**CLS Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Note: Each question is worth 4 points unless specified otherwise.**

1. **Case Study**

CP, a 60 year old male of European ancestry, was admitted with chest pain and shortness of breath. There is no record of him in the transfusion service. His hemoglobin level is 8.2 g/dL and his hematocrit is 24%. Two units of leukoreduced RBC are ordered for transfusion when ready. Pretransfusion testing follows.

ABORh Typing:

|  |  |
| --- | --- |
| Forward Typing | Reverse Typing |
| Anti-A | Anti-B | Anti-D | A1 cells | B cells |
| 4+ | 0 | 3+ | 0 | 4+ |

Antibody Detection Test:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | RH | MNS | LU | P | LEWIS | KELL | Duffy | KIDD | PEG |
|  | D | C | E | c | e | f | M | N | S | s | Lua | Lub | P1 | Lea | Leb | K | k | Fya | Fyb | Jka | Jkb | IS | 37C | IAT |
| 1 | + | + | 0 | 0 | + | 0 | + | + | + | + | 0 | + | + | + | 0 | + | + | + | 0 | + | + | 0 | NH | 3+ |
| 2 | + | 0 | + | + | 0 | 0 | + | 0 | + | 0 | 0 | + | + | 0 | + | 0 | + | 0 | + | + | 0 | 0 | NH | 3+ |

1. What is CP’s ABO type?
	1. Group O
	2. Group A
	3. Group B
	4. Group AB
2. What is CP’s RH type?
	1. D+
	2. D-
	3. Weak D+
	4. Cannot determine with the data provided
3. Given the results of the antibody detection test, what hypothesis can be generated?
	1. One or more alloantibodies are present
	2. One or more autoantibodies are present
	3. Both A and B are potential solutions
	4. Neither A nor B is supported by the evidence
4. Of the following, which would be the MOST informative step to be performed next?
	1. Test a routine antibody identification panel using polyethylene glycol (PeG)
	2. Repeat the antibody detection test using three cell screen
	3. Test a routine antibody identification panel using a low-ionic-strength saline indirect antiglobulin test (LISS IAT)
	4. Repeat the antibody detection test using LISS IAT

**Panel 1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **RH** | **MNS** | **LU** | **P** | **Lewis** | **Kell** | **Duffy** | **Kidd** | **PeG** |
|  | **D** | **C** | **E** | **c** | **e** | **f** | **M** | **N** | **S** | **s** | **Lua** | **Lub** | **P1** | **Lea** | **Leb** | **K** | **k** | **Fya** | **Fyb** | **Jka** | **Jkb** | **IAT** |
| **1** | **+** | **+** | **0** | **0** | **+** | **0** | **+** | **+** | **+** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **+** | **0** | **3+** |
| **2** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **0** | **0** | **+** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **3+** |
| **3** | **+** | **0** | **+** | **+** | **0** | **0** | **0** | **+** | **0** | **+** | **0** | **+** | **0** | **0** | **0** | **+** | **0** | **+** | **0** | **0** | **+** | **3+** |
| **4** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **0** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **1+** |
| **5** | **+** | **0** | **+** | **+** | **0** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **+** | **+** | **0** | **0** | **+** | **+** | **0** | **+** | **0** | **0√** |
| **6** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **+** | **+** | **3+** |
| **7** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **0** | **+** | **0** | **+** | **+** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **3+** |
| **8** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **+** | **0** | **+** | **0** | **0** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **3+** |
| **9** | **+** | **+** | **0** | **+** | **+** | **+** | **+** | **0** | **+** | **0** | **0** | **+** | **+** | **+** | **0** | **0** | **+** | **0** | **+** | **+** | **+** | **3+** |
| **10** | **+** | **0** | **+** | **+** | **0** | **0** | **0** | **+** | **+** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **+** | **0** | **0** | **+** | **3+** |
| **11** | **+** | **0** | **0** | **+** | **+** | **+** | **+** | **0** | **0** | **+** | **0** | **+** | **0** | **0** | **0** | **0** | **+** | **0** | **0** | **+** | **0** | **1+** |
| **AC** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **0√** |

1. Based on the combined results of the antibody detection and identification (Panel 1) tests, which of the following appears to be present?
	1. One or more alloantibodies to common antigens
	2. Antibody to low prevalence antigen
	3. Antibody to high prevalence antigen
	4. Autoantibody
2. What antibody specificity(ies) can be ruled out?
	1. Anti-D, -Lea, -Fya, and –Jka
	2. Anti-D, -Lea, -Fya, and –S
	3. Anti-Lea, -Fyb, -Jka, and –s
	4. Anti-Lea, -Fyb, and –Jkb
3. What testing should be performed next?
4. Panel tested using LISS IAT
5. Selected cells tested using PeG IAT
6. Panel of Ficin treated cells
7. Panel tested using Gel

**Panel 2 – Ficin Treated Cells**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **RH** | **MNS** | **LU** | **P** | **Lewis** | **Kell** | **Duffy** | **Kidd** | **Ficin** |
|  | **D** | **C** | **E** | **c** | **e** | **f** | **M** | **N** | **S** | **s** | **Lua** | **Lub** | **P1** | **Lea** | **Leb** | **K** | **k** | **Fya** | **Fyb** | **Jka** | **Jkb** | **IAT** |
| **1** | **+** | **+** | **0** | **0** | **+** | **0** | **+** | **+** | **+** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **+** | **0** | **0√** |
| **2** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **0** | **0** | **+** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **3+** |
| **3** | **+** | **0** | **+** | **+** | **0** | **0** | **0** | **+** | **0** | **+** | **0** | **+** | **0** | **0** | **0** | **+** | **0** | **+** | **0** | **0** | **+** | **3+** |
| **4** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **0** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **2+** |
| **5** | **+** | **0** | **+** | **+** | **0** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **+** | **+** | **0** | **0** | **+** | **+** | **0** | **+** | **0** | **0√** |
| **6** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **+** | **+** | **2+** |
| **7** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **0** | **+** | **0** | **+** | **+** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **3+** |
| **8** | **0** | **0** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **+** | **0** | **+** | **0** | **0** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **2+** |
| **9** | **+** | **+** | **0** | **+** | **+** | **+** | **+** | **0** | **+** | **0** | **0** | **+** | **+** | **+** | **0** | **0** | **+** | **0** | **+** | **+** | **+** | **2+** |
| **10** | **+** | **0** | **+** | **+** | **0** | **0** | **0** | **+** | **+** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **+** | **0** | **0** | **+** | **0√** |
| **11** | **+** | **0** | **0** | **+** | **+** | **+** | **+** | **0** | **0** | **+** | **0** | **+** | **0** | **0** | **0** | **0** | **+** | **0** | **0** | **+** | **0** | **2+** |
| **AC** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **0√** |

1. What additional antibody specificity(ies) can be ruled out using the results from Panel 2?
2. Anti-e, -C, -f, and –S
3. Anti-e, -C, -Leb, and -Jkb
4. Anti-e, -C, -Leb, and –Fyb
5. Anti-e, -C, -K, and -Jkb
6. What additional antibodies have NOT been eliminated?
7. Anti-f, -M, -N, -S, -K, and –Fyb
8. Anti-S and –K
9. Anti-f, -S, and –K
10. Anti-K, -s, and –f
11. Given the results of the two panels and the antibody detection test, which of the the following antibodies or antibody combinations would you consider to be the MOST likely hypothesis?
12. Anti-e
13. Anti-f and –K
14. Anti-e and –Jkb
15. Anti-f, -S, and –K
16. What testing should be chosen next?
17. Panel tested using LISS IAT
18. Selected cells tested using PeG IAT
19. Panel of Ficin treated cells
20. Panel tested using Gel

**Panel 3**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **RH** | **MNS** | **LU** | **P** | **Lewis** | **Kell** | **Duffy** | **Kidd** | **PeG** |
|  | **D** | **C** | **E** | **c** | **e** | **f** | **M** | **N** | **S** | **s** | **Lua** | **Lub** | **P1** | **Lea** | **Leb** | **K** | **k** | **Fya** | **Fyb** | **Jka** | **Jkb** | **IAT** |
| **1** | **+** | **+** | **0** | **0** | **+** | **0** | **+** | **+** | **+** | **0** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **+** | **0** | **3+** |
| **2** | **+** | **+** | **0** | **0** | **+** | **0** | **+** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **3+** |
| **3** | **+** | **0** | **+** | **+** | **0** | **0** | **0** | **+** | **0** | **+** | **0** | **+** | **+** | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **0** | **3+** |
| **4** | **+** | **0** | **+** | **+** | **0** | **0** | **0** | **+** | **0** | **+** | **0** | **+** | **0** | **0** | **0** | **0** | **+** | **0** | **+** | **0** | **+** | **0√** |

1. Given the data from Panel 3 combined with the results in Panel 1, Panel 2, and the antibody screen, what antibody specificity(ies) is (are) MOST likely responsible for the reactivity noted?
2. Anti-K
3. Anti-S and –K
4. Anti-c and –E
5. Anti-f, -K, and –S
6. Given the combined serologic data, what antibody has NOT been ruled out?
7. Anti-M
8. Anti-Fyb
9. Anti-N
10. Anti-Jkb

**Table 1. CP’s Phenotype Results:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Red Cells Tested** | **Anti-C** | **Anti-E** | **Anti-c** | **Anti-e** | **Anti-S** | **Anti-K** |
| **CP** | 3+ | 3+ | 3+ | 3+ | 0 | 0 |
| **Positive Control** | 3+ | 3+ | 3+ | 3+ | 3+ | 3+ |
| **Negative Control** | 0 | 0 | 0 | 0 | 0 | 0 |

1. The CLS phenotyped the patient’s red cells to provide confirmatory evidence to support the hypothesized specificities. Given the results of the antigen typing (Table 1), what can be concluded?
2. Anti-f is not supported by the data
3. Anti-K is not supported by the data
4. Anti-S is not supported by the data
5. The hypothesis is fully supported by the data
6. The CLS must antigen type donor cells to identify units for transfusion to the patient. Which antigens should be tested for?
7. f-, K-, and S-
8. c-, K-, and S-
9. K-, S-, and M-
10. c-, K- extended crossmatched compatible
11. **Short Answer Section (10 questions) 4 points each**
12. Patient has no historical ABORh, no recent RBCs transfusion nor BMT/SCT. What is the 1st choice of PRBCs to give for transfusion based on the following Type & Screen results (assuming that DBCK results are concordant)?

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Forward Typing** | **Reverse Typing** | **ABSC w AC** |
|  | **Anti-A** | **Anti-B** | **Anti-D** | **A1 cells** | **B cells** | **I** | **II** | **III** | **AC** |
| IS | 0 | 4+ | 4+ | 0 | 0 | 0 | 0 | 0 | 0 |
| RT | 0 | 4+ | 4+ | 0 | 0 | 0 | 0 | 0 | 0 |
| 4°C | 0 | 4+ | 4+ | 0 | 0 | 0 | 0 | 0 | 0 |

1. O Pos
2. B Pos
3. O Neg
4. AB Neg

SFOWI-**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Title **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Select all correct answers for Cord Blood Interpretations.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mother’s Rh type | Cord Blood Reaction with anti-D | Cord Blood Rh Interpretation | DAT result | Result Comments | Result Note |
| a. Pos or Neg | Weak D Pos | Positive | Negative | None | SF\_MOM |
| b. Pos or Neg | Weak D Pos | Indeterminate | Negative | SF\_WKD | SF\_MOM |
| c. Pos or Neg | Weak D Pos | Indeterminate | Negative | SF\_DU | SF\_MOM |
| d. Pos or Neg | Neg at IS | Indeterminate | Positive | SF\_CD1 | SF\_MOM |
| e. Pos  | 3+ to 4+ MF | Indeterminate | Negative | SF\_CD1 | SF\_MOM |
| f. Neg  | 3+ to 4+ MF | Pos | Negative | SF\_CD1 | SF\_MOM |
| g. Pos or Neg | Neg at IS | Indeterminate | Positive | SF\_CD2 | SF\_MOM |
| h. Neg  | 3+ to 4+ MF | Pos | Negative | None | SF\_MOM |

1. c, e, g, h
2. b, c, d, f, g
3. b, d, f, g
4. a, d, f, g, h
5. What is the correct pipetting technique for performing Gel ABSC?
6. Pipet 50 mL of plasma at 450 angle into the microtube. Then pipet 25 mL of 0.8% antibody screen cell suspensions straight down into the same microtube.
7. Pipet 50 mL of 0.8% antibody screen cell suspensions at 450 angle into the microtube. Then pipet 25 mL of plasma straight down into the same microtube.
8. Pipet 25 mL of plasma at 450 angle into the microtube. Then pipet 50 mL of 0.8% antibody screen cell suspensions straight down into the same microtube.
9. Pipet 25 mL of 0.8% antibody screen cell suspensions at 450 angle into the microtube. Then pipet 50 mL of plasma straight down into the same microtube.
10. Select all true statements for LISS tube testing.
11. Weaker reactions may be obtained if tests are incubated **less** than 10 minutes or **more** than 30 minutes.
12. Microscopic examination is discouraged when using LISS Ortho Antibody Enhancement Solution.
13. The ionic strength of the test system is dependent on the amount of serum used.
14. Addition of LISS to red cells prior to the addition of serum/plasma may lead to slight hemolysis of the red cells.
15. a, b, c, d
16. a, c
17. b, c, d
18. a, c, d
19. Patient A’s current ABSC is negative with no ABORh discrepancy. IAT crossmatch (same method as the ABSC) is performed because patient has anti-E. One out of the two E negative group compatible crossmatched pRBC is incompatible. What are the possible explanations for the incompatible crossmatch?
20. Patient has an antibody to a low incidence antigen on the donor pRBC.
21. High protein in the patient’s plasma.
22. Donor pRBC has a positive DAT.
23. Donor pRBC is really E positive.
24. a, b, c, d
25. a, c
26. b, c, d
27. a, c, d
28. What are your compatibility options if anti-A1 is identified with no other current or historical antibody?
29. Immediate spin crossmatch group AB donor pRBC
30. Immediate spin crossmatch group O donor pRBC
31. IAT crossmatch type specific donor pRBC
32. IAT crossmatch group A donor pRBCs
33. a, b, c, d
34. a, c
35. b, c, d
36. a, c, d
37. If anti-M is suspected to be the cause of HDN in an anemic newborn, what is the crossmatch requirement for RBC transfusion if ordered?
38. IAT crossmatch compatible group O donor pRBC
39. IAT crossmatch compatible M negative group O donor pRBC
40. IAT crossmatch compatible DD pRBC donated by father
41. IAT crossmatch compatible ficin treated donor pRBC
42. a, c
43. b
44. a, c, d
45. b, c
46. What are the characteristics of I antigen?
47. Decrease expression is associated with certain diseases e.g. leukemia, sickle cell disease, CHAD etc.
48. Decrease expression is seen in pregnancy.
49. Weakened expression on cord cells.
50. Not expressed on adult cells with i phenotype.
51. a, b, c, d
52. a, b, c
53. b, c, d
54. a, c, d
55. What are the possible causes of the reactions seen in the circled microtubes (below) of an IgG gel card?



* 1. 4+ reaction with some unagglutinated red cells.
	2. Improper mixing of the red blood cells with the plasma sample in the microtube.
	3. Red blood cells trapped within a large fibrin aggregate.
	4. Mixed field reaction.
1. a, b, d
2. b, c, d
3. a, b, c, d
4. a, c, d
5. Does the following patient qualifies for electronic crossmatch?

Current TS done at SFO

Current ABSC = Negative

2 concurrent ABORh

BB comments: Anti-M identified in 2005



1. Yes
2. No