

Answers to Questions for Comprehension

Student Textbook page 509

- Q1.** There are 46 chromosomes that make up the zygote (fertilized egg): 23 from the sperm and 23 from the egg.
- Q2.** The egg must be fertilized within 12 to 24 hours of release because it loses its capacity to develop further after 24 hours.
- Q3.** The sperm must survive the acidic environment of the female reproductive tract. In addition, only one oviduct contains an egg each month; many of the sperm may enter the “wrong” oviduct.
- Q4.** It takes the actions of several sperm and their acrosome enzymes to break through the protective jelly-like layer of the egg, so a sperm that arrives after the first few have breached the barrier is able to utilize its own acrosome enzymes to enter successfully.

Student Textbook page 511

- Q5.** Cleavage is cell division without growth. This is the initial stage of mitotic divisions after the formation of the zygote in the oviduct. The cleavage divisions do not increase the size of the zygote. They only increase the number of cells within it.

- Q6.** The morula reaches the uterus within 3-5 days of fertilization, and upon arrival it begins to fill with fluid that diffuses from the uterus. Within the fluid-filled space inside the morula, two different groups of cells develop and these two different groups of cells characterize the blastocyst: ones that nourish the embryo and ones that become the embryo.
- Q7.** It is the inner cell mass that develops into the embryo.
- Q8.** Implantation occurs when the blastocyst nestles in the endometrium (lining of the uterus). This happens between about the 10th and 14th day after fertilization. The blastocyst attaches to the endometrium by secreting enzymes from the trophoblast cells within to digest some of the tissues and blood vessels.
- Q9.** hCG is human chorionic gonadotropin hormone, which is secreted to maintain the corpus luteum once implantation has taken place. It is secreted at a high level for the first two months, declining to a low level by the end of four months, when there is a fully functional placenta to take over the production of estrogen and progesterone from the corpus luteum. At this point, the hormone production of the corpus luteum is no longer important, although it continues to exist throughout the pregnancy.

Student Textbook page 512

- Q10.** The amniotic cavity is a space that forms between the inner cell mass and the trophoblast. This space fills with fluid, and this is where the embryo will develop, within the sac known as the amnion.
- Q11.** The embryonic disk is composed of three layers: the ectoderm, mesoderm, and endoderm.
- Q12.** The creation of the primary germ layers is called gastrulation. The developing embryo at this point is called the gastrula.
- Q13.** Morphogenesis, which begins with gastrulation, is a series of events that form the distinct structures of the developing embryo. It depends on the ability of embryonic cells to change into different types of cells.
- Q14.** The development of the primary germ layers creates three distinct layers of cells: the endoderm, mesoderm, or the ectoderm. The cells in the primary germ layers are the source of all of the organs and tissues of the body. The process of the development of these cells into particular shapes and able to perform particular functions is called differentiation.

Student Textbook page 515

- Q15.** Neurulation is the development of the neural tube (found just above the notochord), which develops into the brain and the spinal cord. Cells along the surface of the notochord begin to thicken. As the cells thicken, folds develop along each side of a groove along this surface. As the folds fuse, they become the neural tube.

- Q16.** During the third week, a thickened band of mesoderm cells (a primary germ layer) develops along the back of the embryonic disk. These cells lie along what will become the baby's back and come together to form the notochord (the basic framework of the skeleton). In addition, a small reddish bulge that contains the heart forms; the heart begins to beat on the 18th day.
- Q17.** During the fourth week, the blood cells are forming and beginning to fill the developing blood vessels; the lungs and kidneys are taking shape; small buds which will become limbs form; a distinct head, with early evidence of eyes, ears, and a nose, is visible.
- Q18.** Students will list any four of the following: In the fifth week, the lidless eyes are open, and the cells of the brain are differentiating very quickly. At the sixth week, the brain is continuing to develop; the limbs are lengthening and can flex; the gonads produce hormones to influence the development of the external genitalia. In the seventh and eighth weeks, the organs are fully formed; the nervous system is coordinating the body activity; a skeleton of cartilage has formed; eyes are well developed, but not open; nostrils are developed but are plugged with mucus; external genitalia are developing, but are undifferentiated at this point. Upon completion of the eighth week, approximately 90 percent of the organs and structures are established, and continue to enlarge and mature.
- Q19.** The embryo is identified as a fetus ("offspring") after the eighth week of pregnancy, when the organs and structures are established.

Student Textbook page 517

- Q20.** The extra-embryonic membranes are: the allantois, the amnion, the chorion, and the yolk sac.
- Q21.** One portion of the placenta develops from the chorion. The allantois is the foundation of the umbilical cord.
- Q22.** The placenta has nutritional, excretory, respiratory, endocrine, and immune functions.
- Nutritional:* transports nutrients such as glucose, amino acids, and fatty acids; it also stores nutrients (protein, fats, carbohydrates, minerals) to be released later in the pregnancy.
- Excretory:* transports wastes such as urea, ammonia, and creatinine from the fetal blood to the mother's blood.
- Respiratory:* transports oxygen from mother to fetus, and carbon dioxide from fetus to mother.
- Endocrine:* secretes hormones such as estrogen, progesterone, and human chorionic gonadotropin; allows these hormones to diffuse from mother to fetus and fetus to mother.
- Immune:* provides passive immunity by transporting antibodies from the mother to the fetus's blood.

- Q23.** The umbilical cord contains one vein and two arteries; the arteries transport oxygen-depleted blood from the fetus to the placenta. The vein transports oxygen-rich blood to the fetus. (Students can diagram the pathway to summarize the role.)

Answers to Questions for Comprehension

Student Textbook page 520

Q24. The main difference between the embryonic and fetal development periods relates to the type of development of the organism. The embryonic period is a time of morphogenesis when the organs are formed. During the fetal period the organs continue to develop.

Q25. Students can list any three of the following events during the second trimester:

- heartbeat can be heard with a stethoscope
- the bones of the skeleton and joints begin to form
- face begins to look distinctly human,
- the brain grows rapidly
- the nervous system begins to function
- the mother can feel fetal movements as the limbs grow and develop
- fetus becomes covered with fine soft hair and an oily substance
- skin becomes more pink as capillaries extend into it
- body becomes larger in relation to the head
- the scalp develops hair

- eyes open
- eyelashes form
- fetus assumes “fetal position”

Q26. Students can list any three of the following events during the third trimester:

- brain cells form rapidly
- testes descend in males
- fat develops beneath the skin
- fetus shifts to head-first position
- bone marrow takes over production of red blood cells
- the digestive and respiratory systems mature
- lanugo is shed

Student Textbook page 523

Q27. Teratogens are agents that cause structural abnormalities due to exposure during pregnancy.

Q28. Examples of dangers that teratogens pose include:

- structural abnormalities, such as deformed limbs (prescription medication, e.g., Thalidomide)
- constriction of blood vessels, restricting oxygen supply and increasing risk of underweight babies, premature birth, stillbirth, and miscarriage (cigarette smoke)
- damage to the brain, central nervous system, and physical development, leading to decreased weight, height, head size, capacity to learn, memory problems, and personality disorders (alcohol)
- excess amounts of vitamin C consumed by the mother can result in the baby being prone to scurvy, easy bruising, and infections
- increased danger of miscarriage, low birth-weight babies, difficulty fighting infection and disease, developmental delay (exposure to environmental contaminants)

Answers to Questions for Comprehension

Student Textbook page 526

- Q29.** During parturition (birth), estrogen and progesterone levels drop and prostaglandins cause the release of oxytocin (these two hormones result in uterine contractions).
- Q30.** A Caesarian section is a surgical procedure where the mother's abdomen and uterus are opened so that the baby can be delivered when a natural birth is unsafe. (A Caesarian section may be required if the mother has an STI, or if the mother has a small pelvis, or if the baby is in breech position or has the umbilical cord wrapped more than once around its neck.)
- Q31.** Lactation is the formation and secretion of breast milk in the mother.
- Q32.** Oxytocin causes contractions in the mammary lobules, enabling the mother's milk to flow to the milk ducts.

Answers to Questions for Comprehension

Student Textbook page 530

- Q33.** Students should cite any two of the following reasons for male infertility: obstructions in the ductus deferens or epididymis; low sperm count; high proportion of abnormal or non-viable sperm; inability to achieve an erection or ejaculation; smoking; alcohol use, overheated testicles. Treatments can include: healthier lifestyle (cutting back on smoking, alcohol, wearing looser clothing); artificial insemination; *in vitro* fertilization; use of a sperm bank.
- Q34.** Students should cite any two of the following reasons for female infertility: blocked oviducts; failure to ovulate; endometriosis; damaged eggs. Treatments can include artificial insemination; *in vitro* fertilization; surrogate mothers; superovulation.

Student Textbook page 532

- Q35.** The most effective method to avoid conceiving a child is to practice abstinence. It not only prevents pregnancy, it also helps to minimize the risk of STIs.

Q36. The technology that does the best job of preventing conception and protecting against the transmission of STIs is a combination of condoms (a physical barrier) and chemical barriers (spermicides in the form of jellies, foams, or creams).