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# Practice Questions

Try all 30 first, then check the answer key at the back.



**1. A newborn is noted to have low-set ears, micrognathia, and a cleft palate. The mother reports drinking alcohol daily during the first trimester. Which of the following best describes the embryologic period when these craniofacial abnormalities most likely developed?**

A. Weeks 1-3 of gestation
B. Weeks 10-12 of gestation
C. Weeks 16-20 of gestation
D. Weeks 4-8 of gestation

**2. A 15-month-old child presents for a well-child visit. The parents are concerned because the child is not yet walking independently. Which of the following represents the appropriate developmental milestone for this age?**

A. Walking with assistance only
B. Running
C. Walking independently
D. Crawling

**3. A 30-year-old woman is 8 weeks pregnant and is prescribed isotretinoin for severe acne. Which of the following congenital malformations is most strongly associated with exposure to this medication during pregnancy?**

A. Abdominal wall defects
B. Craniofacial abnormalities
C. Limb reduction defects
D. Neural tube defects

**4. A 24-week pregnant woman presents with vaginal bleeding and is diagnosed with placenta previa. Which of the following best explains how this condition affects maternal-fetal interaction?**

A. Decreased placental blood flow leading to potential fetal hypoxia
B. Increased production of fetal stress hormones
C. Direct compression of the fetal neural tube
D. Maternal antibody transfer to the fetal circulation

**5. A 3-year-old child has difficulty interacting with peers, demonstrates repetitive behaviors, and has delayed language development. Genetic testing reveals a mutation affecting synaptic proteins. Which of the following best describes the gene-environment interaction in this condition?**

A. Environmental factors cause genetic mutations that lead to abnormal brain development
B. Genetic factors exclusively determine the condition with no environmental influence
C. Environmental toxins directly damage synaptic proteins leading to the observed behaviors
D. Genetic mutations affect neural circuit development, while environmental factors modify expression of symptoms

**6. During a pediatric visit, a mother reports that her 9-month-old infant becomes extremely distressed when she leaves the room, which was not the case a few months ago. This behavior most likely represents which normal developmental process?**

A. Social communication deficit
B. Regression
C. Separation anxiety
D. Attachment disorder



**7. A 42-year-old pregnant woman undergoes amniocentesis that reveals trisomy 21. Which of the following maternal factors most likely contributed to this chromosomal abnormality?**

A. Smoking during pregnancy
B. Advanced maternal age
C. Maternal diabetes mellitus
D. Previous miscarriage

**8. A newborn presents with ambiguous genitalia. Laboratory analysis reveals elevated 17-hydroxyprogesterone levels. During which week of embryonic development did the pathophysiologic process leading to this condition most likely begin?**

A. Week 7
B. Week 3
C. Week 12
D. Week 20

**9. A premature infant born at 30 weeks gestation develops respiratory distress shortly after birth. Which of the following best explains the developmental basis for this condition?**

A. Incomplete formation of the tracheal cartilaginous rings
B. Delayed closure of the ductus arteriosus
C. Underdeveloped intercostal muscles
D. Insufficient surfactant production by type II pneumocytes



**10. A 62-year-old man presents with crushing substernal chest pain radiating to the left arm that began while shoveling snow. ECG shows ST-segment elevation in leads II, III, and aVF. Which coronary artery is most likely occluded?**

A. Left circumflex artery
B. Left main coronary artery
C. Right coronary artery
D. Left anterior descending artery

**11. Which chamber of the heart has the thickest myocardial wall?**

A. Right atrium
B. Left ventricle
C. Right ventricle
D. Left atrium

**12. A 45-year-old female with a history of rheumatic fever presents with dyspnea on exertion. On auscultation, an opening snap followed by a low-pitched diastolic rumble is heard at the apex. Which valvular lesion is most likely present?**

A. Mitral stenosis
B. Mitral regurgitation
C. Aortic stenosis
D. Tricuspid regurgitation



**13. Which of the following properly describes the sequence of events during the cardiac action potential of ventricular myocytes?**

A. Slow depolarization, plateau, rapid depolarization, repolarization, resting potential
B. Rapid depolarization, plateau, initial repolarization, rapid repolarization, resting potential
C. Plateau, rapid depolarization, initial repolarization, rapid repolarization, resting potential
D. Rapid depolarization, initial repolarization, plateau, rapid repolarization, resting potential

**14. A 58-year-old man with chronic atrial fibrillation is started on amiodarone. Which of the following adverse effects should be monitored most closely?**

A. Neutropenia
B. Ototoxicity
C. Pulmonary fibrosis
D. Nephrotoxicity

**15. Cardiac output is calculated as the product of heart rate and which other parameter?**

A. End-diastolic volume
B. Stroke volume
C. Mean arterial pressure
D. Ejection fraction

**16. A 72-year-old man with chronic angina is prescribed nitroglycerin. What is the primary mechanism of action of this medication?**

A. Conversion to nitric oxide, causing vasodilation through increased cGMP
B. Inhibition of beta-adrenergic receptors in the heart
C. Blockade of calcium channels in vascular smooth muscle
D. Inhibition of angiotensin-converting enzyme

**17. A 50-year-old woman presents with exertional dyspnea and peripheral edema. Echocardiogram shows an ejection fraction of 60% with normal ventricular size but increased wall thickness. Left ventricular filling pressures are elevated. Which type of heart failure best describes this patient's condition?**

A. Heart failure with reduced ejection fraction (systolic heart failure)
B. High-output heart failure
C. Right-sided heart failure
D. Heart failure with preserved ejection fraction (diastolic heart failure)

**18. Which cardiac valve is located between the left atrium and left ventricle?**

A. Aortic valve
B. Pulmonic valve
C. Mitral valve
D. Tricuspid valve



**19. A 65-year-old man with coronary artery disease presents with sudden onset of palpitations. ECG shows a regular narrow-complex tachycardia at a rate of 180 bpm with no visible P waves. Carotid sinus massage temporarily slows the rate. Which arrhythmia is most likely present?**

A. Sinus tachycardia
B. Atrioventricular nodal reentrant tachycardia (AVNRT)
C. Atrial fibrillation
D. Ventricular tachycardia

**20. A 28-year-old male athlete has a loud, mid-systolic click followed by a late systolic murmur at the apex that intensifies with standing. Which cardiac condition is most likely?**

A. Mitral valve prolapse
B. Aortic stenosis
C. Hypertrophic cardiomyopathy
D. Patent ductus arteriosus

**21. Which of the following accurately describes the function of cardiac troponin I?**

A. Activates myosin ATPase to initiate contraction
B. Forms the structural core of thick filaments
C. Facilitates calcium release from the sarcoplasmic reticulum
D. Inhibits actin-myosin interaction in the absence of calcium



**22. A 55-year-old man with hypertension and hyperlipidemia presents with acute chest pain. His ECG shows ST-segment depression in leads V1-V4. Which type of acute coronary syndrome is most likely?**

A. Prinzmetal angina
B. Stable angina
C. Non-ST elevation myocardial infarction (NSTEMI)
D. ST elevation myocardial infarction (STEMI)

**23. Which of the following medications used in heart failure acts by inhibiting sodium-potassium ATPase?**

A. Furosemide
B. Digoxin
C. Carvedilol
D. Lisinopril

**24. A 42-year-old woman presents with recurrent episodes of dizziness and syncope. ECG during an episode shows a prolonged QT interval of 520 ms. Which electrolyte abnormality is most likely to exacerbate this condition?**

A. Hypokalemia
B. Hyperkalemia
C. Hypercalcemia
D. Hypermagnesemia

**25. In the cardiac cycle, which event corresponds to the onset of the first heart sound (S1)?**

A. Opening of the semilunar valves
B. Closure of the semilunar valves
C. Opening of the atrioventricular valves
D. Closure of the atrioventricular valves

**26. A 30-year-old woman has a blood pressure of 100/60 mmHg. What is her calculated mean arterial pressure (MAP)?**

A. 60 mmHg
B. 67 mmHg
C. 73 mmHg
D. 80 mmHg

**27. Which of the following vessel layers is primarily responsible for maintaining vascular tone?**

A. Endothelium
B. Tunica media
C. Tunica intima
D. Tunica adventitia



**28. A 68-year-old man with a history of myocardial infarction is started on lisinopril. Which of the following describes the primary mechanism of this medication?**

A. Inhibition of angiotensin-converting enzyme
B. Blockade of beta-adrenergic receptors
C. Antagonism of aldosterone receptors
D. Inhibition of phosphodiesterase

**29. A 57-year-old man with a 40-pack-year smoking history presents with leg pain when walking that resolves with rest. The pain is described as cramping in the calves. Which condition is most likely present?**

A. Deep vein thrombosis
B. Chronic venous insufficiency
C. Lumbar spinal stenosis
D. Peripheral arterial disease

**30. Which of the following cells forms the majority of the cardiac conduction system?**

A. Epicardial cells
B. Myofibroblasts
C. Purkinje fibers
D. Intercalated discs

# Answer Key & Explanations



**1. D — Weeks 4-8 of gestation**
Craniofacial abnormalities associated with fetal alcohol syndrome typically develop during the critical period of facial development in weeks 4-8 of gestation. This is when the facial prominences and palatal shelves form, and exposure to teratogens during this period can lead to dysmorphic features including low-set ears, micrognathia, and cleft palate.

**2. C — Walking independently**
By 15 months of age, most children should be walking independently without support. This is a key gross motor milestone that typically occurs between 12-15 months. Children who have not achieved independent walking by 18 months warrant further developmental evaluation.

**3. B — Craniofacial abnormalities**
Isotretinoin (a vitamin A derivative) is a potent teratogen that causes characteristic craniofacial abnormalities, including ear malformations, micrognathia, and cleft palate. It also causes cardiac and CNS defects. This medication is contraindicated during pregnancy due to its high risk of causing congenital malformations.

**4. A — Decreased placental blood flow leading to potential fetal hypoxia**
Placenta previa occurs when the placenta implants over the internal cervical os, which can lead to maternal hemorrhage when the cervix begins to dilate. This condition interferes with maternal-fetal interaction by potentially compromising placental blood flow, which can lead to fetal hypoxia and growth restriction due to decreased nutrient and oxygen exchange.

**5. D — Genetic mutations affect neural circuit development, while environmental factors modify expression of symptoms**
Autism spectrum disorder often involves a complex interplay between genetic susceptibility and environmental factors. Genetic mutations affecting synaptic proteins can impact neural circuit development and connectivity, while early environmental exposures and experiences can influence how these genetic factors are expressed, potentially modifying the severity and presentation of the condition.

**6. C — Separation anxiety**
Stranger anxiety and separation anxiety typically develop around 6-9 months of age as infants begin to form specific attachments to caregivers and can distinguish between familiar and unfamiliar people. This represents normal social-emotional development and coincides with the development of object permanence - the understanding that objects (and people) continue to exist even when they cannot be seen.

**7. B — Advanced maternal age**
Advanced maternal age (typically defined as age 35 or older) is the most significant risk factor for trisomy 21 (Down syndrome). The risk increases exponentially with maternal age due to aging oocytes being more susceptible to nondisjunction during meiosis, which leads to trisomy 21 in the fetus.

**8. A — Week 7**
Sexual differentiation of the external genitalia begins around week 7 of embryonic development. In congenital

adrenal hyperplasia (suggested by elevated 17-hydroxyprogesterone), excessive androgen production during this critical period leads to virilization of female external genitalia, resulting in ambiguous genitalia.

**9. D — Insufficient surfactant production by type II pneumocytes**
Surfactant production by type II pneumocytes typically begins around weeks 22-24 but doesn't reach adequate levels until approximately 34-36 weeks gestation. Premature infants born before sufficient surfactant production are at high risk for respiratory distress syndrome due to poor alveolar stability, increased surface tension, and alveolar collapse, leading to impaired gas exchange.

**10. C — Right coronary artery**
ST-segment elevation in leads II, III, and aVF indicates an inferior wall myocardial infarction, which typically results from occlusion of the right coronary artery (RCA). The RCA supplies the inferior wall of the left ventricle in approximately 80% of people (right-dominant circulation).

**11. B — Left ventricle**
The left ventricle has the thickest myocardial wall of all cardiac chambers, as it must generate sufficient pressure to pump blood throughout the systemic circulation against high resistance. The right ventricle has a thinner wall as it pumps against the lower-resistance pulmonary circulation.

**12. A — Mitral stenosis**
An opening snap followed by a low-pitched diastolic rumble at the apex is the classic auscultatory finding in mitral stenosis. This condition is often a sequela of rheumatic fever, which causes valve leaflet thickening, fusion of the commissures, and calcification that restricts blood flow from the left atrium to the left ventricle during diastole.

**13. D — Rapid depolarization, initial repolarization, plateau, rapid repolarization, resting potential**
The cardiac action potential in ventricular myocytes follows this sequence: Phase 0 (rapid depolarization via sodium channels), Phase 1 (initial repolarization via potassium efflux), Phase 2 (plateau via balanced calcium influx and potassium efflux), Phase 3 (rapid repolarization via potassium efflux), and Phase 4 (resting membrane potential).

**14. C — Pulmonary fibrosis**
Amiodarone is associated with multiple adverse effects, but pulmonary toxicity (manifesting as interstitial pneumonitis or fibrosis) is one of the most serious and potentially life-threatening complications. Regular monitoring of pulmonary function and symptoms is essential for patients on amiodarone therapy.

**15. B — Stroke volume**
Cardiac output (CO) is calculated as the product of heart rate (HR) and stroke volume (SV): CO = HR × SV. Stroke volume is the amount of blood ejected by the ventricle during each contraction.

**16. A — Conversion to nitric oxide, causing vasodilation through increased cGMP**
Nitroglycerin is converted to nitric oxide, which activates guanylyl cyclase, increasing cGMP levels. This leads to smooth muscle relaxation and vasodilation, particularly in the venous circulation (reducing preload) and coronary arteries (increasing coronary blood flow), which relieves angina symptoms.

**17. D — Heart failure with preserved ejection fraction (diastolic heart failure)**
This patient has features of heart failure with preserved ejection fraction (HFpEF), also known as diastolic heart failure. The normal ejection fraction (>50%) with increased wall thickness and elevated filling pressures indicates impaired ventricular relaxation and compliance, causing symptoms despite preserved systolic

function.

**18. C — Mitral valve**
The mitral valve (bicuspid valve) is located between the left atrium and left ventricle. It has two leaflets (anterior and posterior) and prevents backflow of blood from the left ventricle to the left atrium during ventricular systole.

**19. B — Atrioventricular nodal reentrant tachycardia (AVNRT)**
This presentation is typical of atrioventricular nodal reentrant tachycardia (AVNRT), a type of supraventricular tachycardia characterized by a regular narrow-complex rhythm at rates of 150-250 bpm. P waves are often not visible as they are buried in the QRS complexes. AVNRT often responds to vagal maneuvers like carotid sinus massage, which temporarily slows AV nodal conduction.

**20. A — Mitral valve prolapse**
A mid-systolic click followed by a late systolic murmur at the apex that intensifies with standing is characteristic of mitral valve prolapse. Standing decreases ventricular volume, causing earlier prolapse and intensification of the murmur. This condition is more common in young adults with lean body habitus.

**21. D — Inhibits actin-myosin interaction in the absence of calcium**
Cardiac troponin I is a regulatory protein found in cardiac muscle that inhibits actin-myosin interactions in the absence of calcium. When calcium binds to troponin C, troponin I shifts position, allowing contraction to occur. Elevated levels in blood indicate cardiac muscle damage, making it a specific marker for myocardial injury.

**22. C — Non-ST elevation myocardial infarction (NSTEMI)**
ST-segment depression in the absence of ST elevation is characteristic of non-ST elevation myocardial infarction (NSTEMI) or unstable angina, collectively referred to as non-ST elevation acute coronary syndrome (NSTE-ACS). This typically results from partial coronary occlusion or transient complete occlusion, in contrast to STEMI, which shows ST elevation due to complete occlusion.

**23. B — Digoxin**
Digoxin inhibits the sodium-potassium ATPase pump in cardiac myocytes, leading to increased intracellular sodium. This promotes increased calcium entry via the sodium-calcium exchanger, resulting in positive inotropy (increased contractility). Digoxin is used in heart failure to improve cardiac output and in atrial fibrillation to control ventricular rate.

**24. A — Hypokalemia**
Hypokalemia prolongs the QT interval by delaying ventricular repolarization and is particularly dangerous in patients with congenital long QT syndrome. Low potassium levels can trigger torsades de pointes (a form of polymorphic ventricular tachycardia), which can lead to syncope or sudden cardiac death.

**25. D — Closure of the atrioventricular valves**
The first heart sound (S1) corresponds to the closure of the atrioventricular valves (mitral and tricuspid) at the beginning of ventricular systole. This occurs when ventricular pressure exceeds atrial pressure, causing the AV valves to snap shut, creating the 'lub' of 'lub-dub.'

**26. C — 73 mmHg**
Mean arterial pressure (MAP) is calculated as: MAP = Diastolic pressure + (1/3 × Pulse pressure). Where pulse pressure = Systolic pressure - Diastolic pressure. MAP = 60 + (1/3 × (100-60)) = 60 + (1/3 × 40) = 60 + 13.3 ≈ 73 mmHg.

**27. B — Tunica media**
The tunica media (middle layer) of blood vessels contains smooth muscle cells and elastic fibers that control vessel diameter through contraction and relaxation. This layer is primarily responsible for maintaining vascular tone, which is crucial for regulating blood pressure and regional blood flow.

**28. A — Inhibition of angiotensin-converting enzyme**
Lisinopril is an angiotensin-converting enzyme (ACE) inhibitor that prevents the conversion of angiotensin I to angiotensin II. This leads to decreased aldosterone secretion, decreased vasoconstriction, and overall reduction in blood pressure. ACE inhibitors are beneficial in post-MI patients by reducing afterload and preventing adverse cardiac remodeling.

**29. D — Peripheral arterial disease**
This patient presents with classic symptoms of intermittent claudication, which is exercise-induced ischemic muscle pain that resolves with rest. It is typically caused by peripheral arterial disease (PAD), most commonly due to atherosclerosis. Smoking is a major risk factor for PAD, and the calf muscles are commonly affected due to their high oxygen demand during walking.

**30. C — Purkinje fibers**
Purkinje fibers form the majority of the specialized cardiac conduction system. They originate from the bundle of His and rapidly conduct electrical impulses throughout the ventricles, facilitating synchronized ventricular contraction. They have fewer myofibrils and more glycogen than regular cardiomyocytes, and conduct impulses about 4 times faster.

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