These review questions are for the Blood lecture topic. The questions were adapted from several sources, including 1800+ Review Questions for Anatomy and Physiology II (2nd edition) by R. Michael Anson, Ph.D.

You are required to know and understand all the material on blood that is covered in the lecture and the laboratory. Questions marked with an asterisk are from material presented in the laboratory section of the course.

Multiple choice review questions:

1) Which is **not** transported by the blood?
   A) Oxygen
   B) Glucose
   C) ATP
   D) Carbon dioxide (CO_2)

2) The liquid part of the blood is the
   A) Plasma
   B) Formed elements
   C) Blood cells
   D) Tissue fluid

3) As a group, all three blood cell types (RBCs, WBCs, and platelets) are known as the…
   A) Isotopes
   B) Osteocytes
   C) Formed elements
   D) Hemostats

4) Which one(s) of the following are dissolved in the plasma?(More than one possible answer).
   A) glucose
   B) Na^+
   C) K^+
   D) albumin

5) Which of the following cells is the most abundant of the formed elements?
   A) erythrocytes
   B) platelets
   C) white blood cells
   D) plasma

6) Erythrocytes
   A) lack a nucleus
   B) are the blood cell that is responsible for fighting bacteria.
   C) are produced in the heart and muscles.
   D) carry glucose in the blood

7) Which blood cell type carries oxygen?

A) Platelets
B) Leukocytes
C) White blood cell
D) Red blood cell

8) Which blood cell type begins the blood clotting process?

A) Erythrocytes
B) Platelets
C) Red blood cells
D) Antigen cells

9) Blood cells are made in

A) The marrow
B) The liver
C) The heart
D) The arteries

10) Weakness due to the inability of the blood to carry sufficient oxygen is known as

A) Hemostasis
B) Thrombus
C) Heart attack
D) Anemia

11) The slowing and halting of blood loss from a broken blood vessel is called

A) Embolus
B) Thrombus
C) Hemostasis
D) Hemolysis

12) Which is **not** one of the three steps of hemostasis?

A) Coagulation
B) Hemophilia
C) Platelet plug formation
D) Vasoconstriction

13) Which of the following events is the first to occur during the process of hemostasis after a blood vessel becomes injured?

A) The vessel wall is damaged, exposing collagen proteins to the blood.
B) The injured blood vessel is dilated by newly released chemicals to let in defense cells.
C) Platelets become "sticky" and a platelet plug is formed near the injury site.
D) A web of fibrin protein strands tightly interweave the platelet plug.

14) Blood clotting would not occur if the plasma was deficient in
A) antibodies
B) hormones
C) albumin.
D) fibrinogen.

15) Which of the following does **not** cause abnormally long bleeding time?
A) Low WBC levels
B) Low platelet count
C) Hemophilia
D) Vitamin K deficiency

16) Thrombus
A) A blood clot in an unbroken blood vessel
B) The molecules on the surface of a cell that the immune system interacts with
C) A medicine given to heart attack victims to restore blood flow
D) The smallest of the three blood cell types

17) Antigen
A) A medicine given to heart attack victims to restore blood flow
B) A type of leukocyte
C) The molecules on the surface of a cell that the immune system interacts with
D) A medicine given to heart attack victims to counteract blood poisonings (such as snake bites or peanut allergy reactions)

18) Considering only the ABO system of red blood cell typing, which of the following is true?
A) People of blood type A have the B antigen only
B) People of blood type B have the A antigen only
C) People of blood type O have the O antigen
D) People of blood type O have no antigens

19) A person whose blood type A has red blood cells with ____ antigens, and the antigen _____ is a foreign antigen to their immune system.
A) B; B
B) A; B
C) A; A
D) B; A

20) Considering the three RBC antigens discussed in lecture (A, B, and Rh), how many blood types are there?
A) 3
B) 4
C) 8
D) 9

21) A person with O+ blood could always safely be given which blood types?

A) O-, O+
B) B+, B-, A+, A-, AB+, AB-
C) O- only
D) O-, O+, B+, B-, A+, A-, AB+, AB-

22) A person with AB+ blood could always safely be given which blood type(s)? More than one answer may be possible.

A) O+
B) O-
C) AB+
D) B+

23) A person with A- blood could always safely be given which blood type(s)? More than one answer may be possible.

A) O-
B) AB+
C) A+
D) B-

24) A woman who has just given birth is given a drug called RhoGAM. This drug protects

A) The newborn baby
B) The woman
C) The next baby the woman has
D) The doctor's insurance corporation

25) A woman who has just given birth is given a drug called RhoGAM. She is given this drug because she is

A) Rh+
B) Rh-
C) O
D) AB

Answers to multiple choice questions:

1 = C
2 = A
3 = C
4 = A, B, C, D
5 = A
6 = A
7 = D
8 = B
9 = A
10 = D
11 = C
12 = B
13 = A
14 = D
15 = A
16 = A
17 = C
18 = D
19 = B
20 = C
21 = A
22 = A, B, C, D
23 = A
24 = C
25 = B

Fill-in-the-blank review questions:

1) Of the four major tissue types of the body, blood is classified as a type of _____ tissue.

2) Although it varies with body weight, normal blood volume is approximately _____ liters.

3) Blood consists of two major parts: Living cells, called the _____, and a straw-colored fluid matrix (consisting of water with many dissolved solutes) called _____.

4*) In lab, you performed a test on a blood sample. You put the blood in a thin glass test tube and then centrifuged it. After being centrifuged, the blood separated into two major layers: _____ on top and _____ on the bottom.

5) A major function of blood is the delivery of _____ and _____ to cells, which are the two major molecules needed for cellular aerobic respiration.

6) A major function of blood is the removal of _____, a waste gas produced by cellular aerobic respiration.

7) Which has the larger volume in blood, plasma or formed elements? _____.

8) Blood plasma is mostly _____ (a molecule), but it also contains dissolved nutrients, gases, hormones, wastes, products of cell activity, ions, and proteins.

9) Name any two ions found in the plasma.

10) Name the major cellular energy-providing organic molecule found in the plasma: _____

11) Name the major gas that is transported in the plasma (not inside blood cells).

12) The most abundant protein found in blood plasma is: _____. It is for osmotic balance and pH buffering.

13) In addition to albumin protein, the blood contains large amounts of _____ which Are proteins needed to protect the body from invaders, and _____ proteins which are needed for blood clotting.

14) Among the many solutes dissolved in the plasma are _____, which are signal molecules that travel in the blood.

15) What is the term for the cells of blood tissue? _____ (Two words)

16) The three formed elements of the blood are _____,_____, and _____.

17) _____ are blood cells that are round and flat, with indented centers. They lack nuclei and most other organelles. These cells are also called _____ cells. Their major function is to carry the _____ using a protein called _____.

18*) The percentage of the total blood volume that is erythrocytes is called the _____. (Hint: You measured this in lab by centrifuging a blood sample in a thin glass capillary tube).

19*) Comparing men and women, it is men/women (circle one) that usually have a higher hematocrit.

20) The blood cells which are part of the immune system are the _____, also known as the _____.

21) There are ____ (a number) major types of white blood cells.

22) Platelets are the smallest of the formed elements and play a major role in the process of _____.

23) Each hemoglobin protein contains atoms of _____, which is a metal that binds oxygen.

24) Which is the most numerous of the three formed element types? _____

25) Blood cell formation occurs in the _____ (a tissue) of _____ (a type of organ).

26) Which one(s) of the three formed elements is/are formed in the red marrow? _____

27) Which bone(s) usually contain red marrow in adults? _____

28) The undifferentiated cells (cells that can become several different cell types) in bone marrow are called _____ cells.

29) The formation of erythrocytes is controlled by the hormone _____, most of which is produced by the _____ (organs) in response to a low supply of oxygen.

30) Weakness due to the inability of the blood to carry sufficient oxygen is called _____.
31) Anemia may be due to an insufficient number of _____ (e.g., after a loss of blood), or an

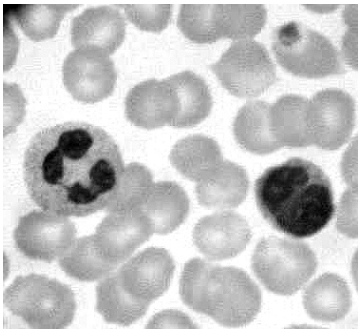
insufficient amount of _____ metal in the diet, or _____ (often as a treatment for cancer), or _____ diseases, such as sickle-cell anemia, that cause RBCs to burst.

32*) Which laboratory blood test could be used to diagnose anemia due to low RBC levels? _____

33) Any overabundance of white blood cells is known as _____.

34) The most common cause of leukocytosis is _____.

35*) The photo below shows a blood sample when viewed through a microscope. What blood cell type are the small gray circles with nothing visible inside? _____ What cell type is the large cell on the left with the black lobed nucleus? _____ What cell type is the large cell on the right with the black round nucleus? _____ Be as specific as possible in all answers.



36) _____ refers to bone cancer that results in abnormally high levels of white blood cells. If untreated, these cancers are always fatal.

37) _____ is the term for all the events that slow down then stop blood loss after damage to a blood vessel.

38) _____ cells are critical for starting and carrying out the hemostasis process.

39) Platelets bind tightly to any _____ they happen to encounter. This protein is normally not accessible to platelets, since it is in the outer _____ (a tissue) layer of the blood vessel wall, but not in the inner layer.

40) The inner lining of blood vessels is _____ (a tissue type).

41) _____ is the body's first step in hemostasis. This slows blood flow through the broken vessel by making the vessel smaller.

42) Platelets that have encountered collagen cause vasoconstriction by _____.

43) The second step in hemostasis is forming a temporary seal where a blood vessel has broken, called the _____.

44)The final step in hemostasis is filling the vessel break with a solid clump of protein fibers and RBCs. The clump is called a _____ and its formation is called _____.
45) One of the last steps in blood clotting is conversion of prothrombin to the active enzyme _____, which then forms a mesh of _____ protein that traps RBCs. The protein that traps theRBCs is made from smaller soluable blood proteins called _____.

46)_____ is the name for all the plasma proteins that are involved in the clotting process.

47) The first clotting factors are activated by _____

48) Place the events of hemostasis in their proper order by writing numbers in the blank space after each event. Write 1 for the first event, 2 for the second event, etc.

_____Prothrombin converted to thrombin
_____ Passing RBCs are trapped
_____ Platelets release molecules
_____Fibrin produced from fibrinogen
_____ Blood vessel constricts

49) The liquid left in a blood sample after a clot forms is called _____.

50) Vitamin _____ is needed by the _____ (an organ) for the formation of many clotting factors.

51) Common causes of long bleeding times are deficiency in _____ (a formed element), failure of the liver to synthesize clotting factors because of lack of vitamin ____, or a genetic defect in one or more of the clotting factors (called "_____").

52) In lecture, a famous family was used as an example of a family that had hemophilia. Which family was this? _____

53) A blood clot that develops in an unbroken blood vessel is called a(n) _____. It may or may not become large enough to block the vessel.

54) Anything that blocks a blood vessel (such as a thrombus that breaks free of its original site and travels through the bloodstream until it wedges itself into a vessel too small for it to traverse) is called a(n) _____.

55) An embolism (such as a dislodged thrombus) that is blocking a blood vessel will cause tissue hypoxia (lack of oxygen) and possibly tissue death. If this happens in the heart it is called a _____. If it happens in the brain it is called a _____.

56) A drug called _____ is injected into heart attack victims to dissolve the thrombus in their heart.

57) Blood thinners are substances that inhibit _____. They are often given to people at risk for a heart attack.

58) _____ is a common, over-the-counter drug which is a blood thinner.

59) Two common prescription blood thinners are _____ and _____.

60) Any molecules on cells that the immune system interacts with are called _____. They are usually proteins, carbohydrates, or lipids on the surface of a cell.

61) Molecules on cells that the immune system interacts with but does not attack (because the molecules occur naturally as part of the organism) are called _____.

62) Molecules on cells that the immune system interacts with and attacks (because the molecules do not occur naturally as part of the organism) are called _____.

63) Humans have different _____ because of differing antigens on their erythrocytes.
These antigens cause such severe immune reactions that a transfusion mismatch is fatal.

64) The _____ blood groups are based on the presence or absence of the A and B antigens on the erythrocyte's surface.

65) In addition to the A and B antigens, erythrocytes may also carry another antigen known as the _____ antigen.

66) A transfusion mismatch is fatal because the debris from lysed (broken) erythrocytes _____.

67) Pete is blood type B-. Which blood types could he always receive safely? Each of your answers must be a complete blood type, such as B- for example.

68) Pete is blood type B-. People of which blood types can always receive Pete's blood safely? Each of your answers must be a complete blood type, such as B- for example.

69) Sean is blood type O+. What blood type(s) can he always safely receive as transfusions? Give full blood types as answers.

70) Sean is blood type O+. To people of which blood types could Sean always safely donate his blood? Give full blood types as answers.

71) Blood type _____ is considered the "universal donor" (can be safely given to everyone) because it lacks any antigens. (Give the full blood type).

72) People of blood type _____ are considered the "universal acceptors" (They can be safely receive any blood type) because all antigens are self antigens to them. (Give the full blood type).

73) List the eight major blood groups. Give full blood types as answers.

74) The immune system only makes antibodies against the _____ antigen *after* an exposure to that antigen. In contrast, the immune system already has antibodies against _____ antigen and _____ antigen, even if the person has never been exposed to these two antigens.

75) If an Rh- woman's first pregnancy is an Rh+ fetus, the fetus' blood cells are/aren't (circle one) in danger of being attacked by the woman's antibodies.

76) If an Rh- woman's second pregnancy is an Rh+ fetus, the fetus' blood cells are/aren't (circle one) in danger of being attacked by the woman's antibodies.

77) The drug _____ is given to Rh- women after the birth of each baby to prevent her immune system from attacking any future Rh+ babies.

Answers to fill-in-the-blank review questions:

1) Connective
2) Five liters
3) Formed elements
   Plasma
4*) Plasma
   Formed elements
5) Oxygen
   Glucose
6) Carbon dioxide
7) Plasma (usually about 55%
   of blood volume)
8) Water
9) Any two ions listed below:
   Na^+
   K^+
   Ca^+
   Cl^-
   H^+
   HCO_3^+
10) Glucose
11) Carbon dioxide
12) Albumin
13) Antibodies
   Clotting factors
14) Hormones
15) Formed elements
16) Red blood cells
   White blood cells
   Platelets
17) Red blood cells
   Erythrocytes
   Oxygen
   Hemoglobin
18*) Hematocrit
19*) Men
20) White blood cells
   Leukocytes
21) Five
22) Hemostasis
23) Iron
24) Red blood cells
25) Red marrow
   Bones
26) All three formed elements
27) Ribs
   Sternum
   Pelvis
   Skull
28) Stem
29) Erythropoietin
   Kidneys
30) Anemia
31) Red blood cells
   Iron
   Chemotherapy
   Hemolytic
32*) Hematocrit
33) Leukocytosis
34) An infection
35*) Red blood cells
   Neutrophil (left)
   Lymphocyte (right)
36) Leukemia
37) Hemostasis

38) Platelet
39*) Collagen
Connective tissue
40) Epithelial tissue
41) Vasoconstriction
42) Releasing molecules that cause smooth muscle in the blood vessel to contract.
43) Platlet plug
44) Blood clot
Coagulation
45) Thrombin
Fibrin
Fibrinogen
46) Clotting factors
47) Molecules releases from torn cells and tissues.
48) 3
5
1
4
2
49) Serum
50) K
Liver
51) Platelets
K
Hemophilia
52) The British royal family
53) Thrombus
54) Embolism
55) Heart attack or myocardial infarction
Stroke or cerebrovascular accident
56) TPA
57) Blood clotting
58) Aspirin
59) Coumadin
Warfarin
60) Antigens
61) Self antigens
62) Foreign antigens
63) Blood types
64) ABO
65) Rh factor
66) Clogs blood vessels
67) B-
O-
68) B-
B+
AB-
AB+
69) O+
O-
70) A+
B+
AB+
O+
71) O-
72) AB+
73) A+
A-
B+
B-
AB+
AB-
O+
O-
74) Rh
A
B
75) Aren't
76) Are
77) RhoGAM

Short answer review questions:

1) Name three major plasma proteins and describe the function of each one.

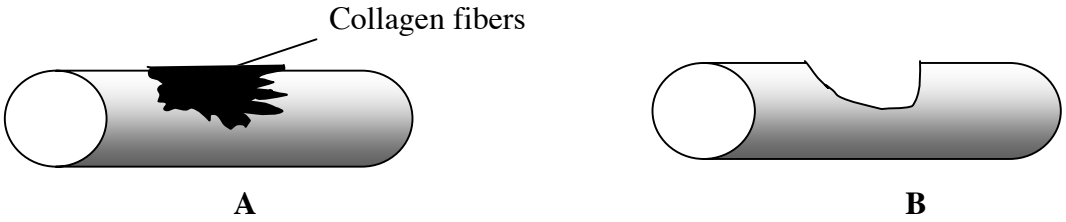
2) Name the formed element that contains iron and explain why it needs iron.

3) Name two possible causes of leukocytosis.

4) What is the difference between hemostasis and blood clotting?

5) Explain the exact cause-and-effect relationship between a thrombus and a heart attack. Your explanation must include specific anatomical details.

6) One person is cut in a way that tears a jagged hole in the wall of a blood vessel (see picture A). Another person is cut in a way that makes a smooth clean hole in the wall of a blood vessel (see picture B). Assuming that the holes are the exact same size, which person's blood would clot first? Justify your answer using hemostasis concepts.



A **B**

7) Describe the events in the body that lead to death when a patient receives a transfusion mismatch.

8) What do the terms "positive" and "negative" refer to in blood types?

9) If a person who was blood type B- received a transfusion of blood that was B+, would they be in danger? Justify your answer.

10) Women who have just given birth are sometimes given a substance called RhoGAM. RhoGAM does nothing for the health of the mother or her newborn.

a) Who then benefits from the RhoGAM?

b) Explain exactly how the RhoGAM protects the above person and what it protects them from.

Answers to short answer review questions:

1) Albumin protein is the most abundant plasma protein. Its main functions are osmotic balance and buffering. Antibodies are another abundant plasma protein. They are part of the immune system and are therefore involved in defending the body from invasion. Clotting factors are another type of plasma protein. They are involved in coagulation of the blood when a blood vessel is damaged.

2) Red blood cells (erythrocytes) contain iron. The iron is used to carry oxygen since iron has a natural affinity for oxygen.

3) Leukocytosis (abnormally high WBC counts) is usually due to the body fighting an infection. Rarely, it is a sign of leukemia.

4) Blood clotting (coagulation), where the blood turns into a solid clot of fibrin and trapped RBCs, is just the final step of hemostasis, Hemostasis also includes two events that occur before blood clotting: Vasoconstriction (the blood vessel constricts) and platelet plug formation (platelets crowd into the tear).

5) A thrombus is a blood clot that develops in an unbroken blood vessel. Although a thrombus does not usually totally block the blood vessel where it first forms, often a thrombus can break loose from its site of formation and drift through the cardiovascular system. If the thrombus becomes lodged in a coronary artery (an artery that supplies the heart muscle with blood), the blood flow to the heart muscle can become totally blocked. This is a heart attack.

6) Blood vessel A has more exposed collagen fibers. Since exposure to collagen fibers is what triggers the platelets to begin hemostasis, blood vessel A would clot first.

7) A transfusion mismatch is when a patient receives blood containing a foreign antigen to that patient. The patient's immune system attacks and breaks apart the new RBCs. The debris from the RBCs clogs many of the patient's blood vessels, causing embolisms throughout the body. The clogging of the kidney blood vessels, however, is especially deleterious because it prevents the kidneys from cleaning the patient's blood.

8) Positive means that the Rh antigen is present on the person's RBCs. Negative means that the Rh antigen is not present.

9) A transfusion is dangerous if the transfused blood contains a foreign antigen to the recipient. For a B- recipient, blood that is B+ does contain a foreign antigen, the Rh antigen. How dangerous this particular transfusion would be, however, depends on whether the recipient has previously been exposed to the Rh antigen. An Rh negative person who has not previously been exposed to the Rh antigen does not yet have any antibodies against it. This means that their immune system will not be able to mount a strong reaction to a transfusion of Rh positive blood, making the transfusion non-fatal. If, on the other hand, the Rh negative person has previously been exposed to the Rh antigen, the person's immune system will already have antibodies against the Rh antigen, and therefore an Rh positive transfusion will be dangerous and very likely fatal.

10) (a) The RhoGAM protects the woman's *next* child from attack by the mother's immune system while the child is developing in the mother's uterus.

(b) If the mother is Rh negative and her first child is Rh positive, the mother will develop antibodies against the Rh antigen after that first child is born . These antibodies in the mother cannot harm the first child (since the antibodies develop after the child is born). If the mother, however, becomes pregnant a second time with an Rh positive child, that second child is in danger from attack by the anti-Rh antibodies in the mother's immune system.

To protect the second child, the mother is given RhoGAM after the birth of her first Rh positive child. The RhoGAM blocks the mother's immune system from "seeing" the Rh antigen. The mother will therefore not develop anti-Rh antibodies.

The mother will get RhoGAM after the birth of every Rh positive child to protect the next Rh positive child she may have.