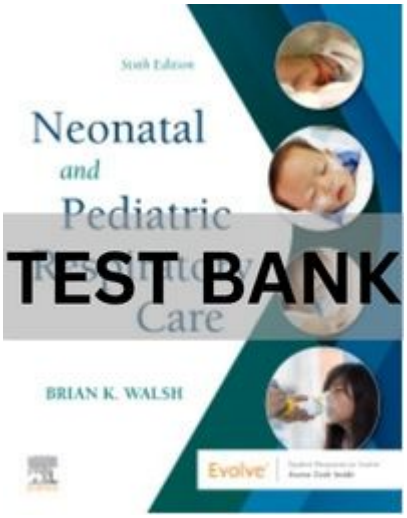
Neonatal and Pediatric Respiratory Care 6th Edition Test Bank

Chapter 01: Fetal Lung Development
Walsh: Neonatal and Pediatric Respiratory Care, 6th Edition



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 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.

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. 2 years
   d. 3 years

   ANS: C
   Most of the postnatal formation of alveoli in the infant occurs over the first 2 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.

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, give rise to the constellation of problems known as *infant respiratory distress syndrome*.

4. Which of the following mechanisms 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.

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.

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.

7. Approximately how much fetal lung fluid is secreted daily?
   a. About 150 to 200 ml
   b. About 250 to 300 ml
   c. About 350 to 400 ml
   d. About 450 to 500 ml

   ANS: B
   Fetal lungs are secretory organs that make breathing-like movements but serve no respiratory function before birth. They secrete about 250 to 300 ml of liquid per day.

8. The lung bud emerges from which of the following structures?
   a. The pharynx
   b. The foregut
   c. The mesenchyme
   d. The tubular epithelium

   ANS: A
   The embryonal phase includes primitive lung development and is generally regarded to encompass the first 2 months of gestation. The lung begins to emerge as a bud from the pharynx 26 days after conception.

Chapter 02: Fetal Gas Exchange and Circulation
Walsh: Neonatal and Pediatric Respiratory Care, 6th Edition

MULTIPLE CHOICE

1. Which of the following embryonic germ layers gives formation to the respiratory system?
   a. Endoderm
   b. Mesoderm
   c. Ectoderm
   d. Periderm

   ANS: A
   The respiratory system—pharynx, lungs, and epithelial lining of the trachea and lungs—originates in the endoderm. Refer to Box 2-1 in the textbook to see the list of various tissue systems found in the three embryonic layers.

2. What is the function of Wharton's jelly inside the umbilical cord?
   a. To help provide nutrition to the fetus
   b. To prevent the vessels inside the cord from kinking
   c. To help protect the fetus

d. To regulate the temperature between the fetus and the mother

ANS: B
Wharton's jelly, a gelatinous substance inside the umbilical cord, helps protects the vessels of the fetus and may prevent the cord from kinking.

3. A pregnant woman is coming for an early prenatal evaluation and wants to know which organ is the first to completely form. What organ would you tell her?
   a. Heart
   b. Brain
   c. Lungs
   d. Kidneys

   ANS: A
   The heart is considered to be the first complete organ formed. By 8 weeks of gestation, the normal fetal heart is fully functional, complete with all chambers, valves, and major vessels.

4. A pregnant woman is coming for an early prenatal evaluation and wants to know if she can listen to the baby's heartbeat. About how early can the fetal heartbeat be detected?
   a. Day 8
   b. Day 22
   c. Day 45
   d. Day 60

   ANS: B
   By day 22, cardiac contractions are detectable and bidirectional tidal blood flow begins.

5. Which of the following anatomic structures are fetal shunts?
   I. Foramen ovale
   II. Sinus venosus
   III. Ductus venosus
   IV. Ductus arteriosus
   a. I and III only
   b. I, III, and IV only
   c. I, II, and IV only
   d. II, III, and IV only

   ANS: B
   The three shunts present in the fetus that close soon after birth include (1) the foramen ovale, the opening between the right atrium and the left atrium, which enables oxygenated blood to flow to the left side of the fetal heart; (2) the ductus venosus, which appears continuous with the umbilical vein and shunts 30% to 50% of oxygen-rich blood around the liver; and (3) the ductus arteriosus, which allows most of the pulmonary arterial blood flow to bypass the nonfunctioning fetal lungs and enter the aorta.

6. Under normal developmental conditions which of the following events causes cessation of right-to-left shunt through the foramen ovale?
   a. Increased levels of PO_2 in the blood of the neonate
   b. Decreased levels of PCO_2 in the blood of the newborn
   c. Increased systemic vascular resistance
   d. Removal of the placenta, causing lowered blood volume returning to the right side of the fetal heart

ANS: C
Once the cord is clamped and the PVR decreases, pressures in the right side of the heart decrease and pressures in the left side increase. Because the foramen ovale flap allows blood to flow only from right to left, it closes when the pressures in the left atrium become greater than those in the right atrium. Closing the foramen ovale further facilitates the increase of blood flow to the lungs during the transitional period and is necessary to maintain normal extrauterine circulation.

7. How long after birth should it take for the ductus arteriosus to close completely?
   a. 24 hours
   b. 48 hours
   c. 96 hours
   d. 1 week

   ANS: C
   Because the pressure in the aorta also increases and becomes greater than the pressure in the pulmonary artery, the amount of shunting through the ductus arteriosus decreases. The functional closure of the ductus arteriosus occurs as a result of being exposed to an increased PO_2, a decrease in PVR leading to the reduction in blood pressure within the ductal lumen, a decrease in the local production of prostaglandins, and a reduction in the number of prostaglandin receptors within the tissue of the ductus arteriosus. Normally, constriction of the ductus arteriosus starts to occur at birth, and 20% of the ductus closes within 24 hours, with 80% closed in 48 hours, and 100% by 96 hours after birth.

8. During early embryonic development, which of the following structures supply nutrition to the growing embryo?
   a. Angiogenic clusters
   b. Chorionic membrane
   c. Bulbus cordis
   d. Wharton's jelly

   ANS: A
   During early embryonic development, small cellular pools, referred to as angiogenic clusters or blood islands, supply nutrition to the growing embryo. These clusters coalesce to form two heart tubes lined with specialized myocardial tissue.

9. Which of the following paths accurately traces oxygenated blood from the placenta to the fetus?
   a. Umbilical arteries, ductus venosus, right atrium, left atrium, foramen ovale, aorta, umbilical vein
   b. Umbilical vein, ductus arteriosus, right atrium, umbilical arteries, foramen ovale, left atrium, aorta
   c. Aorta, umbilical arteries, umbilical vein, ductus venosus, right atrium, foramen ovale, left atrium
   d. Umbilical vein, ductus venosus, right atrium, foramen ovale, left atrium, aorta, umbilical arteries

   ANS: D
   The path of fetal circulation and percentage of oxygen saturation in various locations is illustrated in Figure 2-6.

10. What is the main reason fetal circulation differs from circulation after the infant is born?

a. The lungs need time to develop
b. It is difficult for the fetus to breathe in the amniotic fluid
c. Gas exchange does not occur within the fetal lung
d. The heart does not pump blood while the fetus is in amniotic fluid

ANS: C
Fetal circulation necessarily differs from circulation after the infant is born, because fetal gas exchange does not occur within the lungs.

Chapter 03: Antenatal Assessment and High-Risk Delivery
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MULTIPLE CHOICE

1. A pregnant woman has been diagnosed with pregestational diabetes. Of which of the following adverse fetal outcomes should the therapist be aware at the time of delivery?
   a. Unexplained abruption placenta
   b. Oligohydramnios
   c. Malformations of the cardiovascular system
   d. Fetal limb malformations

   ANS: C
   Adverse fetal outcomes include stillbirth and major fetal structural malformations. Tight glycemic control and antepartum testing have significantly decreased the risk of fetal death. The rate of fetal structural malformations in infants born to pregestational diabetic women can be as high as 10% to 15% and is proportionate to pre-pregnancy glycemic control. This compares to the background rate of 2% to 3% for infants in the general population. The most commonly encountered defects in pregestational diabetes are malformations of the cardiovascular system, including both the heart and great vessels, and the central nervous system, including the brain and spinal cord.

2. The respiratory therapist is attending a term labor of a woman diagnosed with gestational diabetes. The baby is very large for gestational age. What metabolic disturbances should be considered?
   I. Hyperglycemia
   II. Hypocalcemia
   III. Hyperkalemia
   IV. Hypoglycemia
   a. II and IV only
   b. I, II, and III only
   c. I and III only
   d. II, III, and IV only

   ANS: D
   Poor blood sugar control in these women is associated with an increased risk of macrosomia (birth weight greater than 4000 g), traumatic vaginal delivery, preterm delivery, and a small risk of fetal death in some women. After delivery, the infants are at increased risk for metabolic disturbances in the neonatal period; these include hypoglycemia, hypocalcemia, hyperkalemia, hyperbilirubinemia, and idiopathic respiratory distress syndrome.

3. Which of the following microorganisms most commonly affect pregnancy outcome?
   a. Group B *Streptococcus*

b. *Haemophilus influenzae*
c. *Mycobacterium tuberculosis*
d. Hepatitis C virus

ANS: A
A number of infectious agents can affect pregnancy outcome. Among the most important in the United States are group B *Streptococcus* (GBS), herpes simplex virus (HSV), human immunodeficiency virus (HIV), and hepatitis B virus (HBV). As many as 10% to 40% of pregnant women are colonized with GBS. Their infants are at risk for death or severe morbidity if they are born prematurely or after prolonged rupture of the fetal membranes.

4. What is generally accepted as a safe limit for alcohol consumption during pregnancy to avoid the development of fetal alcohol syndrome?
   a. One to two 8-ounce drinks per day are considered acceptable.
   b. Four to five 8-ounce drinks per week are considered safe.
   c. Three to four 12-ounce drinks per week are considered reasonable.
   d. *No* safe range of alcohol consumption is deemed safe during pregnancy.

   ANS: D
   Alcohol is a potent **teratogen**, an agent or factor that causes malformation in the fetus. **Fetal alcohol syndrome**, associated with maternal use of alcohol in pregnancy, is characterized by mental retardation and prenatal and postnatal growth restriction, as well as by brain, cardiac, spinal, and craniofacial anomalies. It is usually seen among children of women who consume 4 to 6 alcoholic drinks daily throughout pregnancy. However, no safe range of alcohol consumption during pregnancy exists.

5. What is the average birth weight difference between infants born of mothers who smoke and those born of nonsmoking mothers?
   a. Infants born of mothers who smoke tend to weigh about 200 g less than infants born of mothers who do not smoke.
   b. Infants born of mothers who smoke are generally weigh about 400 g less than infants born of nonsmoking mothers.
   c. Infants born of mothers who smoke are predisposed to weigh approximately 600 g less than infants born of mothers who do not smoke.
   d. Infants of mothers who smoke are likely to be born weighing about 800 g less than those born of mothers who do not smoke.

   ANS: A
   The mean birth weight of infants of women who smoke during pregnancy is about 200 g less than that of infants of nonsmokers.

6. A woman with a long history of smoking is now in the last part of the third trimester of her pregnancy. She is at high risk for which of the following conditions?
   I. Premature rupture of membranes
   II. Placental abruption
   III. Placenta previa
   IV. Asthma
   a. II and IV only
   b. I, II, and III only
   c. I and III only
   d. I, II, III, and IV

ANS: B
Smoking during pregnancy can cause several adverse effects. Carbon monoxide and nicotine, the main ingredients responsible, mediate their effects by decreasing the availability of oxygen to the fetus and placenta. A strong association occurs between cigarette smoking and lower birth weight. The mean birth weight of infants of women who smoke during pregnancy is about 200 g less than that of infants of nonsmokers. Smoking is also associated with a higher incidence of preterm premature rupture of membranes, placental abruption, and placenta previa, and risk of infant death from sudden infant death syndrome.

7. What is the main potential problem associated with the premature rupture of membranes?
   a. Fetal dehydration
   b. Fetal infection
   c. Maternal hypotension
   d. Maternal renal failure

   ANS: B
   In utero, the fetus is contained in the sterile fluid-filled amniotic sac. If the membranes that compose the external lining of the amniotic sac rupture before term (before 37 weeks of gestation) or before the onset of normal labor at term, the fetal environment is no longer sterile, increasing the risk of fetal infection.

8. Which of the following conditions is responsible for up to 40% of the preterm births in the United States?
   a. Cervical insufficiency
   b. Premature rupture of the fetal membranes
   c. Obstetrical intervention mandated by fetal jeopardy
   d. Hormonal treatment during pregnancy

   ANS: B
   The causes of premature rupture of the fetal membranes are generally not known but are responsible for 35% to 40% of preterm births in the United States. Preterm rupture of the fetal membranes can be seen as being responsible for all of the problems faced by most prematurely born infants.

9. How should the therapist interpret an amniotic fluid index (AFI) of 5 cm?
   a. Polyhydramnios
   b. Multihydramnios
   c. Oligohydramnios
   d. Anhydramnios

   ANS: C
   The amniotic fluid index (AFI) is calculated by measuring the largest vertical pockets of fluid in each of the four uterine quadrants at the time of ultrasound examination. Oligohydramnios, too little amniotic fluid or an AFI below 5 cm, is usually associated with congenital anomalies (especially renal agenesis or urinary tract obstruction), fetal growth restriction or demise, **postterm pregnancy**, ruptured membranes, uteroplacental insufficiency, and use of prostaglandin synthase inhibitors.

10. Once preterm labor is diagnosed, which of the following medications should be considered as tocolytic?
    a. Magnesium sulfate
    b. Sodium bicarbonate

c. Calcium carbonate
d. Epinephrine

ANS: A
Once preterm labor is diagnosed, prompt measures should be taken to try to stop labor and prevent an early delivery. Intravenous hydration is commonly the first approach used. However, it does not seem to be of clinical significance in a well-hydrated patient. Excessive hydration should be avoided because it might exacerbate the risk of pulmonary edema that is usually associated with the use of tocolytics. The most commonly used tocolytics are magnesium sulfate, beta-mimetic agents, and indomethacin (a prostaglandin inhibitor).

11. A pregnant woman at 30 weeks of gestation with premature rupture of membranes has been admitted to the hospital with preterm labor. The physician has ordered betamethasone. When does the maximal benefit of antenatal corticosteroid occur to reduce RDS?
a. After 12 hours
b. After 24 hours
c. After 48 hours
d. After 1 week

ANS: C
All women between 24 and 34 weeks of gestation with a high likelihood of preterm delivery are candidates for antenatal corticosteroid therapy. Betamethasone is the most commonly used agent and is administered in two doses of 12 mg, 24 hours apart. Maximal benefit occurs 48 hours after initiation of therapy and the benefit lasts for 7 days.

12. Which of the following conditions is a significant problem in postterm pregnancy?
a. Infection
b. Fetal anencephaly
c. Meconium aspiration
d. Obesity

ANS: C
Meconium aspiration is a significant problem. Meconium passage *in utero* is common after 42 weeks of gestation. It is frequently associated with fetal hypoxia. Meconium becomes more concentrated in the amniotic fluid when associated with oligohydramnios. Aspiration of meconium may lead to obstruction of the respiratory passages and interference with surfactant function.

13. A woman 41 weeks pregnant is at high risk for complication in the postpartum period. Which of the following agents will be more appropriate to induce labor?
a. Magnesium sulfate
b. Aspirin
c. Terbutaline
d. Oxytocin

ANS: D
Labor induction can be achieved with various medications when the cervix is favorable for induction. Intravenous infusion of oxytocin, a hormone secreted from the posterior pituitary that stimulates uterine contractions and milk letdown, is most commonly used.

14. Which of the following procedures is performed after the 16th week of pregnancy and can be used to assess for chromosomal abnormalities?
a. Amniocentesis

b. Scalp fetal pH
c. Stress test
d. Needle ultrasound

ANS: A
After about 16 weeks, an amniocentesis can be used to obtain amniotic fluid or genetic, biochemical, or other analysis.

15. The respiratory therapist is called to assist in the labor of a pregnant woman whose NST reported two accelerations in fetal heart rate, each of at least 15 beats per minute and lasting at least 15 seconds, associated with maternal perception of fetal movement over a period of 20 minutes. What is the best course of action?
a. A C-section should be scheduled as soon as possible.
b. No action is required because this reactive NST is associated with normal uteroplacental function.
c. A CST should be performed before fetal stress is confirmed.
d. Oxytocin should be administered to prevent more fetal stress.

ANS: B
A reactive NST requires at least two accelerations in fetal heart rate, each of at least 15 beats per minute and lasting at least 15 seconds, associated with maternal perception of fetal movement over a period of 20 minutes. A reactive NST is highly correlated with normal uteroplacental function.

16. A fetus is undergoing a contraction stress test. Uterine contractions are stimulated by the intravenous infusion of oxytocin into the mother. The fetal PO_2 drops below 12 mm Hg and causes the fetal heart rate to slow. Which of the following conditions is likely indicated by this occurrence?
a. Placenta abruption
b. Oligohydramnios
c. Uteroplacental insufficiency
d. Nuchal cords

ANS: C
During a contraction stress test, FHR levels are monitored continuously while uterine contractions are stimulated by intravenous infusion into the mother of a dilute solution of oxytocin. In a normal pregnancy, fetal PO_2 (partial pressure of oxygen) decreases with each uterine contraction and then rapidly returns to normal. A fetal PO_2 drop below 12 mm Hg, resulting in slowing of the FHR, indicates uteroplacental insufficiency. This slowing of the FHR in response to uterine contractions is called a *late deceleration*.

17. A therapist is called to the labor and delivery room to assist in the resuscitation of a 32-week newborn. What FiO_2 should be used to start positive pressure ventilation?
a. 100% and then adjusted using clinical assessment and preductal pulse oximetry
b. 50% and then adjusted using clinical assessment and preductal pulse oximetry
c. 30% and then adjusted using clinical assessment and preductal pulse oximetry
d. Any FiO_2 as long as peak pressures do not exceed 20 cm H_2O

ANS: C