Exam Key

Name_____

Lecture-Lab Exam I
Biology 32
March 4, 2003

Scores:

I_____/10

II_____/10

III_____/50

IV_____/18

V_____/10

VI_____/52

TOTAL_____/150 =

_____%

I. Define or describe briefly what is meant by each of the following terms and it's *significance* in embryogeny. (10 points)

1. Residual body

The excess cytoplasm that is removed during spermiogenisis as the spermatid develops into a spermatozoa. The spermatozoa needs as little cytoplasm as possible so it expels all but a thin layer surrounding the nucleus. The residual bodies are expelled into the seminiferous tubule where they are digested by the sertoli cells.

2. Polar body

During meiosis the oogonia divides into one ova and three polar bodies. The product (ova) needs as much cytoplasm as possible because cytoplasm serves as energy source and give it bulk. There is unequal division during meiosis so that at each of the two divisions one daughter cell gets genetic material and bulk of the cytoplasm while the other gets genetic material and minimal cytoplasm. The polar bodies have no biological function and are degraded.

3. Oocyte atresia

Oocytes atresia is the degredation of follicles that begin to mature but never undergo ovulation. There ar emillions of oocytes present at birth and they degrade over a lifetime. Several follicles mature at the same time in response to FSH but one eventually becomes dominant by secreting a factor that inhibits the effects of gonadotropins on the other developing follicles. Only the dominant follicle ovulates. The others undergo atresia (are degraded).

4. Epiboly

A morphogenetic movement described as spreading of a cell sheet (e.g., outer cells moving toward blastopore); epiblast cells moving toward prmitive streak.

5. Syncytium

When the developing mammalian embryo prepares to implant in the lining of the uteruss, the membranes in an area of the trophoblast fuse to form a multi-nucleu area called the syncytium. This syncytium represents the area of the developing embryo that comes into direct contact with the mother's tissue, either by sitting on top of it or embedding into it.

II. Match the numbered item with its associated characteristic structure, product or products (listed below). Use each lettered answer only once. (10 points)

__D___1) Syntrophoblasts

__B___2) Hypothalamus

__C___3) Anterior pituitary

__H___4) Corpus luteum

__I___5) Leydig cells

__F___6) Acrosome

__E___7) Follicular granulosa cells

__A___8) Oocyte

__G___9) Flagella

__J__10) Sertoli cells

A) Yolk

B) Gonadotropin Releasing Factor

C) Follicle Stimulating Hormone (FSH)

D) (Human) Chorionic Gonadotropin

E) Estrogen

F) Lytic Enzymes

G) Microtubules, in a 9+2 arrangement

H) Progesterone

I) Testosterone

J) Blood-Seminiferous Tubule Barrier

III. Indicate whether the statements given are true (T) or false (F): (50 points)

Of the **Gray crescent**:

__T___1) Forms opposite the site of sperm entry.

__T___2) Site of formation of future chordamesoderm.

__F___3) Its midline corresponds to the ventral midline.

__F___4) Located opposite the site of dorsal lip formation.

___F__5) Site of future endrederm.

Of **Telolecithal eggs**:

__T___6) Cleavage results in disc-shaped blastula.

__F___7) Characteristic of anamniotes only.

__F___8) Characterized by even distribution of yolk among blastomeres.

__F___9) Typical of all homeotherms.

Of the **notochord**:

__T___10) Always dorsal in vertebrates.

__F___11) Derived from ectoderm.

__F___12) Is induced by overlying ectoderm.

__F___13) Has no adult counterpart.

Of **extraembryonic membranes**:

__F___15) Yolk sac wall is composed of somatopleure.

__T___16) Allantois is covered with splanchnopleure.

__T___17) Extraembryonic coelom is lined with mesoderm.

__T___18) Chorionic membrane is made of somatopleure.

Of the **amphibian blastopore**:

__F___19) It will form future mouth. (approx.)

__T___20) It will form future anus. (approx.)

__F___21) It is formed at point of sperm entry.

___F__22) It will retain connection with blastocoel.

Of **Primordial Germ Cells**:

__T___23) Derive from yolk sac endoderm.

__T___24) Origin can be traced to specific regions of the unfertilized egg.

__F___25) Are haploid to begin with.

__F___26) Are "determined" as a direct consequence of primary induction.

Of **Epithelium**:

__F___27) Always of ectodermal origin.

__T___28) Forms linings and coverings.

__T___29) Constituts the neural tube.

__T___30) Can derive from all three germ layers.

Of the **inner cell mass**:

__T___31) Results from holoblastic cleavage of isolecithal egg.

__F___32) Results from cleavage of mesolecithal egg.

__T___33) Gives rise to the body of the mammalian embryo.

__F___34) Contributes to the process of implantation.

__F___35) Its gastrulation process is more similar to that of amphibians than birds.

Of **Splanchnopleure**:

__T___36) Forms visceral lining of coelom.

__T___37) Is composed of endoderm and mesoderm.

__F___38) Is composed of ectoderm and mesoderm.

__F___39) Is composed of mesoderm only.

Of **somites**:

__F___40) Number correspond inversely with embryonic age.

__F___41) Derived from neural crest.

__T___42) Derivatives include dermis, muscle and bone.

__F___43) Give rise to urogenital organs.

__F___44) They eventually fuse with one another, leaving no evidence of segmentation.

Of **cleavage**:

__T___45) Features hyperplasia, but not hypertrophy.

__T___46) Occurs within an intact fertilization membrane.

__T___47) Generates numerous blastomeres.

Of **sagittal sections**:

__T___48) Can divide the body through the midline.

__F___49) Divide the body into cranial and caudal portions.

__T___50) Divide the body into right and left portions.

IV. Below is a list of paired terms. Describe briefly the relationship of each pair. What is the basis (developmental, physiological, structural, conceptual) for presenting them as pairs? (32 points)

1. **YOLK CONTENT** and **CLEAVAGE PATTERN**

The yolk content of the egg greatly influences the cleavage pattern. In an isolecithal egg, there is minimal yolk that is equally distributed. This results in holoblastic (complete) even cleavage patterns. In a mesolecithal egg there is a larger yolk mass that is concentrated at the vegetal pole of the embryo. There is still holoblastic cleavage but the mass of yolk causes the cells in the begtal pole to be larger than those in the animal pole. In a telolecithal egg there is a very large yolk mass concentrated in the vegetal pole. Because of the huge yolk mass there is meroblastic (incomplete) cleavage of the cells in the blastula. Cells in the animal pole are forced to a disk-like formation called the blastodisc.

2. **CORPUS LUTEUM** and **CORPUS ALBICANS**

The corpus luteum is what remains of the follicle in the ovary after the mature ova has been ovulated. After ovulation the corpus luteum becomes an endocrine organ that maintains the level of progesterone in the blood to prepare the lining of the uterus for implantation. If fertilization and pregnancy occur, the developing embryo secretes factors that maintain the corpus tuteum. If implantation does not occur the corpus luteum degenerates into the corpus albicans. The corpus albicans is eventually degraded in the ovary.

3. **ACROSOME and LYSOSOME**

The acrosome is a large lysosome located in the head of a mature spermatozoa. It contains lytic enzymes needed to digest the egg membrane. As the spermatid undergoes spermiogenisis the collection of lytic enzymes are packaged into the acrosome at the head of the sperm. When the sperm encounters the zona pellucida the membranes at the head of the sperm fuse to expel the enzymes in the acrosome to digest the egg membrane and facilitate sperm entry.

4. FAST BLOCK TO POLYSPERMY and MEMBRANE POTENTIAL

When a sperm penetrates the egg membrane there is a fast block reaction of the egg to prevent polyspermy. Ion channels on the surface of the egg membrane open to disrupt the egg's membrane potential. This results in a fast but temporary block to the entry of other sperm which prevents polyspermy. This fast block is very important because polyspermy could have disasterous effects on the developing embryo. The fast block is then followed by a permanent slow block.

5. SLOW BLOCK TO POLYSPERMY and CORTICAL REACTION

During development, the egg built up cortical vesicles near the external membrane of the egg. Upon fertilization the membranes of the cortical vesicles fuse with the egg membrane and release their contents onto the outer surface of the egg membrane. The factors that emerge from the cortical vesicles react with the egg membrane and cause it to harden. This slow block serves as the permanent block to polyspermy.

6. ONTOGENY and PHYLOGENY

Ontogeny refers to the development of an individual (Embryogenesis). Phylogeny is evolustionary history. These are related in phrase, "Ontogeny recapitulates phylogeny," The biogenetic laws (Haeckel) that proposes that the development of an individual passes through the successive stages that mirror those of the evolution of its group.

V. Of the 4 placental types discussed in class, which exhibits the most intimate contact between maternal blood fetal tissues? (1 pt.)

hemochorial

For an epitheliochorial placenta, there are at least 6 tissues between maternal and fetal blood. List them. (3 pts.)

Maternal blood

- __endothelium (maternal)
- ___C.T. of uterus_____
- ___Epithelium (endometrial lining)
- ___syntrophoblast _____
- ___Fetal CT or trophoblast
- ____Fetal Endothelium _____

Fetal blood

Fill in the chart below. (6 pt.)

Problem	Solution in Anamniote	Solution in Amniote	Solution in Mammal
Food Source	Vegetal pole Blastopmeres - Yok	Yolk Sac	placenta
(Nitrogenous) waste disposal	In water	Allantois	placenta
Respiration	Water/dysfusion	chorioallantois	placenta
Aqueous environment	In water	Amniotic sac (amnion)	Amniotic (sac fluid)

VI. Laboratory Practicum (52 points)
Instructions:
a. Make sure you have all the necessary slides.
b. When identifying a structure on a slide, be sure the **tip** of the pointer is positioned on the structure, not merely pointing toward it from a distance. Raise your hand to request that an instructor come over to check your identification.
c. If the instructor grades you "wrong" and you are convinced you are right, you can appeal for a second opinion. This must be done **immediately**, *not* 5 or 10 minutes later!

IDENTIFY the structures described for each designated slide.

Amphioxus: List and identify the four diagnostic characteristics of a chordate.
Use the cross-section through foregut:

1. neural tube
2. notochord
3. pharymical gill slits
4. subpharangeal gland

Frog

_____Blastocoel

_____Ventral Lip of Blastopore

_____Chordamesoderm

_____Neural fold

Chick, 18 hour

_____Area pellucida

_____Head process

_____primitive groove

Chick (24 hr, whole mount)

_____Primitive steak

_____Neural fold

_____Area where gut has roof but no floor

Chick (24 hr, sections)

_____Notochord

_____subcephalic pocket

_____head mesenchyme

Chick (33 hr, whole mount)

_____Area lined with endoderm (foregut, cranial intestinal portal)

_____Primitive streak

_____Area lined with non-skin ectoderm

_____Area where vitelline vessels form

Chick (33 hr, sections)

_____midgut roof

_____lumen of neural tube

_____proamnion

_____somatic mesoderm

_____Coelom

Ovary

_____Structure that shows clear signs of FSH stimulation

_____cells that secrete estrogen granulosa

_____primordial follicle

_____area that contains species-specific sperm receptors

Testis

_____Cell that bears LH receptors

_____Cell described by “2N, 4C”

_____ an original ”2N” cell of spermatogenic lineage

_____Cell described clearly by “N”