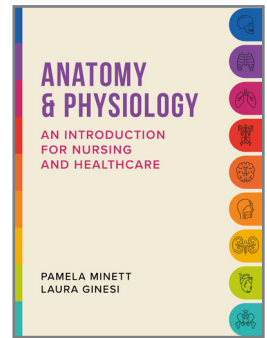




Lantern



# Questions to accompany *Anatomy and Physiology*

## CHAPTER 5 THE CARDIOVASCULAR SYSTEM

### Multiple Choice Questions (MCQs)

Each question consists of a stem statement or question, and 5 options. You must pick the one correct answer.

- 1. Arteries are blood vessels that:**
  - A. carry blood away from the heart
  - B. carry oxygenated blood
  - C. carry blood towards the heart
  - D. carry deoxygenated blood
  - E. carry blood at low pressure
- 2. The systemic circulation includes all of the following structures except one. Which is the exception?**
  - A. the aorta
  - B. the femoral vein
  - C. the superior vena cava
  - D. the pulmonary vein
  - E. the renal artery
- 3. Vascular resistance is determined by:**
  - A. length of a blood vessel
  - B. viscosity of blood
  - C. the way blood flow through a vessel
  - D. diameter of a blood vessel
  - E. blood pressure
- 4. In the heart, valves that ensure one-way flow of blood are found:**
  - A. between the atria and the ventricles
  - B. between the ventricles and the arteries
  - C. between the vena cavae and the atria
  - D. Options A and B
  - E. Options A and C
- 5. The expression 'cardiac cycle' refers to:**
  - A. the sequence of events in the heart that take place every minute
  - B. the volume of blood pumped by the ventricles every minute
  - C. the sequence of events that can be seen on an electrocardiogram
  - D. the sequence of events that create heart sounds
  - E. the sequence of events that take place between one heartbeat and the next
- 6. Put these parts of the electrical conducting system of the heart in the correct order for conduction of the cardiac impulse:**
  1. Atrioventricular node
  2. Atrioventricular (AV) bundle (bundle of His)
  3. Left and right bundle branches
  4. Sinoatrial node
  5. Purkinje fibres
  - A. 5 - 3 - 2 - 1 - 4
  - B. 4 - 1 - 2 - 3 - 5
  - C. 1 - 4 - 2 - 3 - 5
  - D. 4 - 3 - 1 - 2 - 5
  - E. 3 - 1 - 2 - 5 - 4
- 7. The cardiac output is determined by:**
  - A. the heart rate
  - B. the volume of blood returning to the heart (preload)
  - C. afterload which depends on systemic vascular resistance
  - D. mechanical properties of the heart
  - E. all of the above

**8. Within the circulation, where is blood pressure highest?**

- A. in the vena cava (great veins)
- B. in the left ventricle
- C. in the right ventricle
- D. in the pulmonary artery
- E. in the left atrium

**9. Blood pressure is usually expressed in units of millimetres of mercury (mmHg) as:**

- A. diastolic pressure over systolic pressure
- B. systolic pressure over diastolic pressure
- C. systolic pressure minus diastolic pressure
- D. systolic pressure over pulse pressure
- E. pulse pressure over diastolic pressure

**10. The rhythm and electrical activity of the heart can be detected with electrodes on the skin and displayed in the form of an:**

- A. electro-oculogram
- B. electroencephalogram
- C. electrocardiogram
- D. echocardiogram
- E. electromyogram

**11. The atrioventricular (AV) node is important for heart function because:**

- A. it directs the cardiac impulse from the atria to the ventricles
- B. it serves as the pacemaker for the heart
- C. it delays the transmission of the cardiac impulse from the atria to the ventricles
- D. Options A and B are correct
- E. Options A and C are correct

**12. Which of the following events is the first to take place in a cardiac cycle?**

- A. the SA node depolarises
- B. the AV node depolarises
- C. the P wave develops
- D. the QRS complex develops
- E. the ventricles relax

**13. Which of the following terms describes the volume of blood ejected by the heart in one minute?**

- A. end diastolic volume (EDV)
- B. stroke volume (SV)
- C. heart rate (HR)
- D. cardiac output (CO)
- E. blood pressure (BP)

**Critical thinking: ARQs (assertion reasoning questions)**

These questions consist of two statements:

- an assertion, and
- a reason.

You must first determine whether each statement is *TRUE* or *FALSE*.

- If both statements are true, you must next determine whether the reason correctly explains the assertion. The answer will be option 1 or option 2.
- If one statement is true and the other is false then the answer is option 3 or option 4, depending on which of the statements is correct.
- If both statements are false, then the answer is option 5.

There is one option for each possible outcome.

**Question 14**

<b>A = the Assertion</b>	<b>R = the Reason</b>
After birth, about 2 million erythrocytes (red blood cells) are produced every second in bone marrow	Erythrocytes are red because they contain haemoglobin, a pigment that binds with oxygen to form oxyhaemoglobin which is bright red
Options	
1) Both A and R are true and R is the correct explanation of A	
2) Both A and R are true but R is NOT the explanation of A	
3) A is true but R is false	
4) A is false but R is true	
5) Both A and R are false	

**Question 15**

<b>A = the Assertion</b>	<b>R = the Reason</b>
The heartbeat is the rhythmical sounds made when the heart valves close	The pulse can be felt where main veins lie over a bone and come close to the skin
Options	
1) Both A and R are true and R is the correct explanation of A	
2) Both A and R are true but R is NOT the explanation of A	
3) A is true but R is false	
4) A is false but R is true	
5) Both A and R are false	

## Deepening your learning

### Question 16

(a) Explain, using your own words, how the following structure(s) of the cardiovascular system are matched with their function(s) in the body

- Heart muscle (myocardium)
- Arteries
- Veins
- Capillaries

(b) Explain what is meant by the expression 'skeletal muscle pump'. Why is it important to the cardiovascular system?

### Question 17

What is interstitial fluid? Draw and label a diagram that shows how it is formed from plasma. Highlight your key words and write notes on your diagram to explain the process.

### Question 18

Oedema is the retention of fluid in one or more parts of the body. Complete the following table:

Type of oedema	Organ(s) affected	Effect on the individual
<i>Pulmonary oedema</i>		
<i>Cerebral oedema</i>		
<i>Macular oedema</i>		
<i>Lymphoedema</i>		
<i>Peripheral oedema</i>		

## Creating your own flow charts

### Question 19

Create a diagram or figure that explains how blood forms a clot. Highlight your key words and write notes on your diagram to explain the process of haemostasis.

### Question 20

Create a flow diagram that describes the sequence of events that leads to contraction of the ventricles and ejection of blood from the heart. Highlight your key words and write notes on your diagram to explain the process.

# Answers to questions

Answers are supplied to most, but not all questions. Some may require you to carry out further research using the book.

## Multiple Choice Questions (MCQs)

Each question consists of a stem statement or question, and 5 options. You must pick the one correct answer.

- Arteries are blood vessels that:**
  - carry blood away from the heart
- The systemic circulation includes all of the following structures except one. Which is the exception?**
  - the pulmonary vein
- Vascular resistance is determined by:**
  - diameter of a blood vessel
- In the heart, valves that ensure one-way flow of blood are found:**
  - Options A and B
- The expression 'cardiac cycle' refers to:**
  - the sequence of events that take place between one heartbeat and the next
- Put these parts of the electrical conducting system of the heart in the correct order for conduction of the cardiac impulse:**
  - Atrioventricular node
  - Atrioventricular (AV) bundle (bundle of His)
  - Left and right bundle branches
  - Sinoatrial node
  - Purkinje fibres
  - 4 – 1 – 2 – 3 – 5
- The cardiac output is determined by:**
  - all of the above
- Within the circulation, where is blood pressure highest?**
  - in the left ventricle
- Blood pressure is usually expressed in units of millimetres of mercury (mmHg) as:**
  - systolic pressure over diastolic pressure
- The rhythm and electrical activity of the heart can be detected with electrodes on the skin and displayed in the form of an:**
  - electrocardiogram
- The atrioventricular (AV) node is important for heart function because:**
  - Options A and C are correct
- Which of the following events is the first to take place in a cardiac cycle?**
  - the SA node depolarises
- Which of the following terms describes the volume of blood ejected by the heart in one minute?**
  - cardiac output (CO)

## Critical thinking: ARQs (assertion reasoning questions)

These questions consist of two statements:

- an assertion, and
- a reason.

You must first determine whether each statement is TRUE or FALSE.

- If both statements are true, you must next determine whether the reason correctly explains the assertion. The answer will be option 1 or option 2.
- If one statement is true and the other is false then the answer is option 3 or option 4, depending on which of the statements is correct.

- If both statements are false, then the answer is option 5.  
There is one option for each possible outcome.

**Question 14**

A = the Assertion	R = the Reason
After birth, about 2 million erythrocytes (red blood cells) are produced every second in bone marrow	Erythrocytes are red because they contain haemoglobin, a pigment that binds with oxygen to form oxyhaemoglobin which is bright red
2. Both A and R are true but R is NOT the explanation of A	
<p><i>Explanation</i></p> <p>The Assertion (A) is <b>TRUE</b>. Between 2 and 2.5 million red blood cells are produced every second. Erythropoiesis [Greek: <i>erythron</i> = red; <i>poiesis</i> = make] is the multi-stage process through which the human body continuously produces mature erythrocytes (red blood cells) from stem cells.</p> <p>The Reason (R) is also <b>TRUE</b>. Every erythrocyte (red blood cell) contains about 270 million haemoglobin molecules. Their colour depends on the state of haemoglobin – when it is fully saturated with oxygen, it is bright, cherry red in colour but in its deoxygenated state it is a darker, purplish red.</p> <p>Since R is true, but is not the reason for A, <b>option 2 is the correct answer</b>.</p> <p>In humans, the process of erythropoiesis starts initially in the embryonic yolk sac then foetal liver. After birth, it switches to the bone marrow. Vitamin B12 and Vitamin B2 are essential for the process. The rate of production of red blood cells is equal to the rate of destruction of red blood cells and the red blood cell number is sufficient to sustain adequate tissue oxygen levels.</p> <p>The process of erythropoiesis is regulated by a protein hormone called erythropoietin (EPO). Hypoxia is the primary stimulus for cells in the kidney, which are able to sense oxygen levels and stimulate production of EPO when more oxygenation is needed.</p>	

**Question 15**

A = the Assertion	R = the Reason
The heartbeat is the rhythmical sounds made when the heart valves close	The pulse can be felt where main veins lie over a bone and come close to the skin
5. Both A and R are false	
<p><i>Explanation</i></p> <p>The Assertion (A) is <b>FALSE</b>. The heart sounds – described as LUB and DUP – are heard (with a stethoscope) when the heart valves close. They function to ensure one-way flow of blood through the heart, opening and closing during every cardiac cycle.</p> <p>The heartbeat is generated by the alternate contractions (called systole) and relaxation (called diastole) of the muscular walls (myocardium) of the chambers of the heart. The atria and the ventricles contract in turn; the specialised cells of the sinoatrial (SA) node (the pacemaker) control the rhythm and rate at which they contract.</p> <p>The Reason (R) is also <b>FALSE</b>. The pulse can be felt by placing the pads of the fingertips lightly in places where major arteries come close to the skin and lie over a bone. Blood flow is pulsatile in the arteries but is slower and more sluggish in veins.</p> <p><b>Option 5 is therefore the correct answer.</b></p>	

**Question 18**

Oedema is the retention of fluid in one or more parts of the body. Complete the following table:

<b>Type of oedema</b>	<b>Organ(s) affected</b>	<b>Effect on the individual</b>
<i>Pulmonary oedema</i>	Lungs	<p>Alveoli are filled with fluid, causing difficulty in breathing, shortness of breath, cough and reduced tolerance of physical activity.</p> <p>Poor gaseous exchange.</p> <p>Can be acute or chronic and may lead to respiratory failure.</p>
<i>Cerebral oedema</i>	Brain	<p>Damaged brain cells swell, and injured blood vessels become more permeable (leak), forcing fluid to enter brain tissue, so intracranial pressure (ICP) begins to rise.</p> <p>At first, cerebral oedema alone will not produce neurological abnormalities until the ICP reaches a level that restricts blood flow within the brain.</p> <p>Alteration in level of consciousness, bradycardia, increase in blood pressure, abnormal breathing patterns, evidence of inequality of pupil size and abnormalities in reflex responses raise suspicion of cerebral oedema.</p>
<i>Macular oedema</i>	Retina of the eye	<p>Fluid leaks from damaged blood vessels and interferes with detailed vision and ability to see faraway objects.</p> <p>Individual symptoms of macular oedema vary according to the level of swelling of the macula and whether one or both eyes are affected. If fluid affects the function of the fovea, then acuity (precision) of vision deteriorates. Symptoms include blurred vision, difficulty with reading, washed-out colours, wobbly vision or blank spots.</p>
<i>Lymphoedema</i>	Tissues	<p>Fluid accumulates in tissues and they start to swell because the lymphatic system is not draining lymph back to the bloodstream adequately. Lymph drainage channels or lymph nodes have become blocked, damaged or may have been (surgically) removed.</p> <p>The amount of fluid in an area of the body exceeds the capacity of lymphatic vessels to drain it away, effectively flooding the tissue.</p> <p>Depending on which part of the body has been affected, initially there is usually slight, intermittent swelling that comes and goes.</p> <p>If left untreated, swelling can become permanent and the affected area becomes hard and feels solid.</p>
<i>Peripheral oedema</i>	Lower limbs or hands and arms	<p>Fluid accumulates from increased interstitial fluid and it is drained into the tissue of the extremities by gravity. The person's legs or other affected area may look puffy and swollen, feel heavy or stiff and could be bruised or discoloured; the skin is usually warm in the affected area but there may be pitting. The limbs may ache and it can be hard to get dressed, to walk and carry out activities of daily living.</p>