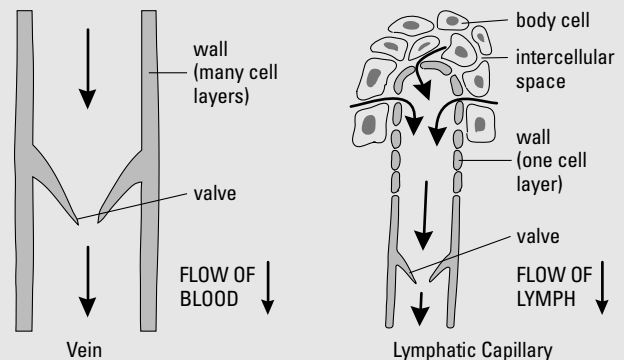


## Section 8.3: Review Answers

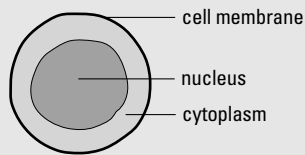
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1. Lymph vessels are closely associated with the capillaries of the cardiovascular system. Fluid that escapes from the cardiovascular capillaries forms part of the interstitial fluid. Some of this fluid is collected in the lymphatic capillaries and eventually returned to the blood.
2. The lymphatic system works to maintain the steady flow of water and other substances between the blood, the interstitial fluid, and the lymphatic system. The lymphatic system also works with the white blood cells to protect the body against infection.
3. Lymph enters the lymphatic system from tissue spaces throughout the body through lymphatic capillaries. A sketch of a lymphatic capillary should show that its walls consist of one cell layer with pores between the cells through which lymph enters from intercellular spaces. The lymphatic capillary is a closed-ended tube where it originates in the tissues. Valves positioned along the length of the capillary prevent back-flow of lymph. A sketch of a vein should show that its walls are many cell layers thick, it is open-ended and that it contains valves that prevent back-flow of blood.

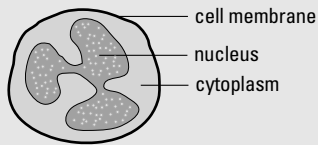


4. Antibodies are proteins that recognize foreign substances (antigens) and act to neutralize or destroy them.  
Antigens are foreign molecules that are found on the surface of the cells and on pathogens. Antigens stimulate the immune system to react to it.
5. A lymphocyte should be drawn as a small spherical cell with a large nucleus. A neutrophil should be drawn to show a somewhat spherical cell with a large nucleus

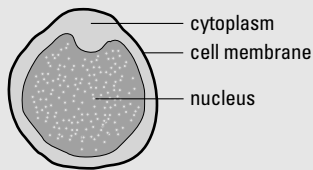
consisting of three large lobes connected by thin strands. A monocyte should be drawn to show a somewhat spherical cell with a very large nucleus which occupies most of the space inside the cell. A monocyte contains very little cytoplasm relative to the volume of the nucleus.



**Lymphocyte**



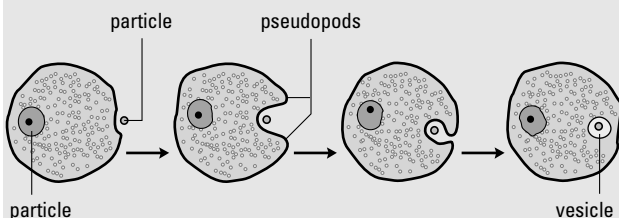
**Neutrophil**



**Monocyte**

The function of macrophages and neutrophils is the destruction of invading bacteria through phagocytosis, in which the pathogens are engulfed by the membrane of the white blood cell, forming a vesicle inside the cytoplasm, which contains the pathogen. The bacteria inside the vesicles are then destroyed when the vesicles fuse with lysosomes in the macrophage that contain destructive enzymes. The function of monocytes is that they enlarge and transform themselves into macrophages at the site of an infection.

6. The diagram should show the process of phagocytosis in which a macrophage produces pseudopods that grow around the harmful cell, creating a vesicle inside macrophage.



7. The letters ABO are derived from the four blood groups in one system of classifying blood. The letter A represents A antigen found on the red blood cell membranes of Type A blood. B represents B antigen on red blood cells in

Type B blood. (AB blood has both antigens on the red cell surface.) The letter O represents the condition in Type O blood where neither antigen is present on the red cell surface.

8. Individuals who are Rh- do not produce anti-Rh antibodies unless the immune system is exposed to Rh antigens (unlike those with blood type O who produce anti-A and anti-B antigens within the first few months of life without exposure to the specific antigens.) An Rh-mother pregnant with an Rh+ child is usually not exposed to the Rh antigens until the birth of the baby, when the placenta breaks and releases fetal red blood cells into the maternal blood. Her immune system then produces anti-Rh antibodies that will cause problems with subsequent pregnancies.
9. Region A on the graph illustrates the immune response to the first exposure to an antigen associated with a pathogen. After this first exposure, plasma cells gradually produce increasing amounts of antibody molecules, reaching maximum production in about six weeks.

Region B on the graph illustrates the response to exposure to the same antigen some weeks later. This subsequent response is more rapid (maximum production in about three weeks) and generates much higher levels of antibodies.

10. The immune system identifies “self” versus “non-self” cells very early in development. An autoimmune disorder develops if this system of identification fails and T cells attack the body’s own cells (the “self” cells) as if they had foreign antigens. The cause of autoimmune disorders is unknown. It is understood that the disorders tend to be hereditary and that recovery from an infection can bring on the condition.

11.

Immune System Disorder	Causes	Symptoms	Treatments
rheumatoid arthritis	T cells or antibodies attacking the linings of the joints, cartilage, bones, tendons, and ligaments	pain, stiffness, fever, fatigue, decreased appetite	anti-inflammatory drugs, steroids; antirheumatic drugs slow down immune response
food allergies	over-sensitivity of the immune system to various foods and food additives	runny nose, vomiting, diarrhea, asthmatic attack, skin problems, aches, pains	antihistamines, avoidance of the offending food or additive in the diet, epinephrine for severe attacks

Immune System Disorder	Causes	Symptoms	Treatments
asthma	inhaled allergens, fatigue or cold air cause an immediate, massive release of histamines	spasms of the bronchioles, watery eyes, runny nose, coughing, wheezing, difficulty breathing	anti-inflammatory drugs, antihistamines