WFU Baptist Medical Center Winston-Salem, NC 27157

Blood Bank Student Protocols and Guidelines

**Welcome to the Blood Bank**

This package of information contains a brief introduction to the Blood Bank protocols, objectives, reading assignments and handout study questions. If there are any questions concerning this material, please ask the manager or assistant manager.

**OBJECTIVES**

Blood Bank is divided into eight different rotations for the student. You are expected to review the objectives prior to each rotation in the Blood Bank. These objectives outline the material and reading assignments to be covered during each rotation. This material will be covered on your quizzes.

**READING ASSIGNMENTS AND CHECKLISTS**

Reading assignments are expected to be completed prior to beginning each rotation in the Blood Bank. Objectives for each rotation specify which section of the reading list is to be used.

**STUDY QUESTIONS**

Study questions are separated and labeled for each one of the Blood Bank rotations. If there are any problems with the material, seek help from the tech assigned to work with you that day or the manager. These questions are designed to help reinforce the activities in the lab each day. You may check them with the answer key when complete.

**CASE STUDIES**

Case studies have been prepared for each section of the crossmatch rotations and are handed out at the beginning of the Blood Bank rotation. These case studies may be worked on in the Blood Bank when all other work is completed, or at home if there is not time to complete the work during the day. Please turn in the completed questions before taking the written quiz on each rotation.

**QUIZZES**

All quizzes are multiple choice to simulate what can be expected on a registry board exam. They will be graded very strictly. All quizzes are in electronic format on the BB iShares. It is highly suggested that each student complete the written study questions and check their answers before taking quizzes. Review of the multiple choice “Registry Review Questions” provided to each student throughout the Blood Bank clinical rotation is also highly recommended.

**GENERAL RESPONSIBLITIES**

Each student is responsible for learning the material outlined. This is to be accomplished by reviewing material from the classroom, completing the reading assignments, completing the workbooks and discussing problem areas with the technologist or assistant manager. Please call any problem areas to the attention of the manager or assistant manager.

**LUNCH**

Lunch should be arranged with the technologist with whom you are working and should be 30 minutes. Permission to leave the laboratory will be given by the tech assigned to work with the student. Permission to alter the workday will be given by the manager.

**Clinical Laboratory Rotation Policies**

The student is expected to review all the material presented in the classroom prior to beginning the Blood Bank rotation.

The factors to be considered in deriving the student’s grade are the performance of procedures, the performance on graded unknowns, the performance on paper problems, dependability, proficiency, self-confidence, the ability to accept responsibility and the demonstration of professionalism. Evaluations will be made by the medical technologist with whom the student works and the manger and assistant manager.

**Blood Bank Grading Scales and Areas of Evaluation**

General Grading Scales

94 – 100 A

86 – 93 B

80 – 85 C

0 – 79 F

Areas of Evaluation

 \*Exams – Paper problems 35%

\*\*Practical 45%

 Study Questions/Panels 10%

 Employee-Supervisor Evaluation 10%

\* Quizzes – located on BB iShares

 1. Components 10 points

 2. ABO-Rh 10 points

 3. DAT 10 points

 4. Antibody ID 10 points

 5. Crossmatch 10 points

 6. Final written examination 50 points

\*\* Practicals

 1. (5) ABO/Rh unknowns 20 points

 2. (5) DATs, 1 Elution/ABID on eluate 10 points

 3. (5) Type and Screen unknowns/ Antibody ID 20 points

 4. (5) Crossmatch unknown 50 points

READING ASSIGNMENTS

Throughout each rotation, each student should read the chapters/sections in the *Technical Manual*, the *Standards for the Blood Banks* *and Transfusion Services*, and the *Circular of Information* which apply specifically to their rotation. This reading material is available in the Blood Bank and may be used while the student is present. These books should not be removed from the Blood Bank.

**General Instructions for Testing**

1. Record all results immediately on blood bank forms (not scrap paper)
2. Interpret all recorded results.
3. Save all samples.
4. Forward and reverse discrepancies must be resolved, either with testing, if available, or a written explanation.
5. Rh neg. patients should have weak D testing. Purpose: not to waste Rh neg. blood.
6. Panels for plasma and eluate, including the last wash, are to be recorded directly on the Antigram for the specific panel in use.
7. Selected cells are to be run and should be recorded on a selected cell worksheet or a printed Antigen Plus Worksheet.
8. Quality Control for Rare Antisera is to be recorded on the Rare Antisera QC form, antigen typing for units and phenotyping for patients is to be recorded directly on the Antigen Typing worksheet or patient requisition.
9. When doing panels, you must list all clinically significant antibodies that cannot be r/o. All other antibodies, such as low frequency, must be listed separately.
10. Test appropriate controls when phenotyping or antigen typing.
11. Positive DAT must have an eluate result or explanation as to possible causes.
12. Record all results in PEN.
13. Errors are corrected with one line drawn thru the error, initial and date.
14. Grading will be on Technical Accuracy, Thoroughness, Neatness.

ANY QUESTIONS? Please ask.

Wake Forest University Baptist Medical Center

Winston-Salem, NC 27157

Blood Bank Student Final Grade Worksheet

**Student Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |
| --- | --- | --- | --- |
| **Written Exam** | **Possible Points** | **Points Earned** |  **Total %** |
| ABO/Rh | 10 |  |
| DAT | 10 |  |
| UADT | 10 |  |
| XM | 10 |  |
| Component /FD | 10 |  |
| Final | 50 |  |
|  |  |  |
|  | **Total Points Earned** |  | **x 35% =** |  |
|  |  |  |  |  |
| **Practicals** | 20 |  |  |  |
| ABO/Rh |
| DAT | 10 |  |
| UADT | 20 |  |
| Final | 50 |  |
|  |  |  |
|  | **Total Points Earned** |  | **x 45% =** |  |
|  |  |  |  |  |
| **Written Materials** |  |  |  |  |
| **Study Questions** | 50 |  |
| **Panels** | 50 |  |
|  |  |  |
|  |  |  |
|  | **Total Points Earned** |  | **x 10% =** |  |
|  |  |  |  |  |
| **Evaluation** | 100 |  |  |  |
|  | **Total Points Earned** |  | **x 10% =** |  |
|  |  |  |  |
|  |  | **Final Grade Total** |  |

Grade Scale:

 A 100 – 94

 B 93 – 86

 C 85 – 80

 F 79 and below

**MLT STUDENT ROTATION SCHEDULE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ABO Rh** | **ABO Rh** | **ABO Rh** | **UADT** | **UADT** |
| 0-15 unknownsNo discrepancies**Process blood****and morning blood order throughout the rotation** | 10-15 unknownsIncluding Discrepancies | Quiz / Practical | Antibody Screen (gel)6-8 unknownsNegativesSingle antibodies**Antigen Typing & Rh phenotyping** | Introduce multiple antibodies Antibody Screen(gel)6-8 unknownsMultiple Abs. |
| **UADT** | **DAT** | **DAT** | **DAT** |  **Crossmatch** |
| QuizPractical | 10-15 unknownsPos and Neg DAT’s | 8-10 unknownsPos and Neg DAT’sElution and Panel | QuizPractical (Include an elution) | Multiple patients2 unit XM’sPos and Neg screens, IS and AHG XM’sCompatible & incompatible units**Antigen type the units and patient.** |
| **Crossmatch** | **Crossmatch** | **Front Desk** | **Front Desk** | **Component Prep** |  |
| Multiple patients2 unit XM’sMultiple and single antibodies.Compatible and incompatible units | Quiz and Practical |  |  | Observe the following if possible:Washing bloodReceiving in Plasma/ Plts.Thawing plasma  |
| **Component Prep** | **Quality Control** |  |  |  |
| Observe the following if possible:Washing bloodReceiving in Plasma/ Plts.Thawing plasmaDeglycing, wash plts IF available | Transfusion ReactionsHDNDonorsFront desk andComponent prep quiz  | Review if neededBMT Lab as time permits | Final examPractical |  |

**General Objective for Blood Bank Students:**

At the completion of the blood bank rotation the student shall be able to:

1. Explain the purpose of the following procedures, perform them correctly and interpret the results:
	* ABO forward and reverse testing
	* Rh typing including weak D testing
	* Direct Antiglobulin Test
	* Antibody screen and detection
	* Identify antibodies
	* Crossmatch donor units
	* Issue blood products
	* Process red blood cells
	* Sign in samples
	* Select and prepare blood products for patient use
2. The student shall be able to discuss:
	* Transfusion reactions
	* Quality control of reagents and equipment
	* Storage requirement for blood products
	* Shelf life of blood products
3. The student is expected to:
	* Clean their work areas at the end of the day
	* Clean up any spills
	* Develop safe work habits
	* Discard of used items properly
	* Restock supplies in their area and reagent rack
	* Return reagents to refrigerator
4. The student will be graded on:
	* ABO/Rh quiz and practical
	* DAT quiz and practical
	* Antibody screen quiz and practical
	* Crossmatch practical
	* Front desk / Component preparation quiz
	* Written study questions and panels
	* Cumulative final exam
	* Evaluations from teaching technologist

**ABO/Rh Objectives:**

At the end of the rotation the student shall be able to:

1. Explain the purpose of the following procedures, perform them correctly and interpret the results:
	* ABO forward and reverse testing
	* Differentiate between A1 and weaker subgroups of A or AB
	* Detect the presence of anti-A1 in the plasma of Group A2 or weaker subgroups of A or AB
	* Rh typing including weak D testing
2. The student shall be able to discuss:
	* Discrepancies between ABO forward and reverse typing
	* Resolution of discrepancies
	* Problem involving Rh typing
	* Subgroups of A and AB and Selection of blood for these patients

3. The student shall determine the ABO group and Rh type of selected unknown

 samples including problem resolution.

Reading assignments from the Routine procedure manual:

1. ABO Rh Protocol
2. ABO Testing
3. Rh Testing and Weak D Typing
4. Anti-A1 Lectin Testing and Test for Anti A1
5. Common Causes of False Negative and False Positive Results in ABO Testing
6. Grading of Positive and Negative Reactions

***Optional Presentations on BB iShares:***

*1.1\_ABO Blood Group*

*1.2\_Rh Blood Group*

*1.3\_ABO Discrepancies*

**Notes on Sub-groups of A**

* About 20% of Group A and AB people are A2 or A2B
* ABO subgroups differ in amount of antigen carried on red cells
* Anti-A1 occurs as an antibody in 1-8% of A2 persons and 22-35% of A2B persons
* Anti-A1 usually reacts at room temp
* Not all patients who have positive reactions with A1 cells are considered subgroups. The discrepancy may be due to a cold antibody such as Anti-M or Anti-P1
* Not all A subgroup people make anti-A1
* The rare A3 subgroup can have a mixed field reaction with Anti-A antisera.

**Antibody Screen, Antibody Detection and Antibody Identification Objectives:**

1. At the end of the rotation the student shall be able to:
	* Perform an antibody screen, including an auto control.
	* Investigate positive results of an antibody screen.
	* Investigate positive results of an auto control.
	* Perform a selected cell panel
	* Perform phenotype of patient
2. The student shall be able to discuss:
	* Cold panels
	* Antibody titration
	* Prewarm procedure
	* Enzymes
	* Titers
3. The student shall perform with accuracy a series of antibody screens on unknown blood samples, including a complete work up of positive results.

Reading assignments from the Routine and Specials procedure manuals:

**Routine:**

1. Antibody Screen

**Specials**

1. Antibody Identification Protocols
2. Antibody Identification Procedures
3. Antibody Titration
4. Prewarm Procedure
5. Testing with Enzymes
6. Enhancements
7. Panels
8. Antigen Typing, Direct and Indirect

***Optional Presentations on BB iShares:***

*1.4\_Antiglobulin Testing*

*1.5\_Intro to Other Blood Groups*

*2.1\_Other Blood groups continued*

*2.2\_Detection and ID of Unexpected Alloantibodies*

*3.2\_Autoimmune Hemolytic Anemia*

**Crossmatch Objectives:**

At the end the rotation the student shall be able to:

1. Explain the purpose of the following procedures, perform them correctly and interpret the results:
* ABO/Rh, Antibody Screen Testing
* Crossmatch units using , immediate spin and antiglobulin phases
* Donor unit selection
* Antigen type donor units
* Investigate and resolve incompatible crossmatches
* Calculate the number of units to screen when antigen negative units are needed
1. The student shall be able to discuss:
* The methods of grading gel reactions
* Selection of units for crossmatch, including group specific and alternative groups
1. The student will perform with accuracy a series of crossmatches on unknown blood samples and donor units, including problem resolution.

Reading assignments from the Routine, Specials and Protocol manuals:

1. Crossmatch, Immediate Spin and Indirect Antiglobulin Phase
2. Selection of Blood and Blood Components
3. Grading of Positive and Negative Reactions
4. Antigen Typing, Direct and Indirect

***Optional Presentations on BB iShares:***

*2.3\_Pretransfusion Testing*

**Donor Objectives - for Discussion**

At the end of reviewing the donor material, meeting the standards cited in the AABB Standards and

Technical Manual,

1. The student shall be able to:

a. describe the criteria for the selection and screening of blood donors.

b. describe the collection of donor blood.

c. describe the processing and labeling of donor blood.

d. describe donor reactions and methods of treatment.

e. describe therapeutic bleedings.

f. describe autologous transfusions.

g. describe plasmapheresis, plateletpheresis, leukopheresis.

 2. The student shall be able to:

 a. define anticoagulant.

 b. describe the following anticoagulants, including advantages and disadvantages, storage

 requirements including temperature and shelf life:

1. ACD – Acid Citrate Dextrose
2. CPD - Citrate Phosphate Dextrose
3. CPDA1 – Citrate Phosphate Dextrose Adenine.
4. AS1 – ADSOL
5. PAS – Platelet Additive Solutions

 READING ASSIGNMENTS

 AABB Technical Manual, current edition – Review donor requirements

 Donor literature provided by Blood Bank

 Circular of Information

***Optional Presentations on BB iShares:***

*3.3\_Whole Blood Donation*

**Transfusion Reactions for Discussion**

At the end of the rotation the student shall be able to:

1. Discuss the major types of transfusion reactions in the following categories:
* Acute immunologic
	+ Acute nonimmunologic
* Delayed immunologic
* Delayed nonimmunologic
1. Discuss signs, symptoms, lab tests and treatment (prophylactic approach) of the major types of transfusion reactions in the following categories:
* Acute immunologic
* Acute nonimmunologic
* Delayed immunologic
* Delayed nonimmunologic
1. Discuss the role of laboratory personnel in the investigation of reactions in general, including review and follow up testing.
2. Discuss transfusion transmitted viruses (TTV) and details involved in their investigation.

References:

 Routine Manual – Transfusion Reaction Policy

Specials Manual – General Guidelines for Lookbacks

 Specials Manual – Recalls and Market Withdrawals

 Specials Manual - Suspected Post Transfusion Reactions

AABB Technical Manual current edition

Circular of Information – current edition

***Optional Presentations on BB iShares:***

*2.4\_Transfusion Reactions*

*2.5\_Transfusion Transmitted Diseases*

**Quality Control Objectives:**

At the end of the rotation the student shall be able to:

1. Explain the purpose of the following procedures, perform them correctly and interpret the results:
	* Perform the testing of antisera and red blood cells reagents
	* Perform blood inspection
	* Check temperatures of all refrigerators and freezers
	* Check temperatures of all heat regulated equipment
	* Process blood
	* Perform pending log
2. The student should be able to discuss:
	* Required quality control of reagents, daily and upon receipt
	* Required quality control of equipment
	* Work up of a transfusion reaction
	* Causes of a transfusion reaction
	* Shelf life of blood components
3. The student should be able to discuss the needed quality control testing for reagents, check temperature of equipment, process blood and discuss tests required in and causes of transfusion reactions.

Reading assignments from the Quality Control and Equipment Manuals:

1. Daily Reagent Quality Control
2. Pending Test Report
3. Receipt Testing
4. Unit / Status Disposition
5. Rees Alarm System

**Front Desk Objectives:**

At the end of the rotation the student shall be able to:

1. Be knowledgeable of the following procedures and protocols:
	* Sign in samples, including review of prior records
	* Issue blood products
	* Return blood products to inventory
	* Determine acceptability of blood products for reissue
	* Notify appropriate personnel of unacceptable samples
	* Determine priority of samples received
2. The student should be able to discuss:
	* Indications for use of emergency releases
	* Indicated use of irradiated products
	* Indicated use of CMV negative products
	* Indicated use of leukocyte reduced products
	* Importance of ABO compatibility
	* Importance of Rh compatibility
	* Importance of antigen negative units for patients with alloantibodies
	* Product selection for bone barrow transplant patients
	* Indications for use of Rh Ig
3. The student should be able to discuss criteria to receive samples for testing and issue blood products for patient use.

Reading assignments

Blood Bank Protocols and Procedures pertaining to:

1. Receipt of Specimens
2. Prior History
3. Issue of Blood Products
4. Return of Blood Products
5. Blood Bank Coolers
6. BioFridges

**Component Preparation Objectives**:

At the end of the rotation the student will be:

1. Knowledgeable of the following:
	* Platelet selection and preparation
		1. PAS platelets
		2. Pathogen Reduced platelets
	* Plasma selection and preparation
		1. Frozen plasma
		2. Liquid plasma
	* Deglycerolized red blood cells
	* Washed red blood cells and platelets
	* Cryoprecipitate selection and preparation
	* Irradiation of red blood cells and platelets
	* Preparation of red blood cells and platelet aliquots for pediatric transfusion
2. The student should be able to discuss:
	* Indications for the use of each blood component (red blood cells, platelets, cryoprecipitate, plasma, granulocytes)
	* Storage requirement of each blood component
	* Shelf life of each blood component
	* Indicated use of irradiated components
	* Preparation of packed red blood cells from whole blood
	* Indicated use of crossmatched and HLA matched platelets
	* Indicated use of washed red blood cells and platelets
	* Indicated use of volume reduced platelets
	* Exchange transfusions
	* Mannitol free products
3. The student will be able to accurately discuss components for patient use:

Reading assignment: Component Prep Manual

1. IBM/COBE 2991 Cell Processor Protocol and Description
2. Installing IBM/COBE Processing Set
3. Washing Red Blood Cells
4. Washing Platelets
5. Deglycerolization – Red Blood Cells
6. Packing Whole Blood by Sedimentation or Centrifugation
7. Exchange Transfusions – Neonates and Sickle Cell Patients
8. Neonatal Transfusion Practice
9. Granulocytes
10. Platelets
11. Sterile Docking Device
12. Irradiation
13. Cryoprecipitate AHF
14. Plasma

***Optional Presentations on BB iShares:***

*3.4\_Blood Components*

**Hemolytic Disease of the Newborn (HDN) Objectives - for Discussion**

At the end of the HDN review, meeting the standards cited in the NCBH Procedure Manual, AABB Standards and the Technical Manual the student shall be able to discuss:

A. The mechanism of sensitizing for the most common types of HDN – ABO and Rh and antibodies involved.

B. Prenatal investigation including:

 1. Determination of the parent’s blood groups and types.

 2. Detection of antibodies in the maternal serum.

 3. Antibody Titration.

C. Postnatal investigation including:

 1. ABO and Rh of the baby.

 2. DAT on the baby’s red blood cells.

 3. Elution and identification of the antibody found on the baby’s red blood cells.

D. Rh Immune Globulin including:

 1. Principle.

 2. Criteria for candidacy.

 3. Tests required before administration.

E. The principle of the Kleihauer-Betle test and other procedures for the detection of fetal cells in maternal

 circulation.

F. Confirmation of ABO HDN.

G. Exchange Transfusion.

H. Intrauterine Transfusion.

READING ASSIGNMENT

AABB Technical Manual, current edition

Literature provided by Blood Bank

***Optional Presentations on BB iShares:***

*3.1\_HDFN*

NOTES: Hemolytic Disease of the Newborn (HDN)

A condition in which maternal IgG antibodies cross the placenta and attach to fetal cells that possess the corresponding paternally inherited antigen, resulting in accelerated red blood cell destruction, both before and after birth.

3 categories

* D hemolytic disease- caused by alloimmune anti-D, the first D-positive infant being the cause in a D-negative mother; the first pregnancy is the immunizing event and the following pregnancies with D-positive infants are affected
* “other” hemolytic disease- caused by alloimmune antibodies other than anti-D
* ABO HDN- caused by anti-A,B in group O women towards their non-group O infants and can occur in any pregnancy, including the first

Alloimmunization occurs through prior exposure to foreign red cell antigens through pregnancy (fetomaternal hemorrhage) or transfusion.

Prenatal evaluation of the mother includes:

* ABO typing
* D typing, including “weak D”, if necessary
* Antibody screen, with antibody identification and titer if positive

Alloimmune HDN can be monitored or evaluated by:

* Maternal antibody titer- serial dilutions done in parallel with previous samples throughout the pregnancy
* Amniotic fluid analysis- monitoring of bile pigment using the Liley curve
* Direct measurement of fetal hematologic and biochemical values by Percutaneous Umbilical Blood Sampling
* Doppler blood flow studies

ABO HDN cannot be diagnosed during pregnancy and the infant is rarely symptomatic at birth.

Prior to birth, fetuses affected with HDN can suffer from:

* fetal anemia
* generalized edema, called “hydrops fetalis”

Treatment of HDN during pregnancy can include:

* Attempts to suppress additional maternal antibody formation through plasma exchange (rarely done) and/or IVIG infusion
* Intrauterine transfusion (IUT)

The blood for IUT should be:

* Group O packed red blood cells
* D-negative or negative for the antigen corresponding to the mother’s antibody
* Irradiated
* Fresh- often less than or equal to 7 days old
* High hematocrit of 75%-85%
* Often leukocyte-reduced and/or CMV negative
* Often Hemoglobin S negative
* Often washed

Postpartum evaluation of suspected HDN includes testing on both cord blood and maternal blood samples.

Maternal testing includes:

* ABO
* Rh, including “Weak D”, if necessary
* Antibody screen and identification of antibody, if present

Cord blood testing includes:

* ABO- forward only
* Rh, including “Weak D”, if necessary
* Direct antiglobulin testing
* An eluate and identification of antibody in eluate if the DAT is positive and the clinical situation warrants.

Types of Eluates:

* Lui Freeze for ABO HDN
* Rapid Acid for alloimmune HDN

Following delivery, newborns affected with either HDN can suffer from:

* Anemia
* Jaundice
* Bilirubinemia ( can result in kernicterus)

Treatment of HDN following delivery can include:

* Phototherapy- for ABO HDN
* Exchange transfusion- for alloimmune HDN

The benefits of an exchange transfusion are:

* Reduction of the mass of antibody-coated red cells so their destruction does not cause a rise in bilirubin
* Reduction of a portion of already accumulated bilirubin
* Reduction of the number of unbound antibody molecules available to attach to newly formed red blood cells

The blood for an exchange transfusion should be:

* Crossmatched with the mother’s serum (or less desirable- the infant’s serum or an eluate prepared from infant red cells)
* ABO compatible, usually group O packed cells suspended in AB plasma
* antigen negative for antibody causing HDN
* other necessary requirements for neonates at that particular institution

Rh Immune globulin is:

* A concentrate of mostly IgG anti-D
* A full dose (300ug) is sufficient for 15ml of D-positive red blood cells or 30ml D-positive whole blood bleed
* There is a 50ug dose for first-trimester abortions or miscarriages

The following women are not candidates for postpartum RhIg:

* the D-negative woman with a negative antibody screen and a D-negative baby
* any D-positive woman, including women that are “weak D”
* any D-negative woman known to be immunized to D

Rh immune globulin is given intramuscularly:

* as prophylaxis at 28 weeks of gestation
* within 72 hours of delivery of an Rh-positive baby

Following delivery, a sample of the mother’s blood should be evaluated for a FMH if the infant is determined to be D-positive. A “fetal bleed screen”, a qualitative test, is performed and if positive, a Kleihauer-Betke is performed to quantitate the FMH as a percentage of fetal cells so dosage of RhIg can be determined.

Calculation for dosage of RhIg from Kleihauer-Betke result:

* Kleihauer-Betke is reported as percent (%)
* The percent of fetal cells is multiplied by the Maternal Total Blood Volume (MTV) x 1/100.
* Determine the MTV:
* MTV = maternal weight (Kg) x 75mL/Kg (note: weight in lbs. / 2.2 = Kg)

If maternal weight in unknown, the standard assigned MTV = 5000mL x 1/100

* The result is mL of fetal blood
* The volume of fetal blood is divided by 30

Example: KB is reported as 1.3%

 1.3 x 50 = 65mL of fetal blood

 65/30 = 2.2 doses

The general rule for rounding is less than 0.5 rounds down, greater than or equal to 0.5 rounds up. In both cases, add 1 vial to the final number as a safety margin. Example: 2.2 give 3 doses 2.5 give 4 doses

**ABO/Rh Study Questions**

1. Why is it necessary to perform ABO/Rh testing?

2. Why and when do you use anti-A,B?

3. What is the purpose of using anti-Al lectin?

4. How should you interpret positive reactions with anti-Al lectin?

5. Are mixed field reactions significant reactions in ABO? Rh? Why or why not?

6. When the forward and the reverse groups do not agree, what steps can we take to identify the problem?

7. ABO serum grouping is unreliable in newborn and elderly people. True or False

8. Name at least 3 reasons that would cause the ABO serum grouping and cell grouping to disagree.

9. Besides confirming the ABO group of a person, Al and B cells may give additional information in what areas?

10. When performing ABO cell testing, weak reactions can be enhanced by incubating at 37 C. True or False?

 Why or why not.

11. When testing a blood sample from a person with a weak subgroup of A what kind of reactions may be seen?

12. If you suspect anti-Al in an A2 person, how do you confirm it?

13. What naturally occurring ABO antibodies (Anti-A, Anti-A1, Anti-A,B, Anti-I) will react with:

Al cells?

 A2 cells?

 B cells?

14. What does the term "saline replaced" mean? When is the procedure used?

15. Rouleaux formation in a patient's blood sample can cause errors in blood grouping and typing. True or False?

 Explain.

16. If rouleaux formation is present in a blood sample, what should be done to confirm the accuracy of the results

 of the test you are performing?

17. Will a routine crossmatch pick up ABO errors? Explain why or why not.

 Rh errors? Explain why or why not.

18. If using an Rh reagent that requires an Rh control, what can cause a positive Rh control ?

19. What procedures should you do when you get a positive Rh Control?

20. When is it appropriate (or necessary) to perform a weak D?

21. How do you perform the weak D procedure?

22. Is a micro positive "mixed field" weak D significant? Why or why not?

23. Is a person considered weak D positive after a positive reaction at 37 C? Why or why not?

24. What is the purpose of saline or chemically modified reagents?

25. Can a positive direct antiglobulin test affect your Rh test? Weak D test? Why or why not?

26. Should a positive and negative control be run when using rare antisera, such as anti-c? Why or why not?

27. Why do we use a heterozygous cell for our positive controls with rare antisera?

28. A homozygous 0 person presents what genes to their offspring?

 Homozygous A ?

29. A group B man is heterozygous if his mother is 0. True or False.

30. The patient you are crossmatching shows the following results:

**Anti-A** – Neg **Anti-B** – Neg **Anti-A,B** - 1+

**A1 cells -** 1+ **B cells** - 3+ **A2 cells** – Neg

**UADT** - Neg **Auto** - Neg

 What do you suspect?

31. Interpret the following:

**Anti-A** **Anti-B** **A1 cells** **A2 cells** **B cells**

 0 2+ 2+ 2+ 0

32. A1 cells and B cells used for serum grouping should be what Rh type?

33. Weak D is a weak antigen that cannot elicit the formation of anti-D. True or False? Explain.

34. Rh antibodies are usually present as naturally occurring antibodies. True or False? Explain your answer.

35. Fill in the table:

|  |  |  |
| --- | --- | --- |
| **Wiener** | **Fisher Race** | **Rh Phenotype****D C c E e** |
| R1 R1 |  |  |  |  |  |  |
| R2r |  |  |  |  |  |  |
| R1r |  |  |  |  |  |  |
| rr |  |  |  |  |  |  |
| R0 |  |  |  |  |  |  |
| r’r |  |  |  |  |  |  |
| r’r’ |  |  |  |  |  |  |
| R2R2 |  |  |  |  |  |  |

36. What is the common genotype of Rh negative people?

37. Weak D testing is required on all donors. True or False.

38. If a donor is D negative, Weak D positive, how should the unit of blood be labeled (regarding Rh type)?

39. A patient of the genotype R1R1 was transfused a unit of blood of the genotype rr. What antibody will most

 likely develop?

40. Should an obstetrics patient that is weak D positive receive RHIG?

**Antiglobulin Study Questions**

1. What are the two major immunoglobulins in polyspecific antihuman globulin?
2. What is the principle behind antihuman globulin?

1. What is the purpose of IgG coated red cells?

1. Is a negative reaction with IgG coated red cells significant? Why or why not?

1. In vivo sensitization is detected by which antiglobulin test?

1. In vitro sensitization is detected by which antiglobulin test?

1. The direct antiglobulin test is useful in detecting four major situations. Name them.
2. The indirect antiglobulin test is useful for what purposes?

1. The washing phase is critical for the direct antiglobulin technique only. The indirect antiglobulin test is unaffected if washed improperly. True or False? Explain.
2. The antiglobulin serum can become inactivated during manual mixing of your tubes. T or F? Explain.
3. Is it safe to leave tubes at 37 C after incubation prior the washing? Why or why not?
4. Is it safe to leave tubes in the cell washer after washing? Why or why not?
5. In the antiglobulin technique, what causes false positives and false negatives?
6. Complement will coat red blood cells in vivo only. T or F? Explain.

1. What blood group antibodies can bind complement to the red blood cell membrane?
2. What is the main use of monospecific antiglobulin serums?

1. What does HTLA mean? What picture do these antibodies usually produce? What are some examples of these antibodies?

1. If you have a positive unexpected antibody detection test what steps must be taken in order to adequately workup an antibody?
2. What are some common enhancement procedures often used to assist in antibody identification? What antibodies are affected by these techniques?
3. Why is it important to know a patient’s medical history and transfusion history when he has an antibody problem?
4. What helpful information can be obtained by running an auto control?

1. When do you perform the prewarming technique?

1. In the presence of a cold or warm autoantibody what technique is helpful in finding blood for a patient? Explain.

1. What is an elution?
2. Would an elution normally be performed if the anti-IgG is negative?

1. Would an elution ever be performed if the anti-IgG is negative?

1. List some common elution methods. What antibodies do they detect best?

1. When would you perform an antibody titration?

1. Name two situations in which an alloantibody is the cause of a positive direct antiglobulin test.

1. Name two situations in which variations in the strength of reactivity can be seen.
2. A confidence level *<95%* is considered adequate in antibody identification. True or False? Explain.
3. When choosing your own panel, how many cells are necessary to obtain this confidence leve1?
4. What is the purpose of performing a crossmatch?

1. Clinically significant agglutinating or hemolyzing antibodies are best detected at room temperature. True or False? Explain.

1. The Rh blood group is the most important group in blood transfusions. True or False? Explain.

1. The recipient’s blood sample and the donor blood should be kept at 1-6 C for at least seven days after transfusion? True or False? Explain.
2. An antibody which reacts at room temperature cannot cause discrepant results in ABO testing. True or False? Explain.

1. Can cells with a positive direct antiglobulin test be used for typing with antiserums requiring the antiglobulin technique? Explain.
2. What does the term electronic crossmatch mean?
3. What is an emergency release? When is an emergency release used?

1. When performing a crossmatch, you should always stop the crossmatch once you get an incompatibility and do a direct antiglobulin test on the patient’s sample? True or false*?* Explain.
2. When you get an incompatible crossmatch, discuss the procedures or steps which should be done to obtain compatible units for the patient.
3. What blood group should the “screening cells” be?
4. What are some examples of clinically significant antibodies that commonly occur together?

1. What is meant by the phrase “clinically significant antibody”?
2. What is polyagglutination?
3. Fill in the chart of characteristics of the following common antibodies in regard to temperature, class, enzymes and frequency seen.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Antibody** | **Temperature** | **Class** | **Enzymes** | **Frequency** |
| **Anti-E** |  |  |  |  |
| **Anti-Fya** |  |  |  |  |
| **Anti-P1** |  |  |  |  |
| **Anti-c** |  |  |  |  |
| **Anti-D** |  |  |  |  |
| **Anti-M** |  |  |  |  |
| **Anti-I** |  |  |  |  |
| **Anti-C** |  |  |  |  |
| **Anti-K** |  |  |  |  |
| **Anti-Lea** |  |  |  |  |
| **Anti-Jka** |  |  |  |  |
| **Anti-S** |  |  |  |  |

1. List 4 reasons for mixed-field agglutination
2. Is it possible to have a negative UADT and an incompatible crossmatch? Yes or no. Explain your answer.
3. Is in vitro hemolysis of any significance in blood bank tests? Yes or no. Explain your answer.

1. What is an absorption?

1. What is enzyme treatment of cells? List common antigens that are destroyed. What antibodies would give enhanced reactions with enzyme treated cells?
2. A 4+ incompatibility is seen at R.T., phase of the major crossmatch. What is the most likely problem?
3. In order to increase the sensitivity of the crossmatch, enzyme treatment of the cells should routinely be performed. True or false, explain your answer.
4. What blood should be given to a person of an unknown ABO group in an emergency situation?
5. What is the most common cause of difficulty in crossmatching?

**Study Questions for Transfusion Reactions**

 1. Describe briefly the different types of transfusion reactions

1. What testing is involved in a routine transfusion reaction work-up?
2. What is the most common type of reaction?
3. What is a delayed reaction?
4. What serological test is most definitive in a reaction work-up?
5. What precautions can be taken to prevent hemolytic transfusion reactions?
6. Briefly discuss the role of laboratory personnel in the investigation of reactions in general. Review the Technical Manual and the blood bank reaction work-up form. Specifically review the required and follow-up testing.
7. Read the chapter in the Technical Manual on Transfusion Transmitted Viruses (TTV). Review Lookback procedures associated with TTV.

**Study Questions for Donors**

1. Why is the donor screening process one of the most important steps in protecting the safety of the blood supply?
2. What are the acceptable limits for donors?

Age:

 Weight:

 Pulse:

 Blood pressure:

 Temperature:

 Hematocrit:

1. Briefly describe the steps for arm preparation for blood collection.
2. Describe the general steps for responding to a donor reaction.
3. List 6 different potential donor reactions.

1. 4.

2. 5.

3. 6.

1. Briefly describe the actions taken during the above reactions.
2. What are the testing requirements for allogeneic donations?
3. What additional tests are routinely performed on donor blood?

 When is antibody screening performed on donor units?

1. What is the storage temperature for donor blood?

During transportation?

1. How often can donors undergo platelet pheresis?

If the donor has donated a unit of blood?

1. A donor states he took aspirin the night before. Should platelets be prepared from his blood?

How does aspirin affect platelet function?

1. How long are records kept pertaining to:

Donor information:

Donor ABO/Rh and Antibody Screen:

Donor disease markers:

1. Care of the Donor after phlebotomy. Put the following steps in order:

 \_\_\_\_\_\_\_\_ Give donor instructions about post phlebotomy care.

 \_\_\_\_\_\_\_\_ Have donor remain reclining on bed or donor chair.

 \_\_\_\_\_\_\_\_ Remove needle from vein.

 \_\_\_\_\_\_\_\_ Allow donor to sit up under observation until condition appears satisfactory.

 \_\_\_\_\_\_\_\_ Apply firm pressure with sterile gauze over the point of entry of the needle into

 the vein.

 \_\_\_\_\_\_\_\_ Note on donor record any adverse reactions that occurred.

 \_\_\_\_\_\_\_\_ Thank the donor for an important contribution and encourage repeat donation

 after the proper interval.

1. List 4 things that the phlebotomist should do before beginning collection of a donor unit in order to assure proper donor/unit identification?

1. Briefly describe the four different Special Donor Categories.

**Study Questions for Hemolytic Disease of the Newborn**

1. Define HDN?
2. List the 3 categories of HDN according to severity and their causes:
3. What is the treatment of ABO HDN?
4. What is the treatment for severe HDN in utero and how is blood selected?
5. What is the treatment for severe HDN after birth and how is blood selected?
6. What are the benefits of exchange transfusion?
7. What is Rh Immune Globulin, who should get it and when?
8. Who is not a candidate for RhIg?
9. What tests are performed in case of FMH and briefly discuss?
10. Calculate the dose of RhIg if the Kleihauer-Betke is 1.3%?

**Front Desk Study Questions**

1. What is important to remember when logging in a sample?
2. When and why are patients checked for previous records?
3. When should antibody studies repeated?
4. When should DAT work-ups be repeated?
5. What is done on Sickle Cell patient specimens upon initial visit and why?
6. What is important to remember when signing out blood components?
7. What is the return and reissue policy?
8. What are the anticoagulants/preservatives commonly used in collecting blood? What are their expiration dates?
9. What is 2,3 DPG? How does it affect storage?
10. Why are autologous or directed units requested?

**Component Prep Study Questions**

1. What is a plateletpheresis? What are random donor platelets? What is the expiration date for each?
2. A doctor requests a plateletpheresis for an O+ patient. What group of platelets would you give the patient? Could you give another group?
3. What group of platelets would be compatible with any group recipient? Is Rh important? Prepare a chart for acceptable platelet transfusions.
4. How are platelets stored? What is their expiration date? Once pooled, what is the expiration time for random donor pooled platelets and pooled plateletpheresis?
5. What is an HLA matched plateletpheresis?
6. What are the indications for the use of platelets?
7. Define the following:

Liquid Plasma

Fresh Frozen Plasma

Cryo Poor Plasma

1. A doctor requests 2 units of FFP for a patient who is B, Rh neg, which group plasma would you
select? Could you select another group?
2. What is the “universal donor” group for FFP? Is Rh important? Prepare a chart for
acceptable FFP transfusions.
3. What is the storage temperature of FFP? What is the expiration date?
4. What preparation is done to FFP before it is given? What temperature is used?
5. One, unit of FFP was thawed by mistake, what ABO group person could receive this?
6. Once FFP is thawed, how long is the expiration time?
7. How is plasma labeled that is given a 5 day expiration after thawing?
8. Are platelets and plasma crossmatcbed? Why or why not?
9. What are the indications *for* the use of plasma?
10. What does a “split” unit mean? Would this affect the expiration date?

1. What would you do if you had a whole blood and the doctor wanted red blood cells? Would this affect the expiration date?
2. What happens to the expiration date on any red cell product if the seal on the bag is opened for processing?
3. What is the storage temperature for blood?
4. What is the criteria for component return? If a unit of red cells is returned after more than 20 minutes, what criteria must be met in order for it to be returned to inventory?

1. What are washed red blood cells? What is the expiration date?
2. What is deglycerolized blood? What is the expiration date?
3. What are the indications for use of:
* whole blood
* packed red blood cells
* washed red blood cells
* deglycerolized blood
1. Discuss low titer Group O Whole Blood. (indications, theory)
2. One unit of blood raises the hematocrit by how much? One unit of platelets raises the platelet count by how much?
3. If a donor unit has an unexpected antibody can the unit be used for transfusion? Explain

why or why not.

1. What is cryoprecipitate? (How is it processed?)
2. How is cryo dosage determined?
3. Single Donor Cryoprecipitate is stored at what temperature? For how long?

How is cryoprecipitate thawed?

1. What is the expiration date and storage temperature of a single donor cryoprecipitate after

thawing?

a. single unit:

b. pooled units:

1. What situation(s) would indicate the use of cryoprecipitate?

1. The minimum platelet count per unit in *at* least *90%* of platelet concentrates and phereses should be:

The PH of platelet concentrates in *90%* of units should be:
2. How soon after collection must a platelet concentrate be separated from a red cell?
3. Would it be necessary to transfuse red cells to a 16 year old girl with a Hgb of 11.0 gm/dl with classic hemophilia?
4. Could a platelet transfusion stimulate red-cell antibody production in a recipient? Explain your answer.
5. Should a Leukocyte Concentrate (leukopheresis) be crossmatched prior to transfusion?

 Explain your answer.

1. Why are components irradiated? What components should be irradiated? What components do not require irradiation?

**QC Study Questions**

1. At what temperature are reagents stored?

2. Why are reagents inspected daily?

3. What is the purpose of daily QC?

4. What is the purpose of equipment QC?

 5. What is the purpose of receipt testing?

 6. Why are temperatures of equipment checked daily?

 7. Why are alarms checked daily?

 8. Why is blood checked daily?

 9. Why is the ABO/Rh repeated on blood received from the Red Cross or any outside source?