HLS Final - Physiology Book Questions

1. Which statement is true concerning erythroblastosis fetalis (hemolytic disease of the newborn [HDN])?

A. HDN occurs when an Rh-positive mother has an Rh-negative child
B. HDN is prevented by giving the mother a blood transfusion
C. A complete blood transfusion after the first birth will prevent HDN
D. The father of the child must be Rh positive

2. Which statement is true?

A. In a transfusion reaction, agglutination of the recipient blood occurs
B. Shutdown of the kidneys after a transfusion reaction occurs slowly
C. Blood transfusion of Rh-positive blood into any Rh-negative recipient will result in an immediate transfusion reaction
D. A person with type AB Rh-positive blood is considered a universal recipient

3. A woman whose blood type is A, Rh positive, and a man whose blood type is B, Rh positive, come to the clinic with a 3-year-old girl whose blood type is O, Rh negative. What can be said about the relationship of these two adults to this child?

A. The woman can be the child's natural mother, but the man cannot be the natural father
B. The man can be the child's natural father, but the woman cannot be the natural mother
C. Neither adult can be the natural parent of this child
D. This couple can be the natural parents of this child

4. What is the appropriate treatment for an infant born with severe HDN (erythroblastosis fetalis)?

A. Passive immunization with anti-Rh(D) immunoglobulin
B. Immunization with Rh(D) antigen
C. Exchange transfusion with Rh(D)-positive blood
D. Exchange transfusion with Rh(D)-negative blood

5. Chronic allograft rejection results primarily from the actions of what effector cell type?

A. Activated macrophages
B. Helper T lymphocytes
C. Cytotoxic T lymphocytes
D. Dendritic cells

6. Which of the following transfusions will result in an immediate transfusion reaction?

A. O Rh-negative whole blood to an O Rh-positive patient
B. A Rh-negative whole blood to a B Rh-negative patient
C. AB Rh-negative whole blood to an AB Rh-positive patient
D. B Rh-negative whole blood to a B Rh-negative patient

7. Which blood unit carries the least risks for inducing an immediate transfusion reaction into a B-positive (B, rhesus positive) recipient?

A. Whole blood A positive
B. Whole blood O positive
C. Whole blood AB positive
D. Packed red blood cells O positive
E. Packed red blood cells AB negative

8. What condition leads to a deficiency in factor IX that can be corrected by an intravenous injection of vitamin K?

A. Classic hemophilia
B. Hepatitis B
C. Bile duct obstruction
D. Genetic deficiency in antithrombin III

9. Which transfusion will result in a transfusion reaction? Assume that the patient has never had a transfusion.

A. Type O Rh-negative packed cells to an AB Rh-positive patient
B. Type A Rh-positive packed cells to an A Rh-negative patient
C. Type AB Rh-positive packed cells to an AB Rh-positive patient
D. Type A Rh-positive packed cells to an O Rh-positive patient

10. Which antigens must be matched optimally between donors and recipients of solid organ transplants?

A. Class I human leukocyte antigen (HLA) antigens only
B. Class II HLA antigens only
C. Class I and Class II HLA antigens only
D. Class I and Class II HLA antigens and ABO antigens

11. A 55-year-old man who has been undergoing stable and successful anticoagulation with warfarin for recurrent deep vein thrombosis is treated for pneumonia, and 8 days later he presents with lower intestinal bleeding. His prothrombin time is quite prolonged. What is the appropriate therapy?

A. Treatment with tissue plasminogen activator
B. Infusion of calcium citrate
C. Treatment with fresh frozen plasma and vitamin K
D. Rapid infusion of protamine

12. A woman whose blood type is A positive and who has always been healthy just delivered her second child. The father's blood type is O negative. Because the child's blood type is O negative (O, Rh negative), what would you expect to find in this child?

A. Erythroblastosis fetalis due to rhesus incompatibility
B. Erythroblastosis fetalis due to ABO blood group incompatibility
C. Both A and B
D. The child would not be expected to have HDN

13. A 2-year-old boy bleeds excessively from minor injuries and has previously had bleeding gums. The maternal grandfather has a bleeding disorder. The child's physical examination shows slight tenderness of his knee with fluid accumulation in the knee joint. You suspect this patient is deficient in which coagulation factor?

A. Prothrombin activator
B. Factor II
C. Factor VIII
D. Factor X

14. A patient has a congenital deficiency in factor XIII (fibrin-stabilizing factor). What would analysis of his blood reveal?

A. Prolonged prothrombin time
B. Prolonged whole blood clotting time
C. Prolonged partial thromboplastin time
D. Easily breakable clot

15. Which agent is not effective as an in vitro anticoagulant?

A. Heparin
B. Warfarin (Coumadin)
C. Ethylenediamine tetraacetic acid (EDTA)
D. Sodium citrate

16. What would most likely be used for prophylaxis of an ischemic heart attack?

A. Heparin
B. Warfarin
C. Aspirin
D. Streptokinase

17. A 63-year-old woman returned to work after a vacation in New Zealand. Several days after returning home, she awoke with swelling and pain in her right leg, which was blue. She immediately went to the emergency department, where examination showed an extensive deep vein thrombosis involving the femoral and iliac veins on the right side. After resolution of the clot, this patient will require which treatment in the future?

A. Continual heparin infusion
B. Warfarin
C. Aspirin
D. Vitamin K

18. Which coagulation pathway begins with tissue thromboplastin?

A. Extrinsic pathway
B. Intrinsic pathway
C. Commonpathway
D. Fibrin stabilization

19. Which of the following causes some malnourished patients to bleed excessively when injured?

A. Vitamin K deficiency
B. Platelet sequestration by fatty liver
C. Serum bilirubin that raises neutralizing thrombin
D. Low serum protein levels that cause factor XIII problems

20. Which of the following would best explain a prolonged bleeding time test?

A. Hemophilia A
B. Hemophilia B
C. Thrombocytopenia
D. Coumadin use

21. Which of the following is appropriate therapy for a massive pulmonary embolism?

A. Heparin
B. Warfarin
C. Aspirin
D. Tissue plasminogen activator

22. What is the primary mechanism by which heparin prevents blood coagulation?

A. Antithrombin III activation
B. Binding and inhibition of tissue factor
C. Binding available calcium
D. Inhibition of platelet-activating factor

Answers

1. D) HDN occurs when an Rh-negative mother gives birth to a second Rh-positive child. Therefore, the father must be Rh positive. The mother becomes sensitized to the Rh antigens after the birth of the first Rh-positive child. HDN is prevented by treating the mother with antibodies against Rh antigen after the birth of each Rh-positive child. This treatment will destroy all fetal RBC's in the mother and prevent the mother from being sensitized to the Rh antigen. A transfusion of the first child after the birth will not accomplish anything because the mother has been exposed to the Rh-positive antigen during the birth process.

2. D) The recipient blood has the larger amount of plasma and thus antibodies. These antibodies will act on the donor RBC's. The donor's plasma will be diluted and have minimal effect on the recipient's RBC's. With any antigen–antibody transfusion reaction a rapid breakdown of RBC's occurs, releasing hemoglobin into the plasma, which can cause rapid acute renal shutdown. Transfusion of Rh-positive blood will only result in a transfusion reaction if the Rh-negative person has previously undergone a transfusion or been exposed to Rh-positive antibodies. Type AB Rh-positive people have no antibodies to the A, B, or Rh(D) antigens in their plasma, so they can receive any blood type.

3. D) Each parent needs only a single allele for either the A or B antigen or the Rh(D) antigen to express these antigens on their blood cells and other cell types. Thus, if each parent also carries an allele for blood type O, as well as a null allele for the Rh(D) antigen, then the child can be homozygous for the recessive O allele and the Rh(D)-negative allele.

4. D) The appropriate treatment is repetitive removal of Rh-positive blood, replacing it with Rh-negative blood (an exchange of about 400 milliliters over 90 minutes). This treatment may be performed several times over a few weeks. Maternal antibodies disappear over 1 to 2 months, so the newborn's endogenous Rh-positive cells cease to be a target. Exchange transfusions can safely be initiated in utero when there is evidence of an active immune reaction against the fetus's blood cells.

5. C) Allograft rejection occurs primarily through the actions of cytotoxic T cells. T-helper cells promote this reaction but are not the effector cells. Both macrophages and dendritic cells may present antigen that promotes the immune response, but the key effector cells are cytotoxic T cells.

6. B) Transfusion of Rh-negative blood into an Rh-positive person with the same ABO type will not result in any reaction. Type A blood has A antigen on the surface and type B antibodies. Type B blood has B antigens and A antibodies. Therefore, transfusing A blood into a person with type B blood will cause the A antibodies in the type B person to react with the donor blood.

7. D) In any patient, transfusion of O-type packed cells will minimize a transfusion reaction because the antibodies will be removed with the plasma removal. Matching the Rh factor will also minimize transfusion reaction. Therefore, in a patient with type B-positive blood, a B-positive transfusion or an O-positive transfusion will elicit no transfusion reaction.

8. C) Hemophilia is due to a genetic loss of clotting factor VIII. Most clotting factors are formed in the liver. Correction of the problem with a vitamin K injection implies that the liver is working fine and that the patient does not have hepatitis. Vitamin K is a fat-soluble vitamin that is absorbed from the intestine along with fats. Bile secreted by the gallbladder is required for the absorption of fats. If the patient is deficient in vitamin K, then clotting deficiency can be corrected by an injection of vitamin K. Antithrombin III has no relationship to factor IX.

9. D) Type O RBCs are considered to be universal donor blood. Reactions occur between the recipient's antibody and donor antigen as shown in the following table.

Donor	**Recipient**	**Reaction**
O-negative	A, B, AB-positive	None
A-positive	B, AB-positive	Reaction (A antibody)

B-positive	A, AB-positive	Reaction (B antibody)
AB-positive	A, B, O-positive	None

10. D) Unmatched donor HLA antigens of both classes are recognized as foreign by recipient T cells. In addition, blood group (ABO) antigens are expressed on the cells of solid organs and can lead to strong organ rejection.

11. C) Antibiotic treatment for pneumonia can kill flora in the gastrointestinal tract that are critical for the production of vitamin K. Production of several active clotting factors (prothrombin and factors VII, IX, and X) has been suppressed in this patient by warfarin inhibition of VKOR c1, which normally reduces vitamin K so that it can activate the listed clotting factors. Further reduction of vitamin K by the death of critical gut flora has produced excessive anticoagulation and resulted in bleeding in this patient. Fresh frozen plasma is infused to provide active clotting factors immediately, and vita-min K is provided to promote endogenous production of active clotting factors. Both are needed in the setting of acute bleeding.

12. D) HDN occurs when the mother is Rh negative and the father is Rh positive, resulting in an Rh-positive child. Because the child is O negative and the father is Rh negative, HDN would not be expected to develop.

13. C) A young man with a bleeding disorder and a history of bleeding disorders in the males of his family would lead one to suspect hemophilia A, a deficiency of factor VIII. The physical examination suggests bleeding into the knee joint, which is frequently seen in hemophilia A.

14. D) Fibrin monomers polymerize to form a clot. Creation of a strong clot requires the presence of fibrin-stabilizing factor that is released from platelets within the clot. The other clotting tests determine the activation of extrinsic and intrinsic pathways or number of platelets.

15. B) Warfarin interferes with endogenous production of active clotting factors but does not affect their function once they are present, as in normal plasma. Heparin activates antithrombin III to produce anticoagulation either in vitro or in vivo. Both EDTA and sodium citrate bind calcium, which is necessary for clotting to proceed.

16. C) Heparin is used for the prevention of a clot, but it must be infused. Heparin prevents formation of clots by binding to antithrombin III, resulting in the inactivation of thrombin. Warfarin is used to inhibit the formation of vitamin K clotting factors. Aspirin is used to prevent activation of platelets. Activation of platelets after exposure to an atherosclerotic plaque and the formation of a platelet plug will impede blood flow and result in an ischemic heart attack. Streptokinase (or, alternatively, tissue plasminogen activator) is used to break down an already formed clot, which is appropriate therapy for a pulmonary embolus

17. B) This clot is due to stasis of blood flow in the patient's venous circulation. Heparin is used for the prevention of a clot, but it must be infused. This anti-coagulation occurs by heparin binding to antithrombin III, with subsequent inactivation of thrombin. A continuous heparin drip is impractical. Warfarin is used to inhibit the formation of vitamin K clotting factors and would prevent the formation of any clot. Aspirin is used to prevent activation of platelets. The current clot is not due to activation of platelets. Vitamin K would be used to restore clotting factors that may be decreased after warfarin treatment. This patient has sufficient clotting factors, as evidenced by her venous clot.

18. A) The extrinsic pathway begins with the release of tissue thromboplastin in response to vascular injury or contact between traumatized extravascular tissue and blood. Tissue thromboplastin is composed of phospholipids from the membranes of tissue.
19. A) Several clotting factors that are formed in the liver require vitamin K to be functional. Vitamin K is a fat-soluble vitamin, and absorption is dependent on adequate fat digestion and absorption. Therefore, any state of malnutrition could have decreased fat absorption and result in decreased vitamin K absorption and decreased synthesis of clotting factors.

20. C) Three major tests are used to determine coagulation defects. Prothrombin time is used to test the extrinsic pathway and is based on the time required for the

formation of a clot after the addition of tissue thromboplastin. Bleeding time after a small cut is used to test for several clotting factors but is especially prolonged by a lack of platelets.

21. D) Heparin is used for the prevention of a clot. Heparin binds to antithrombin III, resulting in the inactivation of thrombin. Warfarin is used to inhibit the formation of vitamin K clotting factors. Aspirin is used to prevent activation of platelets. Tissue plasminogen activator is used to break down an already formed clot, which is appropriate therapy for a pulmonary embolus.

22. A) The primary function of heparin is to bind to and activate antithrombin III.