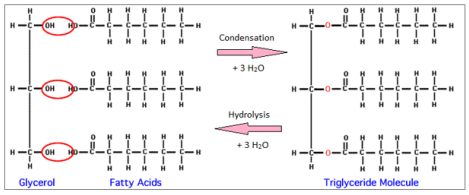
Biomolecule

protein

- function
  - enzyme
  - hemoglobin-oxygen carry pigment
  - structural protein
    - collagen
    - kertain
  - hormones
  - receptor on cell surface membrane
  - transport protein on the cell membrane
  - antibody
- structure
  - monomer: amino acid
    - test: add biuret solution
    - protein present, color turn to purple
  - primary structure
    - a sequence of amino acid
    - condensation by peptide bond
  - secondary structure
    - hydrogen bond between oxygen on the carbonyl group and the hydrogen on the nitrogen
    - alpha-helix
    - beta-pleated sheet
  - tertiary structure
    - the interaction between the R group of the different amino acids
    - disulfide bond
    - ionic bond
    - weak hydrophobic interaction
    - hydrogen bond
  - quaternary structure
    - more than one polypeptide chain working together as a functional macromolecule
    - interaction between polypeptide
  - fibrous protein
    - structural function
    - insoluble in water as the R group of the amino acids are mostly non-polar
    - collegen — alpha helix> triple helix(by hydrogen bond)> 3 polypeptide> collagen molecule> collagen fibrils> collagen fiber
  - globular protein
    - soluble in water — non-polar amino acids are facing inward
    - hemoglobin
      - haem group — a type of prosthetic group, iron can bind oxygen.
      - each subunit can bind one oxygen molecule
      - sickle cell anaemia — genetic disease

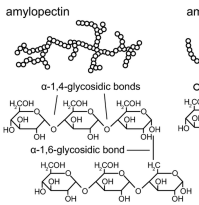
lipid

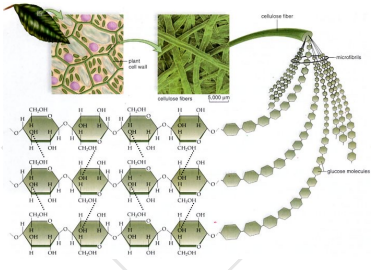
- glycerol+ fatty acid(by ester linkage)
- function
  - energy storage
  - heat insulator
  - buoyancy
  - reserve for water
- test of lipid
  - lipid is dissolved in ethanol
  - add water
  - shake vigorously
  - lipid droplet appear



carbohydrate

- monosaccharide(reducing sugar)
  - alpha-glucose
  - beta-glucose
  - glucose
  - fructose
  - galactose
  - test for reducing sugar
    - add Benedict's solution(CuSO4 in base environment)
    - water bath in beaker(70- 80 degree)
    - blue> green> orange> brick-red ppt.
  - nucleophilic attack: linar structure to ring structure
- hydrolysis
- condensation by 1,4-glycosidic bond
- disaccharide(reducing sugar (except sucrose)
  - maltose
    - alpha-glucose+ alpha-glucose
  - sucrose
    - test
      - make sure no reducing sugar in solution
      - water bath with hydrochloric acid
      - HCl can catalyzes the hydrolysis of sucrose and form fructose and glucose(add NaHCO3 to neutralize)
      - add Benedict's solution, if it turns to brick-red ppt, sucrose exists
    - alpha-glucose+fructose
  - lactose
    - alpha-glucose+ galactose
    - through condensation by 1,4-glycosidic bond
- polysaccharide
  - starch
    - amylose
      - 1,4-glycosidic bond
      - helical structure
      - unbranched
    - amylopectin
      - 1,4/1,6-glycosidic bond
      - branched
    - test for starch
      - add iodine solution(orange brown)
      - turn to dark blue
  - glycogen
    - highly branched(1,4/1,6-glycosidic bond)
    - in the liver and muscle fibers
  - cellulose
    - made up the plant cell wall
    - condensation by the beta-glucose rotated 180 degree
    - 60-70 units 1,4-glycosidic bond
    - microfibril
    - hydrogen bond
    - cellulose fiber
    - hydrogen bond
    - cell wall





nucleic acid

water

- a type of intermolecular force — hydrogen bond
- surface tension
- density
- specific heat capacity
- freezing point
- latent heat of vaporization