

CHAPTER 12

MODERN MATERIALS

FOCUS ON:

- METALS
- ALLOYS
- NATURAL POLYMERS
- SYNTHETIC POLYMERS

METALS

OR

ALLOYS

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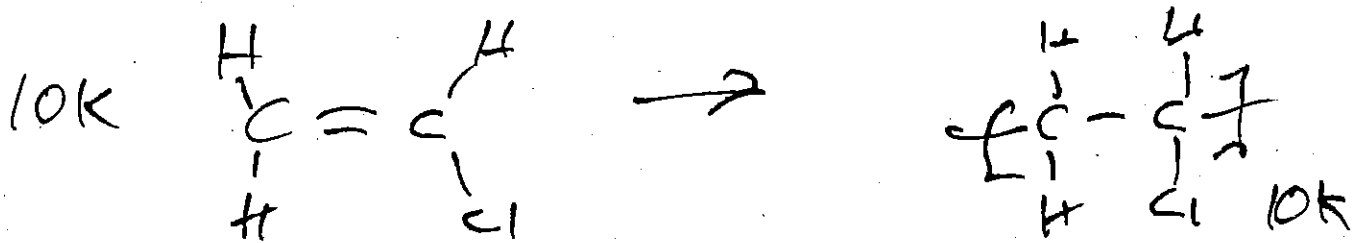
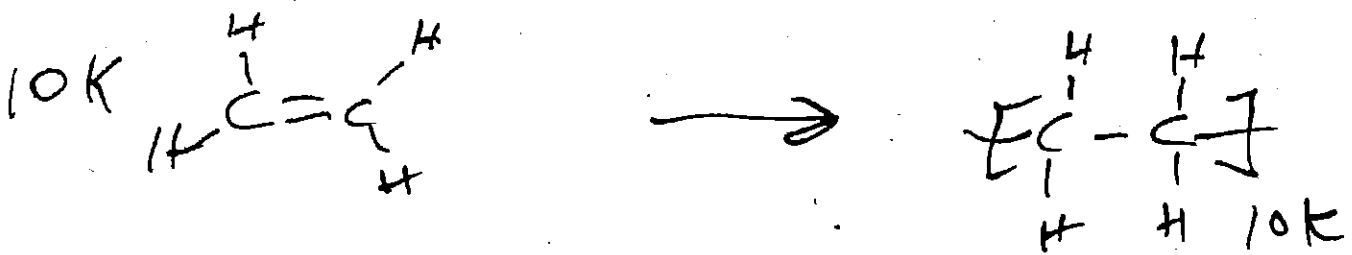
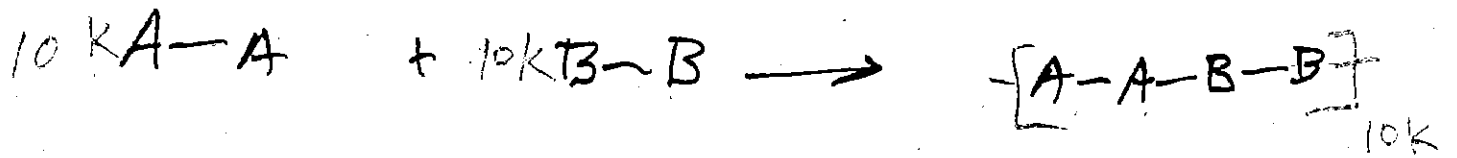
A NICKEL

CU

A PENNY

18 CARAT
GOLD

BRONZE
BRASS



POLYMERS

3

NATURAL (BIO)

OR

SYNTHETIC

PVC

POLYETHYLENE

NYLON

POLYESTER

PROTEINS

RNA

DNA

CELLULOSE

STARCH

POLYURETHANE

POLYSACCHARIDE

HAIR

TABLE 12.4 Polymers of Commercial Importance

| Polymer | Structure | Uses |
|--|---|---|
| Addition Polymers | | |
| Polyethylene | $\text{-(CH}_2\text{-CH}_2\text{)}_n\text{-}$ | Films, packaging, bottles |
| Polypropylene | $\left[\begin{array}{c} \text{CH}_2\text{-CH} \\ \\ \text{CH}_3 \end{array} \right]_n$ | Kitchenware, fibers, appliances |
| Polystyrene | $\left[\begin{array}{c} \text{CH}_2\text{-CH} \\ \\ \text{C}_6\text{H}_5 \end{array} \right]_n$ | Packaging, disposable food containers, insulation |
| Polyvinyl chloride (PVC) | $\left[\begin{array}{c} \text{CH}_2\text{-CH} \\ \\ \text{Cl} \end{array} \right]_n$ | Pipe fittings, clear film for meat packaging |
| Condensation polymers | | |
| Polyurethane | $\left[\begin{array}{c} \text{C}=\text{O} \\ \\ \text{NH-R-NH-C}=\text{O} \\ \\ \text{O-R'-O} \end{array} \right]_n$ R, R' = $\text{-CH}_2\text{-CH}_2\text{-}$ (for example) | "Foam" furniture stuffing, spray-on insulation, automotive parts, footwear, water-protective coatings |
| Polyethylene terephthalate (a polyester) | $\left[\text{O-CH}_2\text{-CH}_2\text{-O-C(=O)-C}_6\text{H}_4\text{-C(=O)-O} \right]_n$ | Tire cord, magnetic tape, apparel, soft-drink bottles |
| Nylon 6,6 | $\left[\text{NH-(CH}_2\text{)}_6\text{NH-C(=O)-(CH}_2\text{)}_4\text{-C(=O)-O} \right]_n$ | Home furnishings, apparel, carpet, fishing line, toothbrush bristles |
| Polycarbonate | $\left[\text{O-C}_6\text{H}_4\text{-C(CH}_3\text{)}_2\text{-C}_6\text{H}_4\text{-O-C(=O)-O} \right]_n$ | Shatterproof eyeglass lenses, CDs, DVDs, bulletproof windows, greenhouses |