# Carlson: Human Embryology and Developmental Biology, 5th Edition

## Chapter 02: Transport of Gametes and Fertilization

### Test Bank

### Multiple Choice

1. During the fertilization process, acrosin functions
   A. To assist the sperm in penetrating the zona pellucida
   B. To initiate the acrosomal reaction
   C. To bind the sperm to the plasma membrane of the egg
   D. As a sperm attractant
   E. To stabilize the plasma membrane of the sperm

ANS: A

2. Which molecule of the zona pellucida serves as a specific sperm receptor?
   A. $ZP_1$
   B. $ZP_2$
   C. $ZP_3$
   D. Hyaluronic acid
   E. Chondroitin sulfate

ANS: C

3. Of the barriers to sperm survival and transport within the female reproductive tract, low pH is most important in the _____.
   A. Upper uterine tube
   B. Lower uterine tube
   C. Uterine cavity
   D. Cervix
   E. Vagina

ANS: E

4. As part of the fast block to polyspermy,
   A. The plasma membrane of the egg becomes rapidly depolarized
   B. Within the first minute, a wave of $Ca^{++}$ begins to pass through the egg from the site of sperm entry
   C. The acrosome reaction is completed
   D. Secretory products released from the cortical granules hydrolyze the $ZP_3$ sperm receptors in the zona pellucida
   E. The nucleus of the spermatozoon decondenses

ANS: A

5. Under the influence of estrogens secreted before ovulation, which of the following changes in the female reproduction tracts occur(s) to facilitate the transport of the ovulated egg and/or spermatozoa?
   A. Decreased smooth muscle activity
   B. Increased viscosity of the cervical mucus
   C. Increased ciliation of the epithelium of the uterine tube
   D. All of the above
   E. None of the above

ANS: C

6. In the slow block to polyspermy, what most directly stimulates the cortical granules to release their contents into the perivitelline space?
   A. $Ca^{++}$
   B. Protamines
   C. $Na^{+}$
   D. $ZP_3$
   E. Hyaluronidase

ANS: A

7. The principal role of the corona radiata in transport of the egg into and down the ampullary portion of the uterine tube is_____.
   A. Facilitating ion exchange with the maternal fluids
   B. Immunological protection of the egg
   C. Providing mechanical bulk
   D. Stimulating ciliary action in the tubal epithelium
   E. Serving as a chemoattractant

ANS: C

8. Which of the following are functions of the $ZP_3$ protein?
   A. Binding of sperm and stimulation of the cortical reaction
   B. Stimulation of the fast block to polyspermy and the cortical reaction
   C. Binding of sperm and stimulation of the acrosomal reaction
   D. Stimulation of completion of the second meiotic division and the cortical reaction
   E. Stimulation of capacitation and the release of acrosin from sperm

ANS: C

9. After a spermatozoon penetrates an ovum, its nucleus decondenses and protamines are lost from the chromosomes. The protamines will be replaced by _____.
   A. Phospholipids
   B. Acrosin
   C. Histones
   D. Hyaluronic acid
   E. None of the above

ANS: C

10. In humans and other mammals that have been studied, the first spermatozoa arrive in the uterine tubes within _____ of the deposition within the upper vagina.
   A. 1 minute
   B. 1 hour
   C. 6 hours
   D. 12 hours
   E. 24 hours

ANS: B

11. Which molecule helps the spermatozoon penetrate the zona pellucida?
   A. Hyaluronic acid
   B. Acrosin
   C. Alkaline phosphatase
   D. Oct-3
   E. Activin

ANS: B

12. During the fertilization process, the acrosomal reaction plays its most important role in assisting the spermatozoon to penetrate the _____.
   A. Plasma membrane of the ovum
   B. Corona radiata
   C. Perivitelline space
   D. Nuclear membrane of the ovum
   E. Zona pellucida

ANS: E

13. The principal energy source for ejaculated spermatozoa is _____.
    A. Prostatic acid phosphatase
    B. Internal glucose
    C. Prostatic citric acid
    D. Fructose in seminal vesicle fluid
    E. Glycogen released from the vaginal epithelium

ANS: D

14. During the fertilization process, the acrosomal reaction plays its most important role in assisting the spermatozoon to penetrate the _____.
    A. Plasma membrane of the ovum
    B. Corona radiata
    C. Perivitelline space
    D. Nuclear membrane of the ovum
    E. Zona pellucida

ANS: E

15. Exposure to an increased concentration of which ion(s) stimulates the cortical reaction during fertilization?
    A. $Na^+$
    B. $Ca^{++}$
    C. $H^+$
    D. $K^+$
    E. All of the above

ANS: B

16. The slow block to polyspermy is based on release of the contents of the _____.
    A. Pronuclei
    B. Cortical granules
    C. Acrosome
    D. Zona pellucida
    E. None of the above

ANS: B

17. Which component of the zona pellucida serves as the binding site for spermatozoa?
    A. Acrosin
    B. $ZP_1$
    C. $ZP_2$
    D. $ZP_3$
    E. Hyaluronic acid

ANS: D

18. The zona pellucida is directly involved in _____.
    A. Spontaneous abortions
    B. Neural induction
    C. Prevention of polyspermy
    D. Identical twinning
    E. Implantation

ANS: C

19. In humans, the structural basis for the slow block to polyspermy is the _____.
    A. Corona radiata
    B. Zona pellucida
    C. Inner acrosomal membrane
    D. Perivitelline space
    E. Plasma membrane of the egg

ANS: B