

**Multiple choice.** Mark the one best answer of your choice (4 pts each).

1. Which tunic of an artery is most responsible for maintaining blood pressure and continuous circulation?

- A. tunica interna
- B. tunica media
- C. tunica externa
- D. endothelium

2. If you were to observe white blood cells moving in the circulation (i.e., under a microscope, for example), how would you describe their movement?

- A. turbulent
- B. too fast to observe
- C. rolling
- D. crawling via chemotaxis

3. What is the structural advantage to a red blood cell's shape?

- A. They can squeeze through capillaries by folding in half.
- B. They have a high surface area-to-volume ratio.
- C. They have no mitochondria.
- D. They can squeeze out of the circulation and into outlying tissues.

4. Extremely leaky capillaries that are only found in certain organs are called:

- A. fenestrated capillaries.
- B. perforated capillaries.
- C. sinusoids.
- D. elastic capillaries.

5. Plasma proteins in the blood encourage \_\_\_\_\_.

- A. the loss of fluid from the capillary due to hydrostatic pressure
- B. the loss of fluid from the capillary due to osmotic pressure
- C. the return of fluid to the capillary due to hydrostatic pressure
- D. the return of fluid to the capillary due to osmotic pressure

6. Where is diastolic blood pressure the highest?

- A. pulmonary arteries
- B. aorta
- C. arteriole end of capillary beds
- D. superior and inferior venae cavae

7. Molecules move out of a capillary and into tissue cells by:

- A. moving from areas of high to low pressure.
- B. active transport.
- C. diffusion.
- D. osmosis.

8. Which of the following statements is true regarding lysozyme?
- A. It kills bacteria by inhibiting prokaryotic protein synthesis.
  - B. It is found in body secretions, such as tears and saliva.
  - C. It constitutes part of the body's adaptive immune system.
  - D. All of the above.
9. Which of the following can contribute to anemia?
- A. an insufficient number of red blood cells
  - B. low hemoglobin content in the blood
  - C. abnormal hemoglobin
  - D. all of the above
10. The rarest of circulating white blood cells are the:
- A. eosinophils.
  - B. neutrophils.
  - C. platelets.
  - D. basophils.
11. In what location in the body would you expect to find the precursor cells that form red blood cells, platelets, and leukocytes?
- A. thymus gland
  - B. red bone marrow
  - C. lymph nodes
  - D. the adventitia
12. When precapillary sphincters are closed, blood moves:
- A. from arteries to veins.
  - B. back into the right atrium.
  - C. into the capillary bed.
  - D. directly through the vascular shunt.
13. Angiogenesis is:
- A. formation of red blood cells in the bone marrow.
  - B. formation of platelets by megakaryocytes.
  - C. formation of new blood vessels to tissues.
  - D. formation of the heart's intrinsic rhythm.
14. Which of the following organs is involved in long-term blood pressure regulation?
- A. the heart
  - B. the liver
  - C. the kidneys
  - D. the adrenal glands.

15. Which of the following is **not** considered a plasma protein?
- A. hemoglobin
  - B. albumin
  - C. fibrinogen
  - D. complement
16. A person who has blood type O can receive blood from someone with:
- A. blood types A or O.
  - B. blood types AB or O.
  - C. blood types A, B or AB.
  - D. blood type O.
17. The nervous system maintains a constant blood pressure with:
- A. plasma proteins.
  - B. reflex arcs and baroreceptors.
  - C. the kidneys.
  - D. cardioaccelerators.
18. During a fever, the body's internal temperature is reset due to the actions of:
- A. pyrogens.
  - B. interleukins.
  - C. complement.
  - D. antibodies.
19. Granulocytes with multi-lobed nuclei that act in phagocytosis are called:
- A. basophils.
  - B. neutrophils.
  - C. lymphocytes.
  - D. platelets.
20. A person's mean arterial pressure is more relevant than his/her pulse pressure because:
- A. pulses can be difficult to feel.
  - B. pulse pressure is the difference between diastolic and systolic pressures.
  - C. the heart spends more time in diastole than in systole, so that value must be favored in the calculation.
  - D. fluid leaves the blood during systole, not diastole.

**True or false.** Mark each statement with a T (for true) or an F (for false) (4 pts each).

- \_\_\_ 21. Every cell in your body has a nucleus.
- \_\_\_ 22. A molecule of hemoglobin can bind a maximum of two molecules of oxygen.
- \_\_\_ 23. Antibodies function by opsonizing pathogens for phagocytosis.
- \_\_\_ 24. As arteries branch, the total cross-sectional area of the vascular bed increases and blood flow accelerates.
- \_\_\_ 25. Angiotensin II regulates blood pressure by acting as a vasodilator.
- \_\_\_ 26. Blood pressure is regulated, in part, by the vasomotor and cardioacceleratory centers in the medulla oblongata.
- \_\_\_ 27. Resistance is generally higher in overweight people due to differences in blood viscosity.
- \_\_\_ 28. A person with type AB blood cannot receive a transfusion of type O blood.
- \_\_\_ 29. In most tissues, epinephrine acts as a vasoconstrictor.
- \_\_\_ 30. Thrombin, fibrin and complement are all important in the formation of blood clots.

31. List the three benefits of inflammation (6 pts each).

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

**Matching.** Match the descriptions on the left with the appropriate terms on the right (6 pts each).

\_\_\_ 32. Expansion and recoil of an artery during heart activity.

\_\_\_ 33. Pressure exerted by the blood against the vessel walls.

\_\_\_ 34. Event primarily responsible for peripheral resistance.

\_\_\_ 35. Blood pressure during heart contraction.

\_\_\_ 36. Blood pressure during heart relaxation.

\_\_\_ 37. Site where blood pressure is measured.

A. Blood pressure

B. Cardiac output

C. Constriction of arterioles

D. Diastolic pressure

E. Over the arteries

F. Over the veins

G. Pulse

H. Systolic pressure

38. Describe the relationship between resistance and:

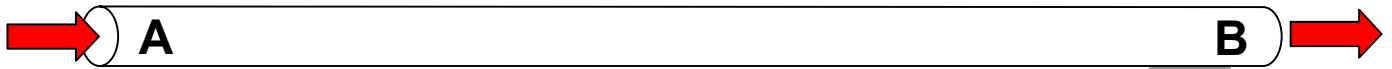
(6 pts each)

vessel diameter: \_\_\_\_\_

vessel length: \_\_\_\_\_

blood viscosity: \_\_\_\_\_

In class, we discussed some of the theory behind fluid flow and how it relates to resistance. Below is a generic blood vessel, and the two ends have been labeled A and B.



Assume that the pressure at A ( $P_A$ ) is higher than the pressure at B ( $P_B$ ). The rate of blood flow through this vessel can be calculated using the following formula:

$$F = \frac{(P_A - P_B)}{R}$$

in which F = flow and R = resistance. Use this formula to answer the following questions:

39. What are the conditions in which flow would be **highest**? (In your answer, make sure you address all three variables –  $P_A$ ,  $P_B$  and R.) (9 pts)

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40. What are the conditions in which flow is **lowest**? (Again, address all three variables.) (9 pts)

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41. Which of these variables is tightly regulated by the body, and how? (9 pts)

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**Extra credit:** In a research lab, how might you test whether a newly discovered molecule can act as a chemoattractant? Describe (or draw) your experimental design below (12 pts):

(Hint: Don't forget to include a control in your experiment!)

SAMPLE