

STRUCTURAL BASIS OF MEDICAL PRACTICE

EXAMINATION I

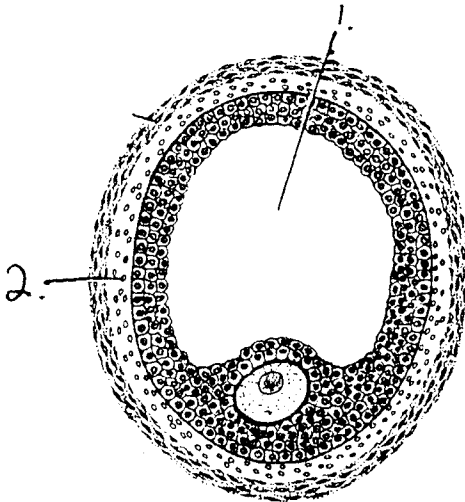
September 1, 2005

PART I. Match the structure with the letter of identification (5 pts)

1. _____

2. _____

- A. Antrum
- B. Zona pellucida
- C. Primary oocyte
- D. Granulosa cells
- E. Theca externa
- F. Theca interna
- G. Blastomere



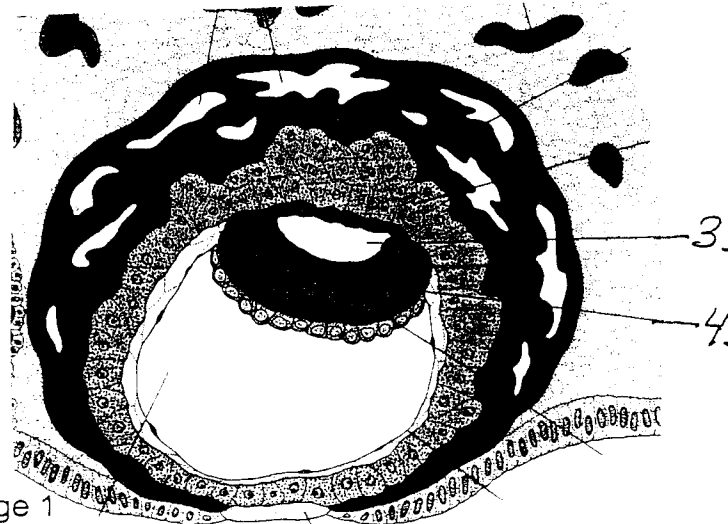
Secondary follicle

3. _____

4. _____

- A. Epiblast
- B. Hypoblast
- C. Exocoelomic cavity (primitive yolk sac)
- D. Amniotic cavity
- E. Cytotrophoblast
- F. Synchiotrophoblast
- G. Endodermal cells

9-day human blastocyst

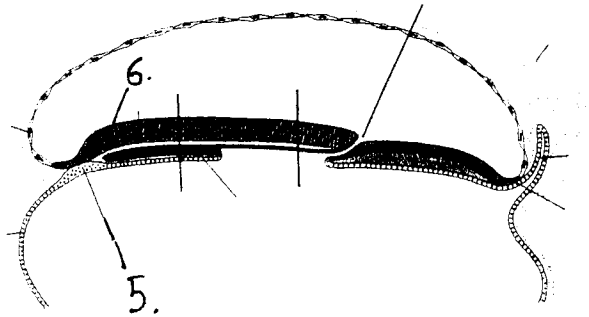


5. _____

6. _____

- A. Allantois
- B. Notochord
- C. Primitive pit and neurenteric canal
- D. Prechordal plate
- E. Ectoderm
- F. Amnion
- G. Notochord

Sagittal section of a 17-day old embryo

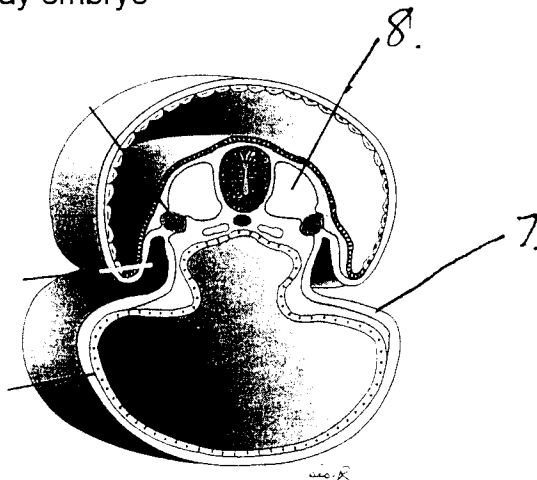


7. _____

8. _____

- A. Neural tube
- B. Amnion
- C. Splanchnic or Visceral mesoderm
- D. Somatic or Parietal mesoderm
- E. Endoderm
- F. Intermediate mesoderm
- G. Somite

Transverse section of a 21 day embryo

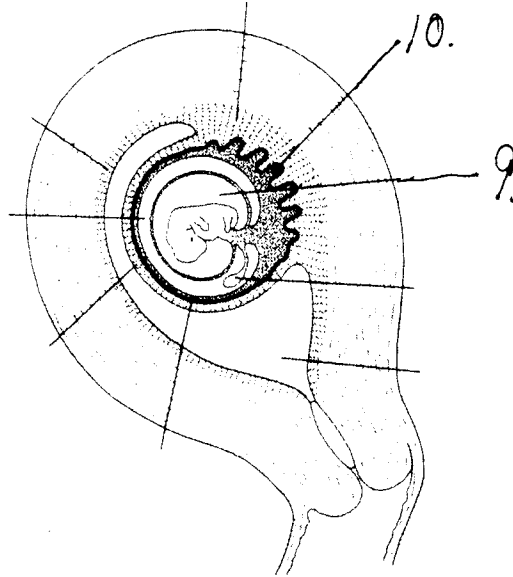


9. _____

10. _____

- A. Amniotic cavity
- B. Yolk sac
- C. Uterine cavity
- D. Chorionic cavity
- E. Chorion frondosum
- F. Decidua capsularis
- G. Vitelline duct

End of the 2nd month



PART II. Circle the correct answer. (7 pts)

1. Mature alveoli have well-developed epithelial endothelial (capillary) contacts in the:
 - a. Pseudoglandular period.
 - b. Canalicular period.
 - c. Alveolar period.
 - d. Terminal sac period.

2. Which statement is **NOT** true in respect to respiratory development?
 - a. The respiratory diverticulum (lung bud) appears in the embryo at approximately 4 weeks old.
 - b. The esophagotracheal septum separates the midgut from the trachea.
 - c. Fetal breathing movements begin before birth.
 - d. Alveoli are not present from 5-16 weeks.

3. Which statement is **NOT** true in regard to heart development:
 - a. The heart originates from the endodermal germ layer.
 - b. By the end of 2 months the heart divides into a typical four-chambered structure.
 - c. The septum primum descends from the roof of the atrium, and leaves a lumen - the ostium primum - for communication between the atria.
 - d. The septum secundum forms between the atria but an interatrial opening, the oval foramen (foramen ovale), persists in the fetus.

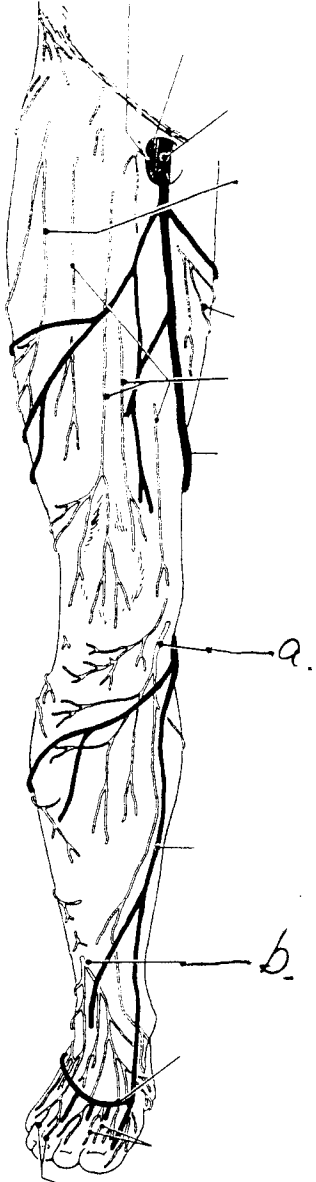
4. Which statement is **NOT** true in heart development:
 - a. The truncus arteriosus will form the roots and proximal portion of the aorta and pulmonary artery.
 - b. The midportion of the bulbus cordis, the conus cordis, forms the outflow tracts of both ventricles.
 - c. The cardiac loop is complete by the middle of the third week.
 - d. Endocardial cushions form the bicuspid and tricuspid valves.

5. A 6-yr old child is referred to a pediatric cardiologist for evaluation of dyspnea (shortness of breath) on exertion. On physical exam you note delayed growth, cyanosis (dark blue coloration of the skin), and unusual heart sounds. After lab exams, you conclude Tetralogy of Fallot. Which is **NOT** a symptom of this disease:
- a. Right ventricular outflow obstruction (pulmonary infundibular/valve stenosis)
 - b. Large ventricular septal defect
 - c. "Overriding" large ascending aorta
 - d. Left to right shunting of blood
6. In regard to developmental heart defects, which statement is true:
- a. A patent ductus (truncus) arteriosus is the failure of closure of the connection between the right and left atria.
 - b. Rubella virus and thalidomide are classic examples of cardiovascular teratogens.
 - c. A patent foramen ovale is an example of a ventricular septal defect.
 - d. Persistent truncus (ductus) arteriosus is the most common congenital cardiac malformation.
7. A newborn male baby presents with a tracheoesophageal fistula. Which is **NOT** a characteristic of a tracheoesophageal fistula:
- a. Catheter cannot be passed into the stomach.
 - b. Reflux (backward flow) of gastric contents into the lungs.
 - c. Chokes after swallowing milk.
 - d. Occurs at the time of surfactant production.

PART III. Identify the structures. (6 pts)

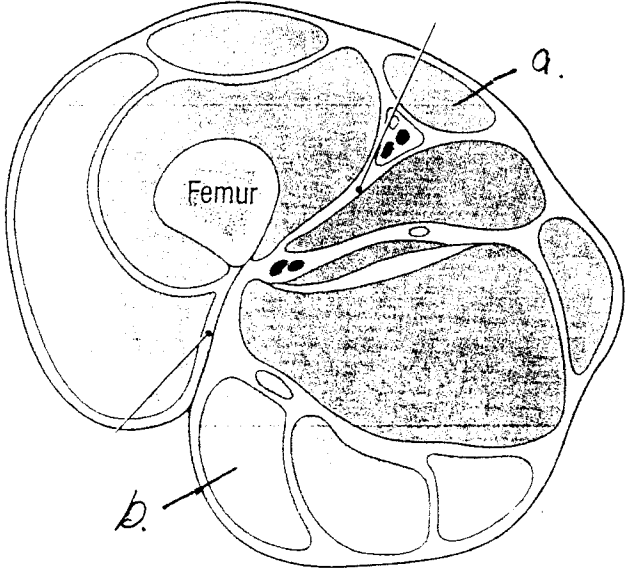
1. Identify the nerves. (1 pt)

- a. _____
- b. _____



2. Identify the structures. (1 pt)

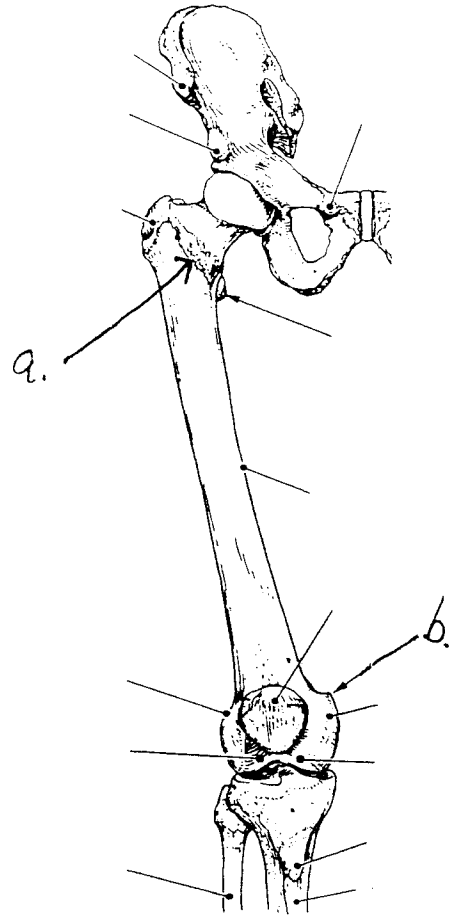
- a. _____
- b. _____



3. Identify the structures. (1 pt)

a. _____

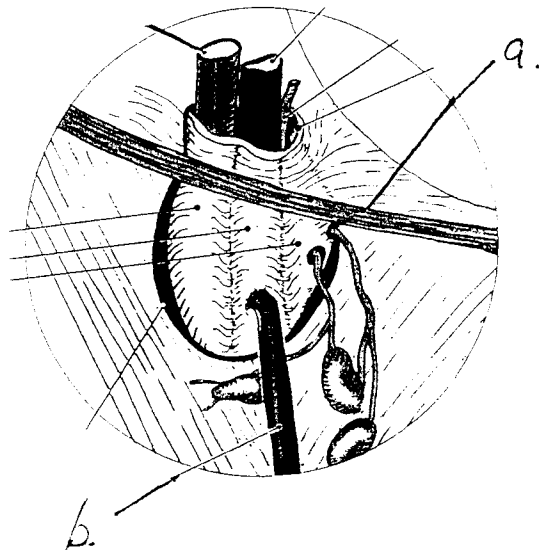
b. _____



4. Identify the structures. (1 pt)

a. _____

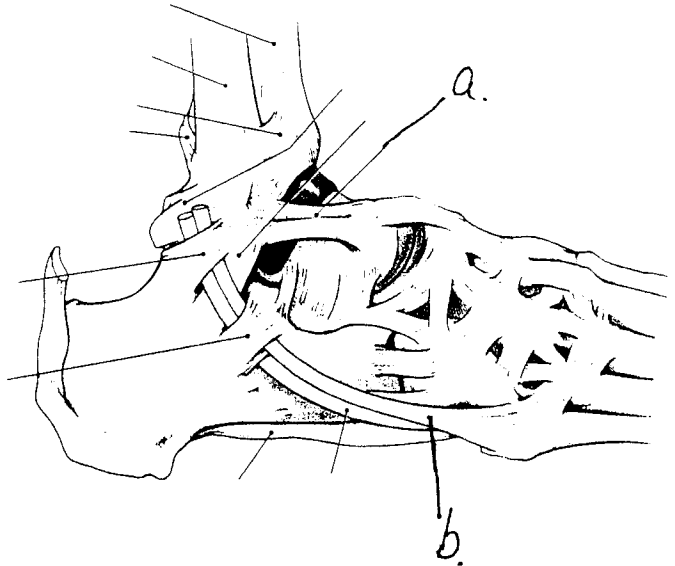
b. _____



5. Identify the structures. (1 pt)

a. _____

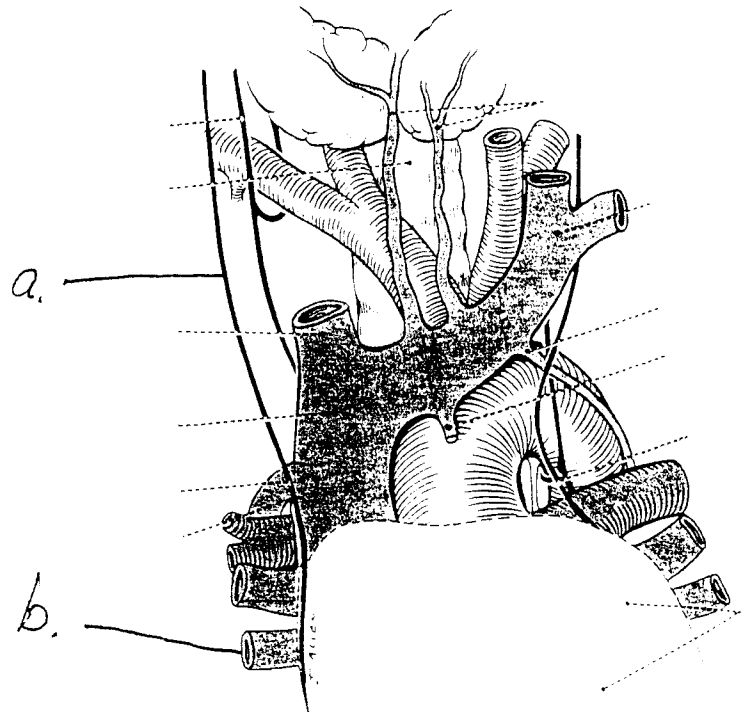
b. _____



6. Identify the structures. (1 pt)

a. _____

b. _____



Part IV. Circle the correct answer. All, none, or some may apply. (36 pts)

1. With respect to the nervous system (4 pts):

- a. There is a white ramus communicans at the level of T2.
- b. The visceral afferents of the greater splanchnic nerve consist of pre- and post-ganglionic neurons.
- c. The motor nerves to the visceral layer of serous pericardium are from the autonomic nervous system.
- d. The sensory nerves of the peripheral diaphragm are from the intercostal nerves.
- e. The intrinsic (terminal/intrinsic) ganglia lie on or within the organ innervated.
- f. The lesser splanchnic nerve contains pre-ganglionic neurons of the sympathetic nervous system.
- g. The sympathetic division of the autonomic nervous system constricts the coronary arteries during periods of "flight or fright".
- h. The costal parietal layer of the pleura has innervation from the intercostal nerves.

2. With regard to the posterior mediastinum (2 pts):

- a. The right anterior intercostal artery for intercostal space 8 is derived from the musculophrenic artery.
- b. The left posterior intercostal artery for intercostal space 1 is derived from costocervical branch of the subclavian artery.
- c. The thoracic duct lies between the azygous vein and thoracic aorta, and is anterior to the esophagus.
- d. The greater splanchnic nerve lies medial to the lesser splanchnic nerve.

3. With respect to the subinguinal region and thigh (4 pts):

- a. The femoral ring is the opening of the femoral canal.
- b. The superior cornu is derived from the cribriform fascia.
- c. The lateral femoral circumflex artery is derived from either the femoral or deep femoral artery, and courses between the iliopsoas and pectineus muscles.
- d. The first perforating artery is derived from the deep femoral artery and contributes to the cruciate anastomosis.

- e. The superficial external pudendal artery arises from the femoral artery and emerges through the saphenous opening.
- f. Femoral hernias are located inferior to the inguinal ligament.
- g. The saphenous nerve, a branch of the obturator nerve, enters the adductor canal but does not exit through the adductor hiatus.
- h. The floor of the femoral triangle is formed, in part, by the iliopsoas and pectineus muscles.

4. In the gluteal region (6 pts):

- a. The piriformis courses through the greater sciatic foramen.
- b. The superior gemellus lies anterior to the posterior femoral cutaneous nerve.
- c. The gluteus medius is a medial rotator of the thigh.
- d. The internal pudendal vein courses through the lesser sciatic foramen.
- e. The gluteus maximus muscle is extremely important in walking, and paralysis of this muscle will not permit ambulation (i.e., walking).
- f. Gluteal injections in the lower medial quadrant could damage the superior gluteal nerve.
- g. A spinal tap (lumbar puncture) should be performed at spinal cord levels T12-L1.
- h. A patient with a lesion (damage) to the left superior gluteal nerve will experience pelvic sag (tilt) when the right lower extremity is off the ground.
- i. The femoral nerve and obturator nerve are derived from L4 through S3.
- j. The obturator internus, but not the obturator externus, is a lateral rotator of the thigh.
- k. The inferior gemellus courses through the greater sciatic foramen to unite with the tendon of the obturator internus.
- l. The gluteus medius, gluteus minimus, and tensor fascia lata muscles are innervated by the superior gluteal nerve.

5. In regard to the thigh/popliteal fossa (3 pts):

- a. A characteristic of a hamstring muscle is an origin from the ischial tuberosity.
- b. The short head of the biceps femoris is innervated by the common peroneal division of the sciatic nerve.

- c. A landmark for the superior lateral and medial genicular arteries is that they are located superior to the popliteus soleus muscle.
 - d. The popliteal artery lies deeper than the popliteal vein or tibial nerve in the popliteal fossa, and is endangered by fractures of the supracondylar region of the femur.
 - e. The circumflex fibular artery contributes to the genicular anastomosis.
 - f. The lateral sural cutaneous nerve is a branch of the tibial nerve.
6. With respect to the foot/arches/gait (6 pts):
- a. The flexor digitorum brevis is innervated by the medial plantar nerve.
 - b. Digit 2 is adducted by the plantar adductor interossei.
 - c. Sesamoid bones are found in the heads of the flexor hallucis brevis.
 - d. The center of gravity passes in front of the ankle joint.
 - e. There are 3 extensor digitorum brevis muscles, but 4 flexor digitorum brevis muscles.
 - f. The arcuate artery lies deep to the extensor hallucis brevis muscle.
 - g. The plantar aponeurosis is a specialization of the tela subcutanea.
 - h. The lateral plantar artery lies superficial to the quadratus plantae muscle.
 - i. The lumbricals flex the metatarsophalangeal joints and extend the interphalangeal joints.
 - j. The medial plantar nerve lies lateral to the abductor digiti minimi muscle.
 - k. Push-off during the gait cycle involves the flexor hallucis longus.
 - l. The adductor digiti minimi serves as the adductor for the 5th digit.
7. In the thorax (5 pts):
- a. The esophagus is narrowed where it is in contact with the arch of the aorta.
 - b. The right recurrent laryngeal nerve courses around the right subclavian artery.
 - c. The right right pulmonary artery and the left bronchus are inferior to the arch of the aorta.

- d. The angle of Louis (sternal angle) is at the level of T4/T5 vertebral disc, and is at the site of attachment of the second costal cartilage.
- e. The subcostal muscles lie deep to the intercostal nerves.
- f. The pericardiophrenic artery is derived from the internal thoracic artery.
- g. The arch of the aorta is located in the middle mediastinum.
- h. The sympathetic trunks course through the posterior mediastinum.
- i. The phrenic nerves course through the superior mediastinum.
- j. The lower border of the parietal pleura in the mid-axillary line is at the level of the 10th rib.

8. With respect to the lungs and ventilation (3 pts):

- a. The left pulmonary artery is shorter than the right pulmonary artery.
- b. A bronchopulmonary segment consists of a 3rd order bronchus, lung tissue, and the pulmonary artery.
- c. The arterial mesocardia unites the pulmonary veins and the aorta.
- d. The eparterial bronchus is located in the right lung, and is characterized by a lack of cartilage.
- e. Expiration of the thoracic cavity/lungs is result of a contraction of the diaphragm.
- f. Fat is often stored between lung tissue and the visceral pleura.

9. In the heart (3 pts):

- a. The SA node is located in the endocardium at the cephalic end of the sulcus terminalis.
- b. The marginal artery is a branch of the nodal artery.
- c. Systole refers to contraction of the heart.
- d. The sternopericardiacal ligaments stabilize the pericardium to the central tendon.
- e. The chordae tendinae function in closure of the semilunar valves.
- f. The moderator band is composed of pectinate muscles.

Part V. Indicate your understanding (characteristics, importance, function, relationships, boundaries and/or contents) of the following. Answer in the space provided. (10 pts)

1. Iliofemoral ligament (3 pts)

2. Oblique sinus. (3 pts)

3. Pump Handle Movement of Respiration (joints, direction of movement, ribs). (4 pts)

Part VI. Answer in the space provided (including the back of the page for each question). (36 pts)

1. An 18-yr old female is starting to train for field hockey after a relaxing summer. The first day she is extremely energetic and has an intense workout, including long-distance running. That night she comes to the emergency room with severe pain radiating from just below the knee to the ankle, and complains of difficulty walking. The leg is swollen, and warm to the touch. An x-ray shows no fractures, but the pulse taken from the dorsalis pedis is markedly weak compared to the femoral artery. You suspect "compartment syndrome". **Discuss the boundaries, contents, and relationships in the anterior compartment of the leg; include muscles, nerves, vasculature, and fascial specializations. Indicate the function of the anterior compartment of the leg, and define the effects of injury to this compartment on the actions and sensitivity of the foot. Explain the weak pulse. Using your anatomical knowledge, what can you recommend for treatment. (12 pts)**

2. A 20-yr old student, while playing football, suffers a severe twisting injury to his left knee. While running he was pushed off balance by another player when his left foot was planted on the ground. He felt a "pop", and has been in excruciating pain. His leg is slightly flexed, and there is a marked tenderness on the medial aspect of the knee. He demonstrates a positive anterior drawer sign (forward movement of the tibia), and you suspect the "unhappy triad". Prior to surgery you are asked to **Review the anatomy of the knee joint and include bones, articulations, ligaments, cavities and bursa, vasculature, muscles, and fascial specializations and muscles that contribute to the stability of the knee joint. Explain the tenderness on the medial side of the knee, and the abnormal forward movement of the tibia in relationship to the femur.** (12 pts)

3. A 30-yr old postal worker is stabbed in the chest during a mugging, and brought to the emergency room in a semiconscious state and gasping for air (dyspnea). The knife penetrated the thoracic wall at the level of the 4th intercostal space along the left sternal border. His vital signs indicate low blood pressure (hypotension), and findings on physical exam show diminished heart sounds and increased venous pressure. These signs are those of the triad of Beck (acute compression test), and you suspect cardiac tamponade (compression of the heart by increased fluid in the pericardium). **Discuss the anatomy of the pericardial sac, including mention of the layers, relationships, stabilization, vascularization, innervation, and lymphatic drainage. Comment on the clinical ramifications of excessive fluid in the pericardial cavity.** (12 pts)

