I. Development
   A. Background
      1. Embryo
      2. Fetus
      3. Gestation
      4. Morphogenesis
   B. First Trimester
      1. Fertilization
      a. Capacitation of Spermatozoa (~300 million ejaculated)
      b. ~100 Spermatozoa reach ampulla of Uterine tube
      c. One sperm penetrates Secondary oocyte with First polar body in Corona radiata with Zona pellucida
         1) Meiosis II resumes resulting in an Ovum and Second polar body
            a) Sometimes First polar body also divides
         2) Hyaluonidase from Acrosomes of many Spermatozoa is necessary for the penetration
         3) Prevention of Polyspermy
         4) Pronuclei come together in Amphimixis
      d. Zygote
2. Cleavage – Occurs in Uterine Tube usually
   a. First Division is 24 – 30 hours after fertilization
   b. Blastomeres
   c. ~ 12 hours between divisions
   d. Morula by third day – 16 cells
3. Blastocyst formation (Chorionic vesicle or Blastula)~Day 6
   a. Differentiation
      1) Bastocoele (Blastocyst cavity)
      2) Trophoblast
         a) Outer covering
         b) Provides nutrients to embryo
      3) Inner Cell Mass (ICM)
         a) Develops into embryo
   b. Hatching – Zona Pellucida is shed
4. Implantation
   a. Lasts from ~7 – 14 days after ovulation
   b. Syncytial Trophoblast (Syncytiotrophoblast) - Superficial
      1) Secretes Hyaluronidase
      2) Erodes Endometrium forming Lacunae
         a) Maternal blood
      3) Sprout Villi
      4) Produces Human Chorionic Gonadotropin (hCG)
   c. Cellular Trophoblast (Cytotrophoblast) - Deep
      1) Forms Embryonic part of Placenta
   d. Amniotic Cavity ~ Day 9
   e. ICM organizes into Blastodisc
      1) Epiblast – Superficial Layer
      2) Hypoblast – Deep Layer facing Blastocoele
   f. Clinical Application - Ectopic Pregnancy
5. Gastrulation ~ Day 12

a. Primitive Streak – Medial plane of blastodisc

1) Invagination forms Germ Layers
   a) Ectoderm – forms from Epiblast
      1] Epidermis and epidermal derivatives
      2] Nervous system
      3] Lining of mouth, nose, anus and salivary glands
      4] Pituitary gland and Adrenal medullae
      5] Pharyngeal cartilages, teeth, auditory ossicles and portions of temporal, sphenoid and hyoid bones
   b) Endoderm – forms from Hypoblast
      1] Most of Digestive & Respiratory epithelia
      2] Part of Urinary & Reproductive systems
      3] Thymus, Thyroid gland and Pancreas
   c) Mesoderm – forms from migrating cells
      1] All of Muscular, Cardiovascular & Lymphatic systems and Serosae, Most of Skeletal System
      2] Dermis, Hypodermis, & Connective Tissue
      3] Kidneys and part of urinary tract
      4] Gonads and Most of Reproductive tract
      5] Adrenal cortex

b. Embryonic Disc
6. End of Fourth Week of Development
   a. Tail fold
   b. Head fold
   c. Organogenesis
      1) Somites

7. Extraembryonic Membranes – lie outside Blastodisc
   a. Yolk sac ~ Day 10
      1) Cells from Hypoblast form pouch
      2) Mesoderm reinforces
      3) Blood vessels appear
         a) Early source of embryonic nourishment
         b) Early site of blood formation
      4) Ectodermal cells migrate here as Primordial Germ Cells and then later migrate to gonads
         a) Spermatogonia
         b) Oogonia
b. Amnion – forms as Yolk sac develops
1) Cells from Epiblast migrate to line inside of Amniotic Cavity
2) Mesoderm reinforces
3) Amniotic fluid
   a) Initially filtrate of maternal plasma
   b) Later in gestation fetus breaths and drinks, then urinates into fluid
4) Functions
   a) Shock absorber for Embryo/Fetus
   b) Regulates fetal body temperature
   c) Prevents adhesions between fetus & tissues
5) Clinical Application: Amniocentesis
c. Allantois
   1) Forms from endoderm and mesoderm near base of yolk sac
   2) Body Stalk
      a) Blood vessels become umbilical vessels
   3) Forms part of embryonic urinary bladder

d. Chorion
   1) Forms from cellular trophoblast and mesoderm
   2) Chorionic villi
      a) Baby’s portion of Placenta
      b) Body stalk connects embryo to placenta
         1) Umbilical cord forms when yolk stalk and body stalk fuse
            a) Two Umbilical arteries
               1} Deoxygenated blood
            b) One Umbilical vein
               1} Oxygenated blood
8. Placenta
   a. Uterine mucosa
      1) Decidua basalis
      2) Decidua capsularis
      3) Decidua parietalis
   b. Chorion
      1) Chorionic villi
   c. Intervillous spaces
   d. Functions
      1) Nutrient uptake
      2) Waste elimination
      3) Gas exchange via maternal circulation
      4) Fights against infection
      5) Produces hormones
         a) Human Chorionic Gonadotropin (hCG)
         b) Human Placental Lactogen (hPL)
         c) Placental Prolactin
         d) Relaxin
         e) Progesterone
         f) Estrogens
B. Second Trimester
C. Third Trimester
D. Birth or Parturition

1. Labor
   a. Dilation stage
      1) Efface cervix
      2) Contractions rupture Amnion
   b. Expulsion stage
      1) Once cervix is completely dilated (10 cm)
   c. Placental stage
      1) Afterbirth