CCT Practice Test

1. Which heart chamber functions to pump deoxygenated blood to the lungs?

a. Right atrium
b. Right ventricle
c. Left atrium
d. Left ventricle

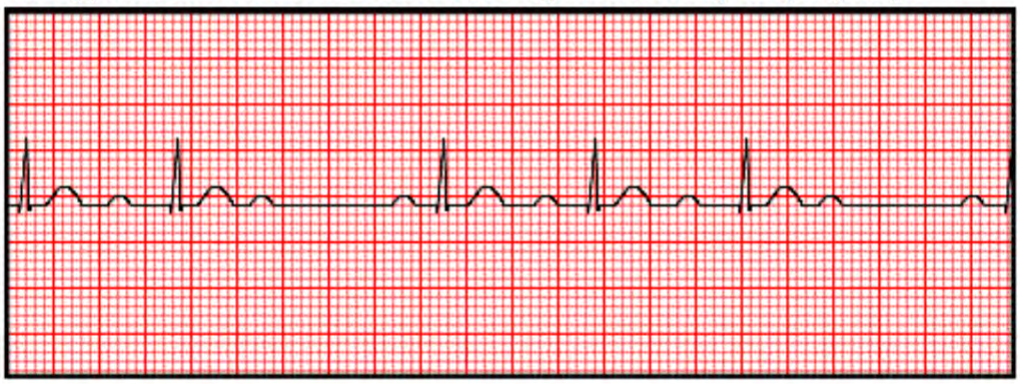
2. Which lead is the most affected by respiration?

a. V2
b. V4
c. Lead III
d. Lead I

3. Which of the following is the correct sequence by which action potentials are conducted through the heart?

a. SA node → AV node → bundle branches → Purkinje fibers
b. Bundle branches → Purkinje fibers → SA node → AV node
c. Purkinje fibers → SA node → bundle branches → AV node
d. AV node → SA node → bundle branches → Purkinje fibers

4. What type of heart block is seen in the following electrocardiogram (ECG) strip?



a. First-degree heart block
b. Second-degree heart block, type 1
c. Second-degree heart block, type 2
d. Third-degree heart block

5. When calibrating an ECG machine, what is the standard size of the calibration mark representing the sensitivity of the ECG machine?

a. 5 mm in height
b. 10 mm in height
c. 15 mm in height
d. 20 mm in height

6. Which of the following is the mechanism of action of nitrates?

a. Decrease the responsiveness of heart to the sympathetic nervous system
b. Lower the heart rate
c. Decrease cardiac contractility
d. Dilation of coronary arteries

7. Which phase of the action potential in fast response myocardial tissues consists of rapid depolarization, with the resting cell being brought to threshold?

a. Phase 0
b. Phase 1
c. Phase 2
d. Phase 3

8. The depolarizing current in pacemaker cells is created primarily by which of the following ions?

a. Sodium
b. Calcium
c. Potassium
d. Chloride

9. Which of the following commonly limits the diagnostic value of Holter monitoring?

a. Patient noncompliance with keeping track of events
b. Lack of continuous monitoring
c. Small capacity of recording devices
d. Transmission of data depends on patient participation

10. Which of the following effects is caused by the actions of the parasympathetic nervous system on the heart?

a. Increased rate of conduction
b. Greater force of contraction
c. Decreased diastolic filling time
d. Decreased rate of SA node pacing

11. What does the T wave represent on an ECG?

a. Atrial depolarization
b. Ventricular depolarization
c. Atrial repolarization
d. Ventricular repolarization

12. What benefit does a thallium stress test have as compared to a standard ECG stress test?

a. More quickly identifies areas of myocardial ischemia in the heart
b. The test is simpler to perform
c. More accurately identifies the specific areas of reduced blood flow in the heart
d. Is a safer test overall for the patient

Answer Key and Explanations

1. B: The right ventricle pumps the deoxygenated blood it has received from the right atrium to the lungs. The right atrium pumps deoxygenated blood from the body to the right ventricle. The left atrium pumps oxygenated blood from the lungs to the left ventricle. The left ventricle pumps oxygenated blood to the body.

2. C: Lead III is the most affected by respiration, and therefore the waveforms may look different depending on the respiratory cycle. Because of this, a Q wave that *only* appears in lead III and is not associated with other corresponding changes in other leads is not significant.

3. A: The sequence by which an action potential is conducted through the heart is from the sinoatrial (SA) node to the atrioventricular (AV) node to the bundle branches and then to the Purkinje fibers.

4. B: The pictured ECG is a second-degree heart block, type 1. This rhythm is also called Mobitz I or Wenckebach. With this heart block the PR interval gets longer with each beat until eventually a P wave occurs, but a QRS does not follow (a beat is skipped). After the skipped beat, the pattern starts over again. A first-degree heart block occurs when the PR interval is longer than 0.2 seconds, but the PR interval generally remains constant and the QRS is not dropped. A second-degree heart block, type 2, also called Mobitz II, is apparent when the QRS suddenly fails to show up after a P wave. A fairly consistent ratio of P waves to QRS complexes is common, and this rhythm lacks the increasing PR interval that is seen in the Mobitz I block. A third-degree heart block is also called a complete heart block and the atria and ventricles beat independently of one another.

5. B: The calibration mark representing the sensitivity of the ECG should be 10 mm in height (two large squares). This mark is usually found on the left side of the page at the beginning of each line of the ECG. When this is set correctly it means that for every millivolt measured from the patient, a deflection of 10 mm will be recorded on the trace.

6. D: Nitrates are useful for the prevention and treatment of angina. They work by dilating the coronary arteries and thus increasing the blood flow to the heart. They dilate peripheral veins, and, in higher doses, other peripheral arteries, which decreases preload and afterload. Beta-blockers decrease the responsiveness of the heart to the sympathetic nervous system. Calcium channel blockers, beta-blockers, and other medications decrease cardiac contractility and decrease heart rate.

7. A: Phase 0 consists of rapid depolarization of the cell to threshold, which leads to activation of voltage-dependent sodium channels. Phase 1 consists of a slight "notch" of repolarization caused mainly by the activation of transient potassium currents (potassium leaving the cell) and a corresponding rapid decrease in the sodium current. Phase 2 is a plateau phase during which "late" calcium, and to a lesser extent sodium, currents offset the effect of potassium currents and temporarily stabilize the membrane potential. Phase 3 refers to repolarization and return to resting potential due to increased potassium currents. Phase 4 is the resting membrane potential.

8. B: The depolarizing current in cardiac pacemaker cells is carried primarily by relatively slow, inward calcium currents. In most other depolarizing cells, such as muscle cells, the depolarization is created by fast sodium currents. Potassium plays a role in repolarization of the cells.

9. A: Patient noncompliance with keeping a diary of their symptoms and using event markers significantly limits the diagnostic value of Holter monitoring. It is important for patients to record and mark their symptoms in order to correlate events with the data collected. Holter monitoring is a type of continuous monitoring and benefits include the large capacity of the recording devices as well as the ability to transmit data without patient participation.

10. D: The parasympathetic nervous system results in cardiac inhibitory effects, including decreased rate of SA node pacing, decreased rate of conduction, and decreased force of contraction. The sympathetic nervous system increases the rate of conduction and causes increased force of contraction. An increased contraction rate, caused by sympathetic nervous system stimulation, would result in decreased diastolic filling time.

11. D: Repolarization of the ventricles begins immediately after the QRS. The T wave represents the final and more rapid phase of that repolarization. Atrial depolarization is represented by the P wave. Ventricular depolarization is represented by the QRS complex. Atrial repolarization is not seen on the ECG.

12. C: Thallium stress tests, also known as nuclear stress tests, gather more specific and accurate information than simple ECG stress tests. It is a helpful test when trying to identify the severity of coronary artery disease in a patient with known coronary disease.

13. D: The appropriate placement of the chest leads is very important for obtaining an accurate ECG. In order to determine whether the electrical activity of the heart is normal or abnormal, and to determine more precisely what type abnormality is present, it is necessary for these leads to be placed precisely and consistently. V1 and V2 are oriented over the right side of the heart, V3 and V4 are oriented over the interventricular septum, and V5 and V6 are oriented over the left side of the heart.

14. B: The mitral valve is a bicuspid valve, meaning that it has two leaflets (also known as cusps). It is located between the left atrium and left ventricle. The tricuspid valve, located between the right atrium and right ventricle, has three leaflets. The pulmonic valve leads from the right ventricle to the pulmonary artery and has three leaflets. The aortic valve leads from the left ventricle to the aorta and normally has three leaflets.

15. C: The amplitude of waves as measured from the baseline is a measure of voltage. Voltage is also known as electrical potential difference, and therefore gives us a picture of the depolarization and repolarization of the heart. These measurements are made in millimeters.

16. A: These spikes are an artifact due to the firing of an implanted pacemaker. In the above ECG the pacemaker is firing at regular intervals and each spike is followed by a QRS complex and a T wave. This is a normal ECG for a patient with a firing implanted pacemaker.

17. D: Holter (ambulatory) ECG monitoring can be useful in evaluating cardiac rhythm abnormalities, assessing pacemaker and implantable defibrillator function, assessing for ischemia, and evaluating heart rate variability. Ambulatory ECGs can be used to rule out conditions that may be missed on routine ECGs. Evaluation for an infarction should be done as an inpatient care since this requires immediate treatment if a new infarction is present.

18. B: Stage 1 of the Bruce protocol is a speed of 1.7 mph and gradient of 10%; stage 2 is a speed of 2.5 mph and a gradient of 12%. Stage 1 of the Modified Bruce protocol is a speed of 1.7 mph and a gradient of 0%; stage 2 is a speed of 1.7 mph and a 5% grade. The third stage of the Modified Bruce