

Name: \_\_\_\_\_  
SID: \_\_\_\_\_

# Physiology of Human Development (MCB 135E)

MIDTERM 1  
October 4, 2006

Name: \_\_\_\_\_

SID: \_\_\_\_\_

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Points Received

Part I: Multiple Choice (30 points)

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Part II: True and False (20 points)

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Part III: Short Answer (50 points)

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SCORE

48
48
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96 + 1

96  
PST  
MCB 135 E

# ***Physiology of Human Development***

Midterm I  
October 4, 2006.

I. Multiple choice questions (30 points, 2 points each correct answer) There is only one correct answer.

1. Which of the following statements on Growth and Development are correct?
  - A. Growth and development continue throughout the lifespan
  - B. Growth and development follow a precise, predictable timetable
  - C. Growth and development can be influenced by both genetic and environmental factors
  - D. All of the above are correct
  - E. None of the above are correct
  
2. Fertilization occurs:
  - A. In the ovary
  - B. In the section of the oviduct, close to the ovary
  - C. In the section of the oviduct, close to the uterus
  - D. In the uterus
  - E. In the corpus luteum
  
3. Sperm and ovum have several characteristics different from each other. Indicate *the characteristic that is the same* for both of them:
  - A. At fertilization, each gamete has a haploid number of chromosomes
  - B. At the moment of fertilization, the sperm is a very small cell
  - C. After puberty sperm production continues throughout life
  - D. Maturation of sperm and ovum depends on estrogens
  - E. At the moment of fertilization, the ovum is a very large cell
  
4. The results of fertilization, include:
  - A. Association of male and female chromosomes
  - B. Determination of the sex of the new individual
  - C. Activation of the ovum into meiotic cell division
  - D. Reestablishment of the diploid number of chromosomes
  - E. All of the above are correct

5. At implantation, the **mother provides**:

- A. A hyperplastic/hypertrophic uterine mucosa under the influence of high estrogen levels from the corpus luteum of the maternal ovary
- B. A hyperhemic /hypervascularized uterine mucosa under the influence of high levels of progesterone from the corpus luteum of the maternal ovary

The **embryo provides**:

- C. hCG from the trophoblast (or chorion) to keep the corpus luteum of the maternal ovary to produce high levels of estrogens and progesterone
- D. From the trophoblast, a number of enzymes (proteinases) and proteins (adhesions molecules) that facilitate trophoblast invasion
- E. All of the above is correct

6. Male sex differentiation depends on:

- A. The presence of gene(s) (SRY gene) in the Y chromosome. These genes are responsible for the production of molecules capable of inducing differentiation of the bipotential, undifferentiated gonad into a testis
- B. The testis starts to secrete testosterone that induces the differentiation of the Wolffian ducts into male secondary sex organs
- C. The development of the enzyme 5-alpha reductase promotes the production of dehydrotestosterone (DHT) that induces differentiation of the external genitalia into the male type
- D. The Mullerian ducts regress via the action of the Mullerian Inhibitory Substance or factor (MIF) secreted by the Sertoli cells
- E All of the above is correct

7. With regard to the placenta, the following statements are correct, EXCEPT:

- A. Maternal and fetal blood mix in the maternal sinuses
- B. Maternal and fetal blood do not enter into direct contact but they are separated by the thin tissue that surrounds the floating fetal villi
- C. Exchange of gases occurs by diffusion from maternal to fetal blood
- D. Delivery of nutrients occurs by diffusion or facilitated transport from mother to fetus
- E. Removal of waste products occurs from fetus to mother

8. The following are some of the major cardiovascular adjustments of the fetus to avoid "Everest in utero," EXCEPT

- A. The establishment of organ priority for the best blood carried by the umbilical arteries to the liver
- B. The ductus venosus shifts the blood from the liver to the inferior vena cava
- C. The foramen ovale, in the wall between right and left cardiac atria, shifts the blood from the inferior vena cava to the right atrium and from there to the right ventricle and to the aorta,
- D. The ductus arteriosus shifts the blood from the pulmonary artery to the descending aorta
- E. Embryonal and fetal hemoglobins have different physico-chemical properties than adult hemoglobin and these favor a better oxygen uptake from maternal blood and better release to the fetal tissues.

9. Major germ layers include:

- A. Ectoderm
- B. Endoderm
- C. Mesoderm
- D. All of the above
- E. None of the above

10. The tissue/organs that derive from the ectoderm include:

- A. The skin, hair and nails
- B. The nervous system
- C. The neuro-epithelium of sense organs
- D. The epithelium of GI tract
- E. All of the above

11. Major hormones of pregnancy include:

- A. hCG
- B. Estrogens
- C. Progesterone
- D. Human chorionic somatomammotropin (hCS)
- E. All of the above

12. Thyroid hormones are necessary for the following functions, EXCEPT:

- A. Normal development and maturation of the brain
- B. Promotion of body growth (bone and muscle) (postnatally)
- C. Promotion of myelinogenesis
- D. Reduction of dendritic branching
- E. Increased excitability of neurons

13. During gestation the placenta:

- 13
- A. Undergoes aging changes
  - B. Reaches peak size and function around 4-5 months
  - C. With aging, the placenta may be responsible for a decline (small-for-date) in newborn size
  - D. All of the above are correct
  - E. None of the above are correct
14. Glucocorticoids from the adrenal cortex are necessary for:
- A. Production of surfactant to decrease surface-tension in alveoli postnatally
  - B. Formation of glycogen from glucose
  - C. Storage of glycogen in the liver
  - D. All of the above are correct
  - E. None of the above are correct
- 15 Pseudohermaphrodites are individuals with:
- A. A normal genetic sex
  - B. Females with XX, may have a male phenotype
  - C. In the case of B, the females were exposed *in utero* to high levels of androgens  $\times\gamma$
  - D. Males with ~~XXY~~, may have a female phenotype due to androgen deficiency or abnormalities of steroid-receptor binding
  - E. All of the above is correct

II. (20 Points total) True or False (In the scantron, True is **A**, False is **B**).

- 16. Turner syndrome or ovarian dysgenesis is characterized by an XO sex chromosome pair
- 17. The fetus and newborn are more resistant to hypoxia (low or lack of oxygen) than adults
- 18. GH (Growth Hormone) is present in the embryo and fetus because it is necessary for fetal growth
- 19. The fetal CNS functions essentially through reflex mechanisms
- 20. Prenatally, the pressure in the right side of the heart is greater than that in the left side. After birth the reverse is true
- 21. Estrogen increase motility (contractions) of uterine muscle
- 22. Progesterone decreases motility (contractions) of uterine muscle
- 23. Ovulation occurs at the end of the menstrual cycle

24. Ovulation depends on a surge of pituitary LH to occur at the middle of the menstrual cycle (day 14<sup>th</sup> -15<sup>th</sup> day)
25. If the ovulated ovum is not fertilized, the corpus luteum regresses and involutes

### III. Short Essay Questions

1. (10 points total) Under the left side, are listed the *major embryonic neural vesicles*. On the right side, the neural structure derived from those vesicles. Please indicate which neural structure comes from which neural vesicle. (Each vesicle may have more than one answer)

(1 point for each correct answer)

Neural Vesicle:

Telecephalon

Diencephalon

Mesencephalon

Rhombencephalon

~~A.~~ Limbic System

~~B.~~ Cerebral Cortex

~~C.~~ Retina

~~D.~~ Olfactory Bulbs

~~E.~~ Corpus Striatum

~~F.~~ Superior and Inferior  
Colliculi

~~G.~~ Thalamus

~~H.~~ Hypothalamus

I. Cerebellum

J. Medulla

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2. (10 points total) What are the characteristics of newborns with anencephaly with respect to:

9 A. Size of the brain (2 points)

B. Areas of the brain which are retained (2 points)

C. Life expectancy (2 points)

u D. Size of the body at birth and implication for hormonal control of fetal body growth (4 points)

3. (10 points total) Explain how the organizing "actions of androgens" manifest themselves at:

10 A. At the level of the Gonads (3 points)

11 B. At the level of the secondary sex organs (3 points)

C. At the level of the hypothalamus and lower portion of the spinal chord (4 points)

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4. (10 points total) Explain the following effects education has on:

A. Life Expectancy (2 points)

B. Quality of Life (2 points)

C. Anatomical changes observed in the brain (4 points)

D. Define neural plasticity and give an example (2 points)

5. (4 points total) Compare and contrast the following in an adult and newborn. Explain your answers:

A. Pathways used for O<sub>2</sub> breakdown (2 points)

B. Resistance to hypoxia (2 points)

6. (6 points total) List the 3 major priorities of fetal circulation and explain why they receive that priority.