1. Fertilization and Early Development

a. Write the terms that complete the sentences in the spaces at the right.

A ____1___ oocyte containing ____2___ chromosomes is released at ovulation, and it is enveloped by several layers of ____3___ cells. After entering a ____4___ tube, it is slowly carried toward the ____5___ by beating ____6___ of cells lining the tube. The oocyte remains viable for about ____7___ hours after ovulation. Sperm deposited in the ____8___ swim into the uterus and up the ____9___ tubes. They usually encounter the secondary oocyte in the upper ____10___ of a uterine tube. Sperm remain viable in the female reproductive tract for about ____11___ hours.

Many sperm are required to separate the ____12___ cells enveloping the secondary oocyte. Once a ____13___ enters the secondary oocyte, chemical changes in the ____14___ prevent other sperm from entering. The secondary oocyte immediately completes the ____15___ meiotic division, forming an ____16___ and another polar body, each containing ____17___ chromosomes. Union of ____18___ and ____19___ nuclei complete fertilization, forming a ____20___ containing ____21___ chromosomes.

1) **Secondary**
2) **23**
3) **Follicular**
4) **Uterine**
5) **Uterus**
6) **Cilia**
7) **24**
8) **Vagina**
9) **Uterine**
10) **third**
11) **48**
12) **Follicular**
13) **Sperm**
14) **Oocyte membrane**
15) **Second**
16) **Ovum**
17) **23**
18) **Sperm**
19) **Egg (ovum)**
20) **Zygote**
21) **46**

b. Write the terms that match the statements in the spaces at the right.

1) Type of cell division in the zygote. **Cleavage**
2) Solid ball of cells formed by cleavage. **Morula**
3) Hollow ball of cells. **Blastula**
4) Mass of cells within the blastocyst. **Inner cell mass**
5) Outer wall of the blastocyst. **Trophoblast**
6) Embedding of blastocyst in endometrium. **Implantation**
7) Length of preembryonic stage. **2 weeks**
8) Length of full-term pregnancy. **280 days**

2. Hormonal Control of Pregnancy

Write the terms that match the statements in the spaces at the right.

1) Hormone secreted by trophoblast. **HCG**
2) Maintains corpus luteum for two to three months. **HCG**
3) Hormone maintaining the uterine lining. **Progesterone**
4) Hormone detected by pregnancy tests. **HCG**
5) Takes over secretion of estrogen and progesterone from second or third month to birth. **Placenta**
6) Prevents GnRH secretion by hypothalamus during pregnancy. **Progesterone**
7) Secretes estrogen and progesterone for the first two to three months of pregnancy. **Corpus luteum**
8) Two hormones that prepare mammary glands for milk secretion after birth. **Estrogen**, **Progesterone**

3. Embryonic Development

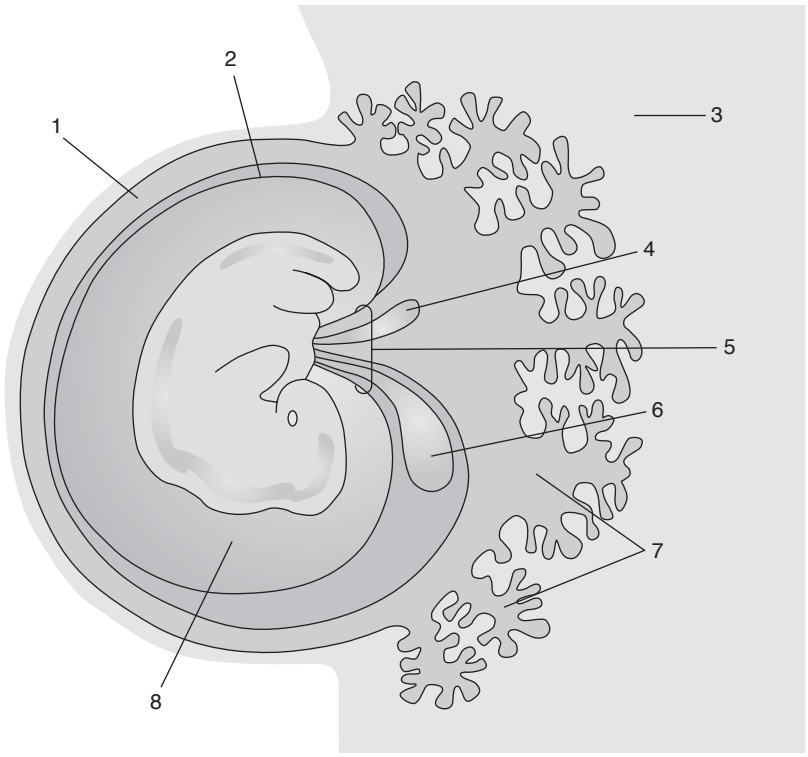
a. Matching (more than one answer may apply).

1) Ectoderm	2) Mesoderm	3) Endoderm
1, 2, 3 Primary germ layers		**3** Liver and pancreas
3 Connective tissue		**1** Epidermis
1 Nervous system		**2** Dermis
2 Muscles		**2** Kidneys and gonads
3 Lining of digestive tract		**3** Lining of respiratory passages

b. Write the terms that match the statements in the spaces at the right.

1) Becomes the chorion. **Trophoblast**
2) Connects embryo to placenta. **Umbilical cord**
3) Form early embryonic blood cells. **Yolk sac**, **Allantois**
4) Serves as shock absorber for fetus. **Amniotic fluid**
5) Membrane surrounding embryo/fetus. **Amnion**
6) Fingerlike projections from chorion that penetrate endometrium. **Chorionic villi**
7) Source of oxygen and nutrients for embryo or fetus. **Mother's blood**
8) Site of exchange of materials between embryonic and maternal bloods. **Placenta**
9) Name given embryo after eighth week. **Fetus**
10) Attaches embryo to the uterine wall. **Chorionic villi**
11) Fluid in which the embryo develops. **Amniotic fluid**
12) Developmental stage between second and eighth weeks. **Embryo**

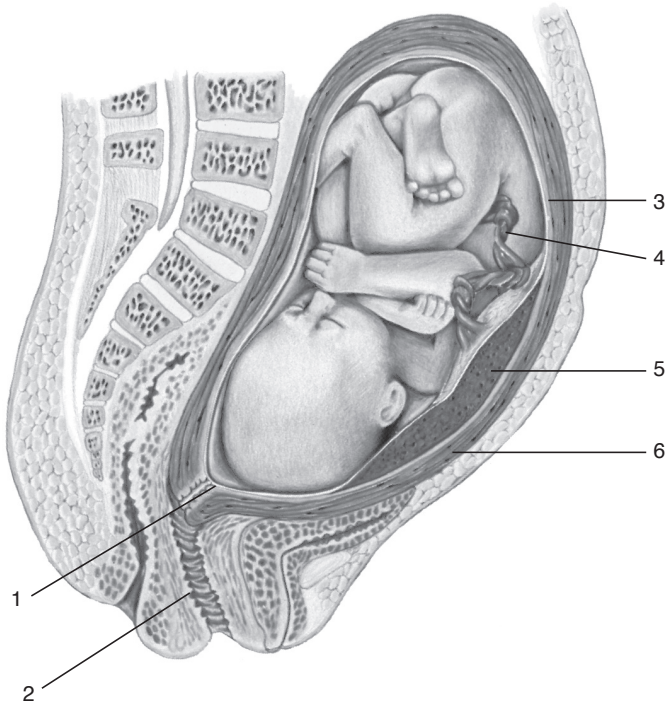
c. Label the figure by placing the numbers of the structures in the spaces by the correct labels.



4 Allantois
2 Amnion
8 Amniotic cavity
1 Chorion
7 Developing placenta
5 Umbilical cord
3 Uterine wall
6 Yolk sac

4. Birth

a. Label the figure by placing the numbers of the structures in the spaces by the correct labels.



3 Amniochorion
1 Cervix of uterus
5 Placenta
4 Umbilical cord
6 Uterine wall
2 Vagina

b. Write the terms that match the statements in the spaces at the right.

1) Relaxes symphysis pubis as birth nears. **Relaxin**
2) Softens cervix as birth nears. **Relaxin**
3) Hormone that inhibits uterine contractions during pregnancy. **Progesterone**
4) Hormone that sensitizes uterine muscles for starting contractions as birth nears. **Estrogen**
5) Term for physical and physiological processes associated with birth. **Labor**
6) Hormone starting and maintaining uterine contractions. **Oxytocin**
7) Receives neural impulses formed by stretching of the cervix. **Hypothalamus**
8) Secretes oxytocin. **Posterior pituitary**
9) Longest stage of labor. **Dilation stage**
10) Stage of labor when baby is born. **Expulsion stage**
11) Stage when the afterbirth is expelled. **Placenta stage**
12) Name for the birth process. **Parturition**

c. Write the words that complete the sentences in the spaces at the right.

As the time of birth approaches, the high concentration of ____1___ overrides the inhibitory effect of ____2___ on uterine contractions so that such contractions are possible. The ____3___ feedback mechanism controlling labor seems to be started by pressure of the fetus on the ____4___ , which forms ____5___ that are carried to the hypothalamus. The ____6___ stimulates the posterior pituitary to secrete ____7___ that stimulates uterine ____8___ . Dilation of the ____9___ increases the frequency of ____10___ sent to the hypothalamus, which, in turn, stimulates the posterior pituitary to release more ____11___ , which increases the strength and frequency of uterine ____12___ . This pattern of positive feedback produces increasingly stronger contractions until the baby is ____13___ . Shortly after birth, uterine contractions cause the detachment and expulsion of the ____14___ .

When the ____15___ is cut, the level of ____16___ increases in the infant's blood, stimulating the ____17___ control center to trigger the first breath. After the first breath, breathing becomes easier because ____18___ in the alveolar fluid keeps the ____19___ open.

1) **Estrogen**
2) **Progesterone**
3) **Positive**
4) **Cervix**
5) **Impulses**
6) **Hypothalamus**
7) **Oxytocin**
8) **Contractions**
9) **Cervix**
10) **Impulses**
11) **Oxytocin**
12) **Contractions**
13) **Born (expelled)**
14) **Placenta**
15) **Umbilical cord**
16) **Carbon dioxide**
17) **Respiratory**
18) **Surfactant**
19) **Alveoli**

5. Circulatory Adaptations

a. Write the terms that match the statements relating to fetal circulation in the spaces at the right.

1) Carries blood from placenta to fetus. **Umbilical vein**
2) Opening between left and right atria. **Foramen ovale**
3) Return blood from fetus to placenta. **Umbilical arteries**
4) Carries blood from umbilical vein to inferior vena cava, bypassing the liver. **Ductus venosus**
5) Carries blood from pulmonary trunk to aortic arch. **Ductus arteriosus**
6) Vein carrying oxygen-rich blood from the placenta. **Umbilical vein**

b. Write the words that complete the sentences regarding fetal circulation in the spaces at the right.

The fetal blood receives oxygen and nutrients from ____1___ blood in the placenta. Oxygen-rich blood is carried from the placenta by the ____2___ vein that enters the fetus at the ____3___ . This vessel divides near the liver, and about half of the oxygenated blood passes through the ____4___ , bypassing the liver, to mix with deoxygenated blood in the inferior ____5___ . When this mixed blood enters the ____6___ atrium, most of it passes through the ____7___ into the ____8___ atrium and flows into the ____9___ ventricle. Contraction of the ventricle pumps blood into the ____10___ to the body cells. Blood entering the ____11___ ventricle is pumped into the pulmonary trunk, but some of it bypasses the lungs by flowing through the ____12___ into the aorta, increasing the blood supply to body cells. A small amount of blood is carried by ____13___ arteries to the nonfunctional lungs and returned to the left ____14___ . Blood is returned to the placenta by two ____15___ arteries.

1) **Maternal**
2) **Umbilical**
3) **Umbilicus (navel)**
4) **Ductus venosus**
5) **Vena cava**
6) **Right**
7) **Foramen ovale**
8) **Left**
9) **Left**
10) **Aorta**
11) **Right**
12) **Ductus arteriosus**
13) **Pulmonary**
14) **Atrium**
15) **Umbilical**

c. Write the terms that match the statements relating to postnatal circulatory changes in the spaces at the right.

1) Remnant of the umbilical vein. **Ligamentum teres**
2) Remnants of the umbilical arteries. **Umbilical ligaments**
3) Remnant of the ductus venosus. **Ligamentum venosum**
4) Remnant of the ductus arteriosus. **Ligamentum arteriosum**

6. Lactation

a. Write the terms that match the statements in the spaces at the right.

1) Two hormones preparing mammary glands for lactation. **Estrogen**
2) Hormone stimulating lactation. **Progesterone**
3) Secretes prolactin-releasing hormone. **Hypothalamus**
4) Secretes prolactin. **Anterior pituitary**
5) First secretion of mammary glands. **Colostrum**
6) Two hormones whose high levels inhibit secretion of PRH. **Estrogen**, **Progesterone**
7) Hormone stimulating milk ejection. **Oxytocin**

b. Write the words that complete the sentences in the spaces at the right.

After birth, the drop in ____1___ and ____2___ levels allows the hypothalamus to secrete ____3___ , which stimulates release of ____4___ by the anterior pituitary, promoting lactation. ____5___ , the first secretion of the mammary glands, is rich in ____6___ and contains no ____7___ . True ____8___ secretion starts within two to three days.

Suckling stimulates formation of __9__ that are carried to the hypothalamus, causing it to secrete __10__, which continues production of prolactin, which maintains __11__, and stimulate the posterior pituitary to secrete __12__, which stimulates contraction of lactiferous ducts, causing milk __13__.

1) **Estrogen**
2) **Progesterone**
3) **PRH**
4) **Prolactin**
5) **Colostrum**
6) **Proteins**
7) **Fats**
8) **Milk**
9) **Impulses**
10) **PRH**
11) **Lactation**
12) **Oxytocin**
13) **Ejection**

7. Disorders of Pregnancy and Prenatal Development

Write the terms that match the statements in the spaces at the right.

1) Implantation of embryo at a site other than the uterus. **Ectopic pregnancy**
2) Spontaneous abortion. **Miscarriage**
3) Increased blood pressure, edema, and convulsions or coma in late pregnancy. **Eclampsia**
4) Nausea and vomiting in early pregnancy. **Morning sickness**
5) Major cause of death in newborn infants. **Respiratory distress syndrome**
6) Substances or influences causing birth defects. **Teratogens**
7) Results from too rapid destruction of fetal red blood cells after birth. **Physiological jaundice**
8) Caused by insufficient surfactant in alveoli. **Respiratory distress syndrome**
9) May result from fetal exposure to X rays, alcohol, and illegal or legal drugs. **Birth defects**
10) Most common teratogen causing birth defects. **Alcohol**

8. Genetics

a. Write the terms that match the statements in the spaces at the right.

1) Number of chromosomes in human body cells. **46**
2) Number of chromosomes in human gametes. **23**
3) Sex chromosomes in a female. **XX**
4) Sex chromosomes in a male. **XY**
5) A unit of inheritance. **Gene**
6) Alternate forms of a gene. **Alleles**
7) Condition in which both alleles for a trait are identical. **Homozygous**
8) Condition in which the alleles for a trait are different. **Heterozygous**
9) An allele that is always expressed. **Dominant**
10) An allele that is expressed only when a dominant allele is absent. **Recessive**
11) A type of gene expression in which unlike alleles are both expressed. **Codominance**
12) A type of inheritance involving more than two dominant or recessive alleles. **Multiple alleles**
13) A type of inheritance involving many genes that produce a gradation of expression in the human population. **Polygenes**
14) The observable characteristics of a trait. **Phenotype**
15) All of the alleles controlling the expression of a trait. **Genotype**
16) Traits whose alleles occur on the X chromosome. **X-linked (sex linked)**
17) Type of cell division that separates chromosome pairs into gametes. **Meiotic**

b. Indicate the genotypes for the following traits.

1) Heterozygous freckled. **Ff**
2) Homozygous freckled. **FF**
3) Homozygous nonfreckled. **Ff**
4) Color-blind male. **X^cy**
5) Normal female carrying allele for color blindness. **X^CX^c**
6) Color-blind female. **X^cX^c**
7) Homozygous type A blood. **I^AI^A**
8) Type AB blood. **I^AI^B**
9) Type O blood. **i^oi^o**
10) Heterozygous type B blood. **I^Bi^o**

c. Indicate the possible genotypes of gametes that can be formed by parents with these genotypes.

1) Homozygous freckled. **F only**
2) Heterozygous freckled. **F; f**
3) Homozygous nonfreckled. **f only**
4) Color-blind male. **X^c; y**
5) Normal vision, carrier female. **X^C; X^c**
6) Color-blind female. **X^c; X^c**
7) Heterozygous type A blood. **I^A; i^o**
8) Type AB blood. **I^A;I^B**

d. Indicate the predicted phenotype ratios for the following matings.

1) Homozygous freckled × homozygous nonfreckled **All freckled**
2) Heterozygous freckled × homozygous nonfreckled **1/2 freckled: 1/2 nonfreckled**
3) Type AB blood × type O blood **1/2 type A: 1/2 type B**
4) Heterozygous type A blood × type O blood **1/2 type A: 1/2 type O**
5) Normal vision, color-blind carrier mother × normal vision father **Girls: all normal vision; Boys: 1/2 normal vision: 1/2 color blind**

e. Indicate whether each statement is true (T) or false (F).

__T__ Genetic disease may be caused by the presence of an extra chromosome.
__F__ Recessive sex-linked traits appear more frequently in females since they have two X chromosomes.
__T__ Traits that show a gradation of expression in the population are determined by polygenes.
__T__ It is possible to examine fetal cells for chromosome abnormalities.
__T__ Some genetic diseases caused by specific alleles do not show up until adulthood.
__T__ Down syndrome is caused by trisomy 21.
__T__ Amniocentesis is used to obtain a sample of amniotic fluid for examination.
__T__ Genetic counseling may be helpful for prospective parents with genetic disease in their family histories.

9. Clinical Applications

a. When the sperm count in semen falls below 20 million/ml, male infertility results. How do you explain this? **Half of the sperm do not enter the uterine tube with the oocyte, and of those that do, many never reach the oocyte. Many sperm are required to disperse the follicular cells so one sperm can penetrate the oocyte.**

b. Physicians advise women to avoid all drugs (legal and illegal) during pregnancy. What is the basis for this advice? **Drugs may cause abnormalities in embryonic and fetal development resulting in birth defects. Rapidly dividing cells of an embryo and fetus are especially sensitive to the affects of drugs.**

c. What problems would occur if a newborn infant's foramen ovale failed to close? **Body cells would receive only partially oxygenated blood and would be deprived of sufficient oxygen needed for normal functioning.**

d. Why can monozygotic twins receive blood transfusions from each other without difficulty, but dizygotic twins often cannot? **Monozygotic twins have identical genotypes and blood types. Dizygotic twins do not have identical genotypes and may not have the same blood types.**

e. Mary and Joe have discovered that they are both heterozygous for sickle-cell anemia. They want to know what the chance is that their children will inherit sickle-cell anemia. What would you advise them? **Each of their children will have a 25% chance of being homozygous for the sickle-cell allele and, therefore, of inheriting sickle-cell anemia.**