# Chapter 1: Fetal Lung Development
# Test Bank

**MULTIPLE CHOICE**

1. Which of the following phases of human lung development is characterized by the formation of a capillary network around airway passages?
   a. Pseudoglandular
   b. Saccular
   c. Alveolar
   d. Canalicular

   ANS: D
   The canalicular phase follows the pseudoglandular phase, lasting from approximately 17 weeks to 26 weeks of gestation. This phase is so named because of the appearance of vascular channels, or capillaries, which begin to grow by forming a capillary network around the air passages. During the pseudoglandular stage, which begins at day 52 and extends to week 16 of gestation, the airway system subdivides extensively and the conducting airway system develops, ending with the terminal bronchioles. The saccular stage of development, which takes place from weeks 29 to 36 of gestation, is characterized by the development of sacs that later become alveoli. During the saccular phase, a tremendous increase in the potential gas-exchanging surface area occurs. The distinction between the saccular stage and the alveolar stage is arbitrary. The alveolar stage stretches from 39 weeks of gestation to term. This stage is represented by the establishment of alveoli.

   REF: pp. 3-5

2. Regarding postnatal lung growth, by approximately what age do most of the alveoli that will be present in the lungs for life develop?
   a. 6 months
   b. 1 year
   c. 1.5 years
   d. 2 years

   ANS: C
   Most of the postnatal formation of alveoli in the infant occurs over the first 1.5 years of life. At 2 years of age, the number of alveoli varies substantially among individuals. After 2 years of age, males have more alveoli than do females. After alveolar multiplication ends, the alveoli continue to increase in size until thoracic growth is completed.

   REF: p. 6

3. The respiratory therapist is evaluating a newborn with mild respiratory distress due to tracheal stenosis. During which period of lung development did this problem develop?
   a. Embryonal
   b. Saccular
   c. Canalicular
   d. Alveolar

   ANS: A

The initial structures of the pulmonary tree develop during the embryonal stage. Errors in development during this time may result in laryngeal, tracheal, or esophageal atresia or stenosis. Pulmonary hypoplasia, an incomplete development of the lungs characterized by an abnormally low number and/or size of bronchopulmonary segments and/or alveoli, can develop during the pseudoglandular phase. If the fetus is born during the canalicular phase (i.e., prematurely), severe respiratory distress can be expected because the inadequately developed airways, along with insufficient and immature surfactant production by alveolar type II cells, gives rise to the constellation of problems known as *infant respiratory distress syndrome*.

REF: p. 6

4. Which of the following mechanisms is (are) responsible for the possible association between oligohydramnios and lung hypoplasia?

   I. Abnormal carbohydrate metabolism
   II. Mechanical restriction of the chest wall
   III. Interference with fetal breathing
   IV. Failure to produce fetal lung liquid
   a. I and III only
   b. II and III only
   c. I, II, and IV only
   d. II, III, and IV only

   ANS: D
   Oligohydramnios, a reduced quantity of amniotic fluid present for an extended period of time, with or without renal anomalies, is associated with lung hypoplasia. The mechanisms by which amniotic fluid volume influences lung growth remain unclear. Possible explanations for reduced quantity of amniotic fluid include mechanical restriction of the chest wall, interference with fetal breathing, or failure to produce fetal lung liquid. These clinical and experimental observations possibly point to a common denominator, lung stretch, as being a major growth stimulant.

   REF: pp. 6-7

5. What is the purpose of the substance secreted by the type II pneumocyte?
   a. To increase the gas exchange surface area
   b. To reduce surface tension
   c. To maintain lung elasticity
   d. To preserve the volume of the amniotic fluid

   ANS: B
   The primary role of mammalian surfactant is to lower the surface tension within the alveolus, specifically at the air–liquid interface. This allows the delicate structure of the alveolus to expand when filled with air. Without surfactant, the alveolus remains collapsed because of the high surface tension of the moist alveolar surface. Surfactant is composed predominantly of an intricate blend of phospholipids, neutral lipids, and proteins.

   REF: p. 8

6. Which of the following tests of the amniotic fluid have been shown to be sensitive indicators of lung maturity?
   a. Levels of prednisone
   b. Levels of epidermal growth factor
   c. Levels of prostaglandins
   d. Levels of phosphatidylglycerol and phosphatidylcholine

   ANS: D
   Of clinical relevance during late gestation, analysis of amniotic fluid for the concentration of phosphatidylglycerol and phosphatidylcholine has been shown to be a sensitive indicator of the state of fetal lung maturity.

   REF: p. 8