Name_____

MCB 135E, Fall 1994
1st Midterm

1. (6 points) List three (3) major functions of the ovum at fertilization
   a)

   b)

   c)

2. (6 points) List three (3) major functions of the sperm at fertilization
   a)

   b)

   c)

3. (12 points) List three (3) structural or functional similarities and three (3) differences between ovum and sperm.

   Similarities: a)

   b)

   c)

   Differences: a)

   b)

   c)

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In the following multiple choice questions, only one answer is correct. Each correct answer, 3 points.

4. In humans, fertilization occurs in the
   A. vagina.
   B. uterine cavity.
   C. abdominal cavity.
   D. fallopian tube or oviduct.
   E. none of the above

5. In the fetus,
   A. levels of blood glucose are lower than in the mother
   B. levels of blood glucose are higher than in the mother
   C. levels of blood glucose are the same as in the mother
   D. levels of blood glucose are not important for energy metabolism
   E. levels of blood glucose are independent from liver glycogen

6. Functions of the placenta include
   A. secretion of several hormones (HCGn, estrogen, progesterone, others).
   B. diffusion of O_2 and CO_2 from and to maternal blood.
   C. transport of nutrients from maternal blood to fetus and enzymatic breakdown of some of them to facilitate fetal utilization.
   D. none of the above
   E. all of the above

7. Implantation of the blastocyst in the uterine wall depends on
   A. circulating high levels of progesterone.
   B. proliferation and hyperhemia of the uterine wall.
   C. presence of an invasive trophoderm/trophoblast.
   D. presence of an active corpus luteum in the ovary.
   E. all of the above

8. Testosterone
   A. in birds increases the size of singing-related nuclei in brain.
   B. in male rats activates lordosis.
   C. in humans decreases the size of preoptic hypothalamic nuclei.
   D. determines the regression of the Mullerian ducts.
   E. none of the above

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9. Turner's syndrome
   A. is identified by an extra Y chromosome.
   B. is identified by the absence of an X chromosome (X0).
   C. is marked by accelerated puberty.
   D. is frequent (one in 50 live births).
   E. is associated with high fertility.

10. In the developing brain, the prosencephalon ultimately gives rise to
   A. the thalamus.
   B. the hypothalamus.
   C. the cerebral cortex.
   D. the medulla.
   E. the cerebellum.

11. The major events of development and maturation of neuroblasts into neurons include
   A. dendritic proliferation/branching.
   B. axon growth/collateralization.
   C. appearance of spontaneous and evoked electrical activity.
   D. myelinogenesis.
   E. all of the above

12. Education (as in school years)
   A. promotes longevity.
   B. decreases disability in old age.
   C. delays the onset of pathology in old age.
   D. All of the above
   E. None of the above

13. Education affects the lifespan by
   A. decreasing dendritic branching in the central nervous system.
   B. decreasing the number of synapses in the brain.
   C. reducing brain blood flow.
   D. increasing dendritic branching and brain synapses.
   E. None of the above

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14. Differentiation of the bipotential gonad into an ovary or a testis occurs
    A. postnatally.
    B. at midgestation.
    C. from the 6 to 8 embryonal weeks.
    D. immediately upon implantation.
    E. after the maturation of the hypothalamo-pituitary-gonadal axis.

15. The major functions of the amnion include
    A. to provide a buoyant medium to support the delicate embryonal/ fetal tissues.
    B. to allow free movements of the fetus.
    C. to help at parturition in dilating the uterine neck.
    D. to serve as a water cushion for prevention of mechanical injuries.
    E. all of the above

16. In the fetus, growth hormone
    A. is not secreted by the anterior pituitary.
    B. is secreted by the hypothalamus.
    C. is secreted by the anterior pituitary but has no growth-promoting action.
    D. none of the above
    E. all of the above

17. IGF-I and IGF-II
    A. are polypeptides.
    B. are secreted by the liver and other tissues.
    C. with insulin, they promote fetal growth.
    D. their regulation is independent from GH.
    E. all of the above

18. Placental lactogen (or somatomammotropin) is
    A. produced by fetal anterior pituitary.
    B. produced by the maternal mammary gland.
    C. produced by the placenta and secreted in the maternal circulation.
    D. produced by the placenta and secreted in the fetal circulation.
    E. none of the above

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19. Fetal hyperinsulinemia
    A. may occur in a fetus from a diabetic mother.
    B. often results in large and obese children with hypertrophy and hyperplasia of visceral organs.
    C. may be due to a tumor of the pancreas.
    D. two of the above
    E. none of the above

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20. (15 points) In the fetal circulation there are a number of unique structures that represent useful adaptations to the fetal needs and conditions. Indicate:

the location and
the function(s)

of the following structures:

Ductus venosus

Foramen ovale

Ductus arteriosus

21. (9 points) Prenatally, hormones have so-called "organizational actions", that is, are capable of directing the differentiation and growth of target organs.

Give three examples of such organizational actions involving:

testosterone

dihydrotestosterone

thyroid hormones

22. (4 points) With respect to O2 availability, the fetus in utero has been compared to an individual on the top of the Mount Everest. List four (4) mechanisms by which the fetus is capable of coping with the relatively hypoxic uterine environment and continue to grow:

1.

2.

3.

4.