Terms to know:
Pharmacokinetics - study of the ‘fate’/ ‘movement’ of substances administered to the body
Pharmacology - study of effects of drugs on behavior

Administration:

- Intravenous - fast, precise, direct access to the brain
  - Drug abuse, adrenaline
- Intraperitoneal - fast indirect access to brain
  - Chemotherapy
- Intramuscular - slower, direct access, has to be absorbed by blood vessels
  - Vaccines, antibiotics (commonly distributed in the buttocks or shoulder)
- Subcutaneous - slow absorption (fat tissue) indirect
  - Insulin
- Oral - easy, delayed (has to go through stomach, intestines, and liver
  - aspirin
- Sublingual - easy for humans to bypass digestive system capillaries of the tongue
  - Steroids
- Intrarectal - slow, bypass the stomach
  - Suppositories
- Inhalation - fast, easy, requires volatile substances
  - Nasal decongestant, drugs of abuse
- Topical - fast, local (skin mucous..)
  - Nasal, eye (herpes, glaucoma) eardrops
- Intracerebral - bypass the BBB, local (specific brain area)
  - Mostly used for research
- Intracerebralventricular - bypass the BBB, global effect
  - Used in emergency cases

Kinetics of Absorption:
- Study of the effect on some specific brain areas, movement through the BBB
- Lipid - soluble (such as heroine) substances pass the BBB water soluble substances (such as morphine) do not.

Effectiveness:
- Response curve - dose
- Linear curve - if the effect was proportionate to the amount of drugs

Affectiveness:
- Affinity
- Drugs may have the same end-results, but may vary in effectiveness
Different sites of action:
- Morphine: analgesic, inhibits pain-perception neurons
- Aspirin: analgesic, suppress ‘chemical signal’ from damaged cells to the nervous system

Margin of Safety:
- Drugs have multiple effects at different concentrations
- A high margin of safety is better than a low margin of safety for drugs
- Therapeutic Index= measure of drug safety

- LD ← Lethal dose
- ED ← effective dose

- Higher TI is safer! (if the TI=3 that means it only takes 3 pills to kill someone)

Drug misuse/abuse
- Long term effects of drugs
  - The more frequent you use a drug the less effective it becomes
  - Tolerance: need more drugs, compensatory mechanism counteracting the effect of the drug
  - Withdrawal: symptoms- compensatory mechanism alone, opposite behavior/emotions.
    - Sensitization: Effect increases with repeated use
    - Effects can be psychological- placebo effect

How do drugs work?
- Agonist- opens receptors
- Antagonist- blockers

Neurotransmitters:
- Goal: release postsynaptic potentials (EPSP/IPSP)
- The main families of neurotransmitters:
  - Amino Acids
  - Acethylcholine(ACH)
  - Monoamines
  - Neuropeptides

Amino Acids:

Glutamate-
- Synthesis: from protein in food
- Found Where? Everywhere in CNS
- Receptors:
  - Always Excitatory
  - Ionotropic for Na+
  - Ionotropic for Na+ and Ca^2+
  - Metabotropic glutamate receptor
- Psychopharmacology:
  - NMDA- involved in learning and memory
  - AP5 blocks the glutamate binding site on NMDA receptors
Alcohols block NMDA receptors
PCP blocks NMDA and calcium entry in cell

**GABA**
- Synthesis: from glutamate
- Found where? In CNS
- Receptors:
  - always inhibitory
  - Ionotropic for Cl- (GABA-a)
  - Metabotropic for K+ (GABA-b)
- Psychopharmacology:
  - Controls spread of excitation (epilepsy, seizures)
  - Muscimol opens & biculline blocks GABA-a
  - Benzodiazepines opens GABA-a

**Glycine**
- Synthesis: found in sugar cane, endogeneous production unknown, non-essential
- Found where? Mainly spinal chord
- Receptors: always inhibitory, ionotropic for Cl-
- Psychopharmacology:
  - Prevents excessive muscle contraction
  - Tetanus- bacteria produces a chemical that blocks glycine release