I. Organic Molecules
   A. Energy input
      1. ATP
      2. reducing power

   B. Energy retrieval
      1. strip away electrons from chemical bonds
      2. oxidation of food molecules
         - cellular respiration
         - 2 step process (remove e- then use)

II. Glycolysis (first step)
   - in cytoplasm
   A. Splitting of glucose
      1. 10 enzyme-catalyzed reactions

      2. glucose → two 3-C molecules

      3. pyruvate

   B. Substrate-level phosphorylation
      1. transfer of high-energy Pi to ADP

      2. net gain of ____ ATP per glucose

   C. Two electrons removed and carried as NADH (will use later)

III. Oxidation (oxidative respiration)
   - mostly in mitochondria; O₂ must be present

   A. Pyruvate oxidized
      1. CO₂

      2. acetyl-CoA
         a. ATP synthesis (oxidative respiration)
         b. fat synthesis

   B. Krebs cycle (matrix reactions)
      1. acetyl-CoA stuck onto 4-C sugar

      2. enzyme-catalyzed metabolic pathway
      3. net results
         a. ____ CO₂
b. ____ e- removed in pairs
   - each pair of e- will power synthesis of 2 or 3 ATP

c. ____ ATP
d. original 4-C sugar

C. Electron Transport System (making ATP)
   1. similar to photosynthesis
   2. protons pumped out of matrix

   3. chemiosmosis
      a. ↓ [H⁺] inside matrix
      b. H⁺ diffuse across inner membrane
         - special channel protein

   4. used e- are not recycled:

   5. H₂O

D. Net results
   1. _____ ATP from complete oxidation of one glucose
   2. _____ ATP from glycolysis

E. Regulation
   - “feedback inhibition”

IV. Fermentation
A. _____________ is absent.

B. Glycolysis cannot proceed without NAD⁺
   NAD all fully occupied (NADH) if no O₂ available to accept e-
   1. animals:
   2. yeasts