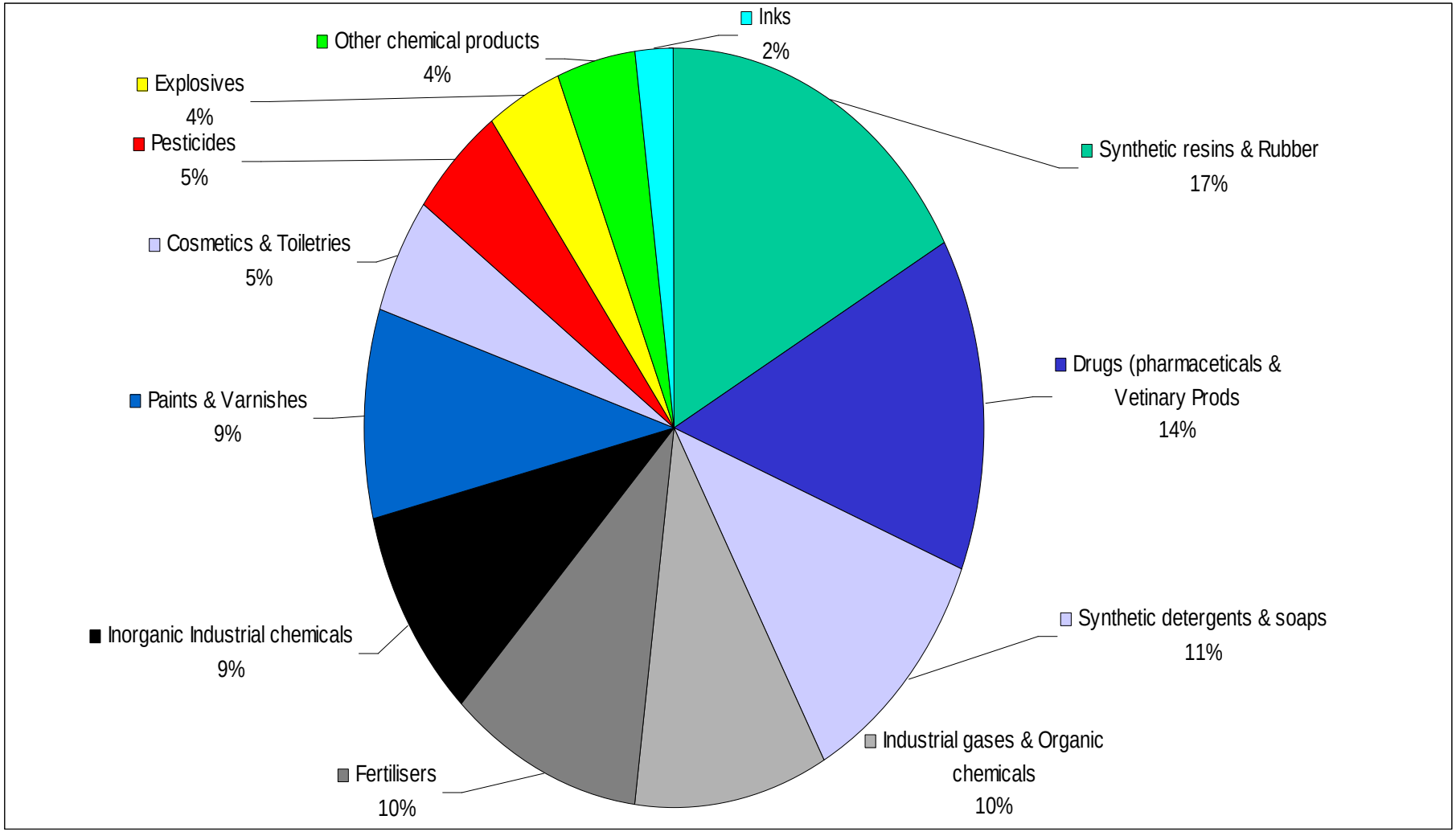
Chemical Industry

Top Ten Chemicals (World)

1. Sulphuric acid (H_2SO_4)
2. Nitrogen (N_2)
3. Oxygen (O_2)
4. Ethene (C_2H_4)
5. Lime (CaO)
6. Ammonia (NH_3)
7. Phosphoric acid (H_3PO_4)
8. Sodium Hydroxide ($NaOH$)
9. Propene (C_3H_6)
10. Chlorine (Cl_2)

Australian Chemical Industry



Australian Chemical Industry

Synthetic resins & Rubber 17%

Drugs (pharmaceticals & Vetinary Prods 14%

Synthetic detergents & soaps 11%

Industrial gases & Organic chemicals 10%

Fertilisers 10%

Inorganic Industrial chemicals 9%

Paints & Varnishes 9%

Cosmetics & Toiletries 5%

Pesticides 5%

Explosives 4%

Other chemical products 4%

Inks 2%

Location of Australian Industry

- Botany Bay – NSW
- Altona West / West Footscray – Vic
- Kwinana - WA

Important Issues

- Availability of raw resources
- Availability and cost of transporting these raw materials
- Proximity of markets for the products
- Cost of energy used in production
- Cost and availability of appropriate labour force

Important Issues

- Cost and suitability of land for the industry
- Coast and difficulty of disposing of any waste products
- Provision of any government concessions such as tax rebates or other incentives
- Other social, political and environmental issues

Environmental / Social Issues

- Increasing awareness of public in environmental impact of industrial plants
- How a plant effects the society it is built in

Yield

- The percentage of Product produced compared to Reactants
- Conversion from reactants to products is rarely complete
- Extent of completion of reaction is determined by
  - Temperature
  - Pressure
  - Concentration

Yield

- For manufacturing process to be profitable, raw products must be converted to products quickly and efficiently
- Need to ensure
  1. The reaction rate is fast
  2. High proportion of reactants are converted to products at equilibrium

Attaining a Fast Rate

- High concentrations / pressures
- High pressures
- High surface area of solids
- Use of a catalyst

Attaining High Equilibrium Yields

- Pressures depend on relative numbers of reactants and products particles
- Low temp for exothermic reactions
- High temp for endothermic reactions
- Addition of excess reactant
- Removal of product as it forms

Costs

- Expense may influence the choice of
  - Catalyst – a less expensive one may be preferred to a more effective and expensive one
  - Pressure – high pressure vessels are costly to build and maintain
  - Temperature – fuel costs rise as temperatures rise
  - Choice of reactant in excess – the cheaper one

Costs

- Cost of building plant
- Raw materials
- Labour
- Energy
- Marketing
- Transport
- Waste disposal
- Depreciation

Controlling Reactions in Industry

- Batch Processing
  - Done in the laboratory
  - Fixed amount of reactants give fixed amount of products
- Continuous Flow Processing
  - Reactants are continually mixed providing a constant supply of products