FINAL EXAM NOTES
KINESIOL 1A03 - Anatomy and Physiology I

Unit 1

Overview of Anatomy and Physiology

- ❏ Body Parts and Regions
- ❏ Serous Membranes
    - Visceral serous membrane - inner
    - Parietal serous membrane - outer
    - Pericardium - around heart
    - Pleura - sound lungs
    - Peritoneum - around organs of abdominal cavity
        - Peritoneal fold - double membrane connecting one organ to another
        - Mesenteries - connect small intestines to each other
    - Retroperitoneal organs - outside/behind serous membranes

Homeostasis

- ❏ Set point - ideal normal value and can fluctuate within normal range
- ❏ Feedback systems
    1. Stimulus
    2. Receptors - monitor value of some variable
    3. Control center
    4. Effector
    5. Response
- ❏ Negative Feedback - any change from set point made smaller
- ❏ Positive Feedback - response makes greater change (e.g. giving birth)
- ❏ Normal range can change during exercise but still homeostatic

Embryology and Development

- ❏ Ampulla - site of fertilization
- ❏ Ovary - location of gametes
- ❏ Ovulation - mature sex cells from ovary → ampulla region of fallopian tubes

- ❏ What helps with movement of the sperm?

- self-propelled by **flagella**
- **uterus contract** to move the sperm towards the ampulla
    - Caused by **oxytocin** (released during intercourse) as well as **prostaglandins** (support sperm)

❏ mature egg or oocyte will only survive for ~24 hours

❏ Prenatal Development

1. Germinal period: (first 2 weeks of development) during formation of primitive germ layers
2. Embryonic period: (week 2 - 8) organ systems develop, now an embryo
3. Fetal period: (week 9-birth) organ systems grow and mature to fetus

❏ Fertilization

- During meiosis gamete divides into oocyte and polar body

Ultimate goal: combine the genetic material from the head of the sperm with the genetic material found within the oocyte nucleus

1. Sperm passes through corona radiata and zona pellucida to reach oocyte
    - Zona pellucida has ZP3 glycoprotein - sperm receptors (only human)
2. Acrosome of sperm binds to receptor → Acrosomal reaction → digestion of zona pellucida
    - Need multiple sperm to break down ZP
3. Sperm bind to integrin a6B1 → depolarization (fast block to polyspermy)
4. Female nucleus second meiotic division → ovary & 2nd polar body, **now pronucleus**
5. Sperm head detach from body
6. Both join → zygote
7. 1st division - largest (within 24 hour - duration 6-36h), multiple divisions after
    - Totipotent
8. Morula (day 5) - same size as zona pellucida
    - pluripotent
9. Blastocyst (day 6) - fluids pushed to the side → fluid filled cavity and cells pushed as single layer around

❑ Factors that prevent multiple sperm entering oocyte

- Fast block to polyspermy - depolarization
- Slow block to polyspermy - release of Ca2+ causes exocytosis of H2O → zona pellucida and ZP3 denature

❑ Implantation and Formation of Placenta

8-12 days

Blastocyst attaches to uterine cavity, trophoblast cell → cytotrophoblast and syncytiotrophoblast cells

- Cytotrophoblast cells - separate embryo proper and maternal blood supply
- Syncytiotrophoblast cells - multinucleated cell invades endometrium
    - release chorionic gonadotropin in maternal blood - maintain thicken wall

14 - 20 days

- Blastocyst fully covered by uterine wall (implantation)
- Placenta occuring
- Syncytiotrophoblast continues to invade
- Cytotrophoblast forms finger-like projections
- Embryo proper creates connecting stalk (becomes umbilical cord)
- Lacunae (syncytiotrophoblast cells digest arteriole wall)

1 month

- Cytotrophoblast cord forms (--> chorionic villi)
    - Surround syncytiotrophoblast and lacunae → embryo can get its own blood supply now

❑ Mature placenta and Fetus

- Chorionic villi creates chorion (syncytiotrophoblast and basement membrane)
    - Chorion separates maternal blood and fetal blood
- Cytotrophoblast disintegrated and forms placenta

❏ Embryonic Disk

- Amniotic Cavity - forms inner cell mass, surrounded by amniotic sac
- Epiblast - 3 germ layers (will differentiate)
- Hypoblast - extraembryonic membranes (mesoderm, syncytiotrophoblast)
- Yolk sac - forms inside blastocele from hypoblast

❏ Formation of Germ Layers

Gastrulation (day 13-14)

- Embryonic disk more ovulated, head becomes cephalic end, tail → caudal end , cells move through primitive streak to hypoblast
- Primitive streak - linear band of thickened epiblast
- Endoderm - forms lining of digestive tract and derivatives
    - Epiblast cells displace hypoblast and take over
- Mesoderm - forms tissues (muscle, bone, blood vessels)
- Ectoderm - forms skin and nervous system
    - Don't migrate and stay in epiblast

❏ Formation of the Notochord

Day 16

- Solid cylinder of mesodermal cells under ectoderm
- Induction - signals from mesoderm to ectoderm to form neural plate
    - Neural plate - thick region of ectoderm

Day 18

- Development of neural plate
- Oropharyngeal membrane - will be mouth
- Cloacal membrane - anus

❏ Formation of Neural Tube

Day 18 - 26

- Neural groove and 2 neural folds form → higher until crests form → crests come together to form tube → single layer creates is the skin
- Neural tube → brain and spinal cord
- Neural crest - general CT of head, parts of PNS

❏ Formation of Somites

- Formed by mesoderm, becomes vertebral column, ribs, skeletal muscle
- Beside neural tube

❏ Embryonic Folding and Gut Formation

Day 20

- Amniotic cavity folds around 3 germs layers longitudinally
  - Coelom →pocket that becomes body cavities
- Fold in median plane around head and tail
  - Hind gut - close to caudal end
  - Foregut - cephalic end
  - Allantois - bladder

Day 25

- Folds in median place get closer & mesoderm pushed out the way
- Lateral fold starts to pinch off endoderm from yolk sac

Day 30

- Somites and vertebral column develop faster than ventral causing curve
- Evaginations of gut tube form
  - Anterior pituitary, thyroid gland, lungs, liver, pancreas
  - Branchial arches
- Coelom → pericardial cavity → pleural and peritoneal cavities

❏ Limb Bud Development

- Limb buds → limbs (~day 28)
- Apical ectodermal ridge - thickening of ectoderm → stimulated outward growth
- Limb grow from proximal to distal