule.**




1. Auxochrome 2. Chromophore

**12. What are fertilizers? Give their types with examples. (March-1999)**

1. Plants require certain elements as nutrients for their growth, flowering and yielding the crop for fruits.
2. They are natural, primary, secondary and micro nutrients.
3. Manure is cow dung or compost obtained from natural source. Fertilizers are the synthetic chemicals.
4. The commonly used fertilizers in agriculture can be divided into three types viz.
   (i) Potassium fertilizers
   (ii) Nitrogen fertilizers and
   (iii) Phosphorous fertilizers as they provide potassium (K), Nitrogen (N) and Phosphorous (P) respectively.

Types of commonly used fertilizers in agriculture.

| Types of Fertilizers | Examples |
|---|---|
| 1. Potassium fertilizers. | 1. $KCl$, $K_2SO_4$, $KNO_3$ |
| 2. Nitrogen fertilizers. | 2. $NH_4NO_3$, $NH_4Cl$, $NH_2CONH_2$ |
| 3. Phosphorus fertilizers. | 3. $Ca(H_2PO_4)_2$,$NH_4H_2PO_4$ $(NH_4)2PO_4$ $(NH_4)_3$ $PO_4$ |

5. The fertilizer which can give only one nourishing elements is called single fertilizer. Example are $NH_4Cl$, $NH_4NO_3$, $KCl$, $Ca(NO_3)_2$ etc.,
6. Certain fertilizer can provide two nutrient elements and hence called compound fertilizer for example $KNO_3$, mono di and tri ammonium phosphate provide two nutrient elements each.
7. However, the use of mixture of fertilizers instead of a single provides all the nutrient elements N, P and K and the proportions of these elements can also be varied according to the need of the soil. These fertilizers are called mixed fertilizers. Commercially available nitrophoska for instance is a mixed fertilizers.

## 2 Marks Questions

**1. What are the characteristics of good quality face powder?**
**(June-2008, March-2003, 2008)**

A. Characteristics of good quality face powder.
1. Opacity (covering power)
2. Slip (ease of distribution)
3. Adherence (sticking to the skin)
4. Absorbency (power of absorbing oil and sweat)
5. Fitness (size of the powder particles)

**2. Describe briefly cold cream and face powder mentioning their ingredients.**
**(March-1999)**

A. **Cold cream:** Creams are emulsions of oil and water. Chief contents are almond oil, bee wax, rose water, borax, butter, olive oil, lanolin oil and paraffin wax.
**Face powder:** It is applied to the face to remove oil and sweat and impart smooth finish to the skin, chief ingredients are chalk, tale, zinc oxide, magnesium stearate, titanium dioxide and zinc stearate.

**3. What are cosmetics?** **(March-2005)**

A. Any substance preparation or treatment applied to the person to cleanse, beautify alter the appearance or to promote the attractiveness of the person is called cosmetic.

**4. What are the uses of cold cream?**

a) Cold creams are used as cosmetics for skin.
b) They protect the skin from hot sun, effect of clod breeze and dust.
c) They clean the skin make it feel smooth.
d) A good quality cream melts at body temperature and spreads readily over the skin. It should not be sticky and greasy.

**5. Write short notes on synthetic adhesives and their uses?**

A. 1. Adhesives are substances capable of holding materials together by surface attachments.
2. Adhesives are two types.
a) Natural adhesives b) synthetic adhesives

Example for synthetic adhesives are urea formal dehyde resin. This is a water resistant and useful in wood work and ply-wood and lamination.

**6. Give a list of different types of adhesives, their properties and uses.**

| Name of adhesive | Properties & Uses |
|---|---|
| 1. Natural adhesive; Gum-arabica. | 1. Cheap, water soluble and used for paper. |
| 2. Synthetic adhesives urea formal dehyde resin. | 2. water resistant, wood work, plywood and lamination. |

**7. Mention the methods of manufacture of cement? (March-2006)**

Cement is manufactured by two methods.
1) Wet process and 2) Dry process

**8. What is annealing. (June-2005, March-05)**

A. **Annealing:** The partially liquid state of glass is passed through a high temperature zone to low temperature zone is a long narrow chamber by a conveyor belt when it cools slowly giving transparent glass. This process is called annealing strengthens the glass.

**9. Define and give two examples for each. (March-2005)**

a) Cosmetic and
b) Pharmaceutical

A. **Cosmetics:** Any substance, preparation or treatment applied to cleanse, beautify alter the appearance or to promote the attractiveness of the person is called cosmetics.
**Eg:** Cream, lotions.
**Pharmaceutical:** Pharmaceuticals are drugs given to the patient in one or more modified forms.
**Eg:** Syrups, Capsules.

## Very Short Answer type questions
## 1 Mark questions

**1. Write names of two hormones? (March-2010)**

A. 1) Insulin and 2) Cortisone

**2. What is glass blowing? (June-2010)**

A. Glass blowing is technique by which glass articles are shaped by melting glass and blowing air into it till derived shape is obtained. For this pyrex glass and boro silicate glasses are used.

**3. What are pharmaceuticals? (June-2009)**

A. Pharmaceuticals are modified forms of drugs such as tablets, capsules, lotions, syrups, tonics and injections.

**4. What is plastic?**

A. Plastic is defined as polymeric organic material together with small amounts of other materials like fillers, plasticizers, lubricants etc.

**5. What are adhesives? (March-2004)**

A. An adhesive is a substance capable of holding materials together by surface attachment.

**6. Mention name of any two chromophores.**

A. Nitro ($-NO_2$) and nitroso (–NO) are two chromophores.

**7. What are micro fertilizers? What is their use?**

A. The fertilizers containing micronutrients such as B, Cu, Mn, Zn, Fe are called micro fertilizer. These are applied in small quantities mixed with super phosphates $KNO_3$ and other fertilizers. Micronutrients are added as their deficiencies lead to unhealthy growth of plants.

**8. What are primary nutrients? (March-2006, 2010)**

A. The primary nutrients are nitrogen, phosphorous and potassium. These are absorbed from soil by the plants through the roots.

**9. What is the use of adding cullet to the raw materials of glass? (June-2007)**

A. Cullet is added to the raw materials of glass to lower the melting temperature of the raw materials.

**10. What does LPG consists of? (March-2005)**

A. LPG consists of propane, butane and small proportion of ethane.

**11. What are called glass-gall?**

A. The impurities obtained in the manufacture of glass are called glass-gall.

**12. Name the types of glass used in glass-blowing?**

A. Pyrex glass & Boro silicate glass.

**13. What is meant by refining of petroleum?**

A. Purification of petroleum and separation of its constituents into useful products is called refining of petroleum.

**14. What are natural nutrients?**

A. Carbon, Hydrogen, Oxygen are called natural nutrients.

**15. Examples for ceramics.**

A. Pottery, earthenware, crockery, stationary ware.

**16. Examples for simple pottery?**

A. Pots, jugs, common bricks.

**17. Examples for earthenware?**

A. Spark plugs, electrical insulation, crucibles dish, glazed wall tiles.

**18. Example for dry spum fibres?**

A. Cellulose, acetate and orion.

**19. Example for melt spun fibres?**

A. A nylon and dacron.

**20. Example for natural fibres.**

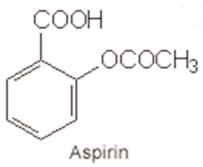
A. Cotton, jute and wool etc.

## Fill in the Blanks

1. Cement is a mixture of _____ **(June-2010, June-2007, 08)**
2. Glass blowing is possible with _____ **(June-2006, March-05, 02)**
3. Chromophore role is _____ **(June-2001)**
4. Auxochromes role _____
5. Drugs which act on blood circulation are _____ **(March-2010, 2005)**
6. Chief component of cooking gas _____
7. The first synthetic dye was prepared by the scientist _____ **(June-2010, 2003)**
8. The constituent of petroleum having highest boiling point is _____
9. _____ is an example for auxochrome. **(March-2008)**
10. Example for a mixed fertilizer is _____ **(June-2008)**
11. The process of cooling glass is called _____ **(June-2007, March-09, 07, 06, 01)**
12. _____ hold materials together by surface attachment. **(June-2007)**
13. Cold cream is an _____ of oil and water. **(June-2008)**
14. Chemical composition of talc is _____ **(June-05, 02)**
15. Cold cream is an emulsion of _____ **(March-08)**
16. _____ is used as refrigerator lining _____ **(March-2008)**
17. Polymeric organic substance is commonly known as _____ **(March-2008)**
18. The figure showing the structure of Aspirin drug molecule is _____ **(June-2010)**
19. Glass is a mixture of _____
20. Terra-cotta articles are _____

21. A natural dye among indigo, turkey red, tyrian purple is _____
22. The chemical composition of chalk _____
23. Greyhard balls of cement is called _____
24. Chemicals derived from the fraction of petroleum are called _____
25. _____ gives blue colour to the glass.

## Answers

1. calcium silicate & calcium aluminate
2. pyrex glass & boro silicate glass
3. imparts colour to fibre
4. binds the dye to fibre and intensities the colour of dye
5. cardio vascular
6. butane
7. W.H. Perkin
8. Asphalt
9. $-SO_3H$
10. nitrophosk
11. annealing
12. adhesive
13. emulsion
14. magnesium silicate
15. oil and water
16. polystyrene
17. resin
18. 

Aspirin
19. sodium silicate, calcium silicate and sand
20. porous
21. all of them
22. calcium carbonate
23. clinker cement
24. petro chemicals
25. $CuSO_4$