4. Immunity and Blood Groups

Exercise Questions

1. Question

Cells applied in defence mechanism, are not found in :

A. Bone marrow

B. Liver

C. Stomach

D. Lymph node

Answer

The cellular barrier of the innate defence mechanism contains cells involved in destructive processes, such as macrophages, neutrophils, monocytes, etc. and cytotoxic cells like natural killer cells. These cells are found in organs such as liver, bone marrow and lymph nodes, but are absent in stomach.

2. Question

Plasma cell is transformed form of following cell :

A. B-lymph cell

B. T-lymph cell

C. Neutrophil

D. Both (a) and (b)

Answer

Plasma cells are white blood cells, originating in bone marrow. They are differentiated B-cells , which secrete large amounts of antibodies.

They are not formed from T- lymph cell or neutrophils.

3. Question

Antigenic determinants are found in which of the following :

A. Antigen

B. IgG Antibody

C. IgM antibody

D. Plasma cell

Answer

Antigenic determinants, also called epitope, are specific binding sites on an antigen. These are the sites on the surface of an antigen, which is recognised by a single antibody , i.e. immunoglobulin. There are more than one antigenic determinants on an antigen, each recognised and binding specifically to only one antibody.

4. Question

First produced antibody is :

A. IgG

B. IgM

C. IgD

D. IgE

Answer

There are five types of antibodies in the human body. Each antibody has a specific property. IgM antibody has a pentameric structure, and it is the first antibody to be produced in response to an antigen.

5. Question

Which antibody is found in mother's milk?

A. IgG

B. IgM

C. IgD

D. IgA

Answer

Amongst the five types of antibodies in human body, only IgA is found in mother's milk. It is a dimeric antibody , and is very important for providing immunity to the infant.

6. Question

Which of the following cells are not found in blood?

A. Red blood cells

B. White blood cell

C. B-lymph cell

D. Epithelial cells

Answer

The cellular or formed elements of blood contain red blood cells, white blood cells and platelets. B-lymph cell is type of white blood cell. Epithelial cells are the cells that form the surface lining of the body, and these layers lack blood vessels. They are not found in blood.

7. Question

Who classified blood in different blood groups?

A. Louis Pasteur

B. Karl Landsteiner

C. Robert Koch

D. Edward Jenner

Answer

In 1901, Karl Landsteiner classified blood in different blood groups, based on the presence or absence of surface antigens on the surface of red blood cells.

8. Question

Universal donor blood group is :

A. A

B. AB

C. O

D. B

Answer

The people with blood group O can donate blood to anyone, and are called universal donors. This is because the red blood cells in O blood group don't have any surface antigen . So, in the recipient blood, no antibodies are formed in response making it safe for transfusion.

Blood group A has antigen A, blood group B has antigen B and blood group AB has both antigens A and B. All these types of blood groups will produce antibodies in the recipient blood.

9. Question

The main reason of erythroblastosis foetalis is :

A. Blood Transfusion in baby

B. Rh-anomaly

C. ABO anomaly

D. Both (a) and (b)

Answer

Rh-anomaly takes place during pregnancy, if the mother is Rh- negative, but the foetus is Rh-positive. In such case, Rh antibodies are produced in the mother's blood against the foetal antigen, when it gets mixed with the foetal blood during pregnancy. The first pregnancy, may be normal. But, this condition can complicate the second pregnancy and cause haemolysis in the second child. This condition is called erythroblastosis foetalis.

10. Question

Which is used in autogenic transfusion of blood :

A. Person's own stored blood

B. stored blood of others

C. Stored blood of sheep

D. Both (a) and (b)

Answer

'Auto' means self and 'genic' means produced . Hence, in autogenic transfusion of blood, a person's own stored blood is used. Stored blood of others is used in allogeneic transfusion. Generally, sheep blood is not used for transfusion in human body.

11. Question

Which disease does not occur due to carelessness during blood transfusion?

A. Hepatitis B

B. Malaria

C. Haemolysis

D. Creutzfeldt-Jakob disease

Answer

Malaria is a vector transmitted, plasmodium infection, which can rarely be caused during blood transfusion.

12. Question

Which blood group is result of homozygous recessive gene interactions?

A. ’A’ Blood Group

B. ’B’ blood group

C. ’O’ blood group

D. ’AB’ blood group

Answer

The inheritance of blood group in human ABO system depends on three alleles of one gene. Two dominant alleles, I^A and I^B and one recessive allele, i, make up six combinations of genotype, determining four phenotypes of blood group. Amongst them, the pair of recessive alleles, ii denotes blood group O , which has no surface antigen on RBC.

13. Question

Which one of the following is not an application of heredity in blood groups?

A. Treatment of haemophilia

B. Treatment of malaria

C. Treatment of Dengue

D. Both (b) and (c)

Answer

Hereditary of blood groups is applied in treatment of diseases like haemophilia, which have a genetic basis of inheritance. Dengue and malaria are infectious diseases and don’t have a genetic inheritance. Thus, blood group hereditary is not applicable in their treatment.

14. Question

’Organ Donation day’ is celebrated on which day in India?

A. 13 September

B. 13 August

C. 13 May

D. 13 June

Answer

To spread awareness and encourage more number of people for organ and body donation, the Indian government celebrates 'Organ Donation Day' on 13 August every year.

15. Question

The Number of organ donating persons in India is(per ten lakhs) :

A. 0.1

B. 2.0

C. 0.8

D. 1.8

Answer

In India, the number of organ donating persons is very less, only 0.8 per ten lakhs. This is because of the stereotypical and orthodox beliefs of people.

16. Question

How many types of defence mechanism are found in human being body?

Answer

There are two types of defence mechanisms found in human body:

1. Innate defence mechanism, which is congenital and non specific in nature. It includes different barriers like physical, chemical , cellular barrier.

2. Acquired defence mechanism, which a person acquired during his/her lifetime by the attack of a microbe or a foreign substance. It is specific in nature.

17. Question

What are the type of antibodies?

Answer

On the basis of the type of heavy chain present, the human immune system has five types of antibodies. They are : IgG, IgM, IgA, IgE and IgD, and contain gamma , mu, alpha, epsilon and delta heavy chains respectively. IgM is a pentameric structure and IgA has a dimeric structure. Rest all are monomeric.

18. Question

What should be the molecular weight of antibody?

Answer

The molecular weight of antibodies is around 150kDa . This comprises the weight of two heavy chains, each weighing around 50kDa, and two light chains of 25kDa each.

19. Question

Which type of proteins are contained in antibodies?

Answer

Antibodies or immunoglobulins, are gamma globulin proteins , which are formed in plasma cells . These plasma cells are found in blood and body fluids of an organism.

20. Question

Which antibody can reach in embryo by passing through placenta?

Answer

IgG antibody, which is found in highest concentration in the body, is the only antibody that can cross placenta . It reaches the embryo and provides initial immunity to the growing embryo.

21. Question

Write name of the antibody found on mast cell.

Answer

IgE is the antibody which is found on mast cell. It is responsible for the body's response during an allergy.

22. Question

Which cell present in blood is associated with gaseous exchange?

Answer

The red blood cells or RBCs present in blood are responsible for transportation and exchange of gases. This is due to the presence of haemoglobin in them.

23. Question

Classification of blood was done by which scientist?

Answer

Karl Landsteiner, in 1901 classic blood into different blood groups, based on the presence or absence of an antigen on the surface of red blood cells.

24. Question

Which blood group is universal donor?

Answer

Blood group O is a universal donor as it lacks both antigens A and B, and hence produces no antibodies in response in the recipient blood.

25. Question

In which blood group both ‘A’ and ‘B’ antigens are found?

Answer

Both antigens A and B are found in blood group AB . Such individuals are universal acceptors.

26. Question

Nearly how many percentage of people in world have Rh-positive blood?

Answer

Around 85% of people in the world have Rh positive blood groups.

27. Question

Which Rh-factor is most important?

Answer

Rh factor D is the most important and most frequently found antigen in human species. It is important because it the most immunogenic of all Rh factors.

28. Question

Who accomplished first blood donation?

Answer

Dr Jean Baptiste Denis performed the first blood transfusion in a fifteen year old child. It was accomplished on 15 June, 1667 in France, where Dr Denis used sheep blood for transfusion.

29. Question

What is allogenic transfusion?

Answer

During blood transfusion, when the stored blood of some other person is used for transfusion in the recipient, the method is called allogenic transfusion of blood.

30. Question

Write the names of alleles determining blood group.

Answer

There are three alleles of a single gene which determine the blood group of a person . The two dominant alleles are I^A and I^B . The recessive allele is denoted as I^O or i.

31. Question

When organ donation day is celebrated in India?

Answer

Organ donation day is celebrated every year on 13 August in India. It is an initiative by the government of India to spread awareness regarding the importance of donation of organs and body.

32. Question

Write the names of two persons who donated their body recently.

Answer

Former chief minister of West Bengal, Sh. Jyoti Basu and novelist Dr Vishnu Prabhakar have donated their bodies, recently.

33. Question

Define antibody.

Answer

Antibodies or immunoglobulins are gamma globulin proteins formed in the plasma cells of blood and body fluids. They are responsible for recognising, interacting and inactivating the antigen or foreign substances which enter the body. The part of antibody which specifically reacts with the antigen is known as paratope.

34. Question

What is antigenic determinant?

Answer

Antigenic determinants are the specific sites on an antigen , where a particular antibody binds to it. These are the sites of recognition of the antigen by the antibody. There can be more than one antigenic determinants on a single antigen, but each determinant binds specifically to one antibody only. Antigen determinants are also called epitope.

35. Question

What is meant by ‘hinge’ in antibodies?

Answer

The Y shaped structure of most antibodies presents a flexible origin of both arms , called hinge. It is present in the constant region . This flexibility of the hinge allows the antibody to accommodate large molecules of antigen .

36. Question

What is blood?

Answer

Blood is a liquid connective tissue which flows in blood vessels. It is a red and viscous liquid containing plasma and formed elements. The formed elements include cells like red blood cells, white blood cells and platelets.

137. Question

Explain ABO blood grouping.

Answer

In 1901, Karl Landsteiner classified blood into four blood groups. This system is called ABO system. It is based on the presence or absence of a surface antigen, on the surface of red blood cells. According to this, there are four blood groups, A , B, AB and O. The A blood group has A antigen, B blood group has B antigen. AB has both whereas O blood group has no antigen on RBC surface.

38. Question

What is Rh-factor? Explain its importance.

Answer

Rh or rhesus factor is also a surface antigen on human red blood cells. It was first discovered in a monkey, named Macaca rhesus. It is a 417 amino acid containing protein and is of five types in humans . Rh factor type D is the most immunogenic, frequent and the most important of all. Nearly 85% population in the world is Rh positive.

39. Question

What is blood donation? Explain.

Answer

When a person allows voluntarily allows his /her blood to be drawn out of body, and be used for transfusion in some other person's circulatory system, it is known as blood donation. Donation can be either of the whole blood , or a part or product of blood such as platelets, plasma , etc.

40. Question

Write about precautions which should be taken care of during blood transfusion.

Answer

The following precautions should be taken during transfusion of blood:

1. ABO antigens of the donor and recipient must be matched.

2. Rh antigen of the donor and recipient must be matched.

3. The donor's blood should be free from pathogens and harmful substances.

4. Collected blood must be stored in cold storage after desirable processes.

5. Collection and transfusion must be done in presence of a doctor only.

6. The collected blood must be prevented from any pollution.

41. Question

Explain about the need for organ donation.

Answer

Donation is the giving of an **organ** and tissue to help someone that needs a **transplant**. **Transplants** can save or transform the life of a person, the need for organ donation are:

1. The transplant of organs like a kidney, heart, eyes from a brain death person to a needy person in eight hours from death can give another person a new life to live.

2. The organ donation helps to improve the standard of medical education. Thus creating good doctors for society.

42. Question

Explain the genotypes responsible for ABO blood groups.

Answer

There are six genotypes responsible for four types of blood groups of ABO system. These genotypes are a result of combination of three alleles, namely I^A, I^B and i. The combination of alleles and their phenotypes associated are as follows :

GENOTYPE	PHENOTYPE
$I^A I^A$	A
$I^A i$	A
$I^B I^B$	B
$I^B i$	B
$I^A I^B$	AB
ii	O

43. Question

Explain the structure of antibodies.

Answer

The structure of an antibody is similar to the alphabet Y. It has two heavy chain, each containing 440 Amino acids, and two light chains , containing 220

amino acids each. One heavy and one light chains join by disulphide bonds to form a dimer. Two such dimers form equal halves of the antibody structure. Both these dimers are joined to each other by disulphide bonds. Each heavy and light chain has two zones,

1. Variable region, also called the Fab part, is present near the amino end. It interacts with the antigen.

2. Constant region, also called the Fc part, is present near the carboxy end . It contains the hinge and allows accommodation of large molecule of antigen.

44. Question

Explain erythroblastosis foetalis.

Answer

● Erythroblastosis foetalis is a haemolytic disease of the new-born , arising due to anomaly in the Rh factor. During pregnancy, if the mother is Rh negative and the foetus is Rh positive, then the maternal body produces antibodies against the foetal antigen. This is due to the mixing of maternal and foetal blood during delivery. The first child is though, born normally.

● Complications arise when in the second pregnancy too, the foetus is Rh positive in a Rh negative mother. This time, the performed antibodies interact with the Rh antigen on the surface of red blood cells of foetus. It leads to haemolysis of the foetal blood due by blood agglutination method, cause destruction you RBCs , and ultimately death of foetus in the mother's womb. Even if the child takes birth, he /she remains weak, and is infected with hepatitis.

45. Question

How the process of blood transfusion is conducted?

Answer

The process of blood transfusion is conducted in two sections.

The first section is blood collection. In this,

1. Health check up of the donor is performed first.

2. Blood is collected from the donor using a cannula of appropriate capacity, in a sterilized pouch which contains anticoagulant.

3. This collected blood is kept in cold storage, to slow down bacterial growth and cellular metabolism.

4. Stored blood is tested for matching of ABO and Rh antigens, and also for hepatitis B, hepatitis C HIV, etc.

5. After blood collection, the donor is kept under observation and is provided medical assistance in order to avoid or cure donation related reactions , if

any occur.

The second section is the transfusion of stored blood. In this,

1. The recipient's blood is matched completely with the donor's blood for ABO, Rh antigen, etc.

2. The stored blood is taken out around half an hour before transfusion

3. Blood is administered intravenously to the recipient ,using a cannula. The process takes around 4 hours.

4. Patient is provided medical assistance to reduce transfusion related reactions, such as fever, pain, cold, irregular heartbeat, etc.

This way blood is transfused from a donor to a recipient.

46. Question

What is organ donation? State its importance.

Answer

● Organ donation is the process of surgical removal of an organ or tissue from the body of a donor, in order to transplant the same into the body of a recipient on need , legally with consent of the donor . Organ donation is a very noble act. It allows the organs of a dead person to be used to prolong and enhance the life of a living human being, whose self organ(s) is damaged due to injury or disease.

● Organ donation is very important. Every year , around two lakh kidneys are required to be donated in India . But, the number received is just 7000 -8000. The number of heart , liver and other organs is even less. Due to this, thousands of people die , suffering from organ failure and lack of organs for transplantation. This condition can be made better by donating organs.

The government of India celebrates Organ donation day on 13 August every year, to spread awareness regarding this noble cause.

47. Question

Discuss the importance of heredity in blood groups.

Answer

Blood group of an individual is determined by the combination pair of alleles inherited from parents. The three alleles, form six genotypic combinations, which give four phenotypes of blood groups. This hereditary pattern of blood grouping follows Mendel's pattern of inheritance.

The hereditary in blood groups is important due to various reasons, like:

1. It is useful in solving paternal controversies, and determines the genetic parents of an individual.

2. Matching of blood groups is essential before blood transfusion.

3. It is useful in understanding the genetic basis of diseases such as haemophilia and haemolysis, and thus helps in their better treatment.