

PathMD™: Board Review Letter

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Blood Bank – Part 1 (Answers)

Volume 1, Number 1

Question 1: Answer is D. Statement A is right but is only a historical fact and does not explain the significance of ABO system. Statement B and C are not correct as we know that anti-A and anti-B are usually IgM and naturally occurring antibodies. Answer to this question is D and which explains the significance of naturally occurring anti-A and Anti-B being complement binding and reacts at 37° thus can cause intravascular hemolysis e.g. hemolytic transfusion reaction following mismatched transfusion and also responsible for hyperacute rejection following ABO mismatched solid organ transplantation.

Question 2. Answer is A. This question pertains to basic biochemistry of ABO system and one should carefully learn and understand that ABO antigens are indirect gene product. Carbohydrate antigens are formed due to action of glycosyltransferases which are the gene products of ABO system. Different ABO genes code for the different glycosyltransferases and transfer different sugars determinant to basic carbohydrate chains. E.g. Fucosyltransferase produced by H gene is responsible for basic H substance, N-acetyl-D-galactosaminyltransferase for group A antigen and D-galactosyltransferase for B antigen. This will also help with question 4 and 8 which are formatted differently to test the same knowledge. Answer for question 4 is B and answer for question 8 is C.

Question 3. Answer is A. There are 4 different basic carbohydrate chains as represented in different choices of the answer. Two important chains are type 1 present in saliva and secretions, and type 2 chains present on red cells. The enzyme gene products of different genes can act preferentially on one or other chain and thus responsible for the expression of different antigen in secretion or on the surface of red cells. The enzyme produced by the Se gene is Fucosyltransferase and it acts on type 1 chain in saliva and secretions while fucosyl transferase produced by the H gene acts on the type 2 chains on the red cells.

Question 4. Answer is B. The glycosyltransferase produced by A gene is N-acetyl-D-galactosaminyltransferase which is responsible for putting the N-acetyl-D-galactosamine or A antigen sugar. Sugar determinant for the B antigen is D-galactose.

Question 5. Answer is D. The frequency of Anti-A1 in A₂ individual is 1-5% and in A₂B individuals is up to 25%. Thus the correct answer is D i.e. 25% of A₂B individuals.

Question 6. Correct answer is D i.e. all the statements are true and answer E is a distracter. As we know that in most infants anti-A and Anti-B is demonstrable by 3-6 months thus any detectable anti-A and anti-B in cord blood is passively transferred from mother's serum and of maternal origin.

Question 7. Correct answer is B. Anti-H activity is present in the lectin from *Ulex europaeus* while *Dolichos biflorus* is anti-A1 lectin and lectin from *Glycin soja* is used in differential of polyagglutinability of red cells due to T activation. Lectin of *Ulex europaeus* will be useful in investigation of Bombay blood group.

Question 8. Correct answer is C. The sugar at the mark site is fucose due to H gene while galactose the B group antigen determinant sugar due to enzyme galactosyl transferase is put at □1-3 site of type 2 chain. This question is a deviation from a usual way of direct questions where traditionally sugars of group A and B antigens are asked and can be confused, if careful attention is not paid.

Question 9. Correct answer is D. The careful study of pedigree tree will confirm the proband is Bombay group as the children's are expressing B antigen which could only come from mother. The mother is not expressing B antigen because she is *hh* (Bombay blood type) and though genetically B as evident from children, could not express B due to lack of precursor H substance.

Question 10. Correct answer is D. All the statements for the anti-Le antibodies are correct and should be remembered, The question may appear on the board testing the significance of this antibody in hemolytic disease of newborn and in transfusion practices.

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Question 11. Correct answer is C. All the other statement are not correct as the Anti-I antibody is common cold reactive autoantibody at a titer of ≤ 64 . It can be responsible for the cold agglutinin disease when high titer ($>1:1000$) and acts at high thermal amplitude with complement binding. It is seen in association with *Mycoplasma pneumoniae* infection. Infectious mononucleosis is associated with anti-i.

Question 12. Correct answer is B. Neutralization of antibodies is one of the ways of confirmation of specificity of some of the commonly observed and mostly clinically insignificant antibodies. The questions are common and formatted in many different ways and following table may help in solving these questions.

Antibody	Neutralized by
Le	Secretor Saliva
P	Hydatid cyst fluid or pigeon egg
Chido/Roger	Plasma
Sd ^a	Urine from guinea pig or Sd ^a positive human

Question 13. Correct answer is B. Anti-PP1Pk is an antibody seen in rare individual with very rare 'p' phenotype seen in one in 5.8 million and associated with abortion early in pregnancy. This is hemolytic antibody and is responsible for hemolytic transfusion reaction and hemolytic disease of newborn.

Question 14. Correct answer is B. Antibody associated with paroxysmal cold hemoglobinuria (PCH) is Donath-Landsteinter antibody which are biphasic hemolysin that means antibody binds red cells at low (room) temperature and causes hemolysis at body temperature. This antibody has anti-P specificity.

Question 15. Correct answer is D and E is a distracter. P is receptor for all the listed pathogens in the question.