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00053297

Q. P. Code:

SYBSc in Biotechnology sem III Examination

Model Answers Biotechnology – USBT303 Immunology ~~Set III~~

Q 1 Do as directed (Any fifteen)

15

- 1 Classical complement pathway is initiated by \_\_\_\_\_ (antigen-antibody reaction)
- 2 What are CTL? (cytotoxic T lymphocytes, They have ability to recognise & eliminate altered self cells./ Tc cells are activated when they interact with an antigen-class MHC complex on the surface of altered self cells in presence of appropriate cytokines. This activation, which results in proliferation, causes Tc cells to differentiate into CTL)
- 3 State role of mast cells (They have large numbers of cytoplasmic granules that contain histamine & other pharmacologically active substances. They together with blood basophils play important role in development of allergies.)
- 4 State true or false : dendritic cells function as antigen presenting cells (True)
- 5 What is the site for T cell maturation (Thymus)
- 6 Give an example of a cell which contains vesicles with histamine (Mast cells, Eosinophils)
- 7 What is the function of spleen? (Spleen plays major role in mounting immune response to antigens in the blood stream.)
- 8 Name two cells which carry MHC class II molecules (Macrophages, B cells, Dendritic cells)
- 9 State true or false : B cell receptor binds to antigens (True)
- 10 Fill in the blank : Peptide binding cleft of MHC class I is made of \_\_\_\_\_ and \_\_\_\_\_ domains ( $\alpha 1$  &  $\alpha 2$ )
- 11 State true or false : Antigen recognition by  $CD4^+$   $T_H$  cells is MHC class II restricted (True)
- 12 State true or false : Pro- B cells express a transmembrane tyrosine phosphatase called CD45R (True)
- 13 State true or false : immature B cells secrete antibodies (False)

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- 14 State true or false: More than one Fab site should be available to react with an antigen (True)
- 15 Radial immunodiffusion is also known as \_\_\_\_\_ method. (Mancini method)
- 16 RBCs of which animal is used in complement fixation test? (Sheep RBC)
- 17 State one difference between direct and indirect coombs test (In direct Coomb's test mother is already sensitized and it detects immunoglobulin already bound to RBC and its one step reaction. Indirect test is two steps. Patients serum is incubated with Rh<sup>+</sup> RBC cells then anti-anti Rh is added for agglutination.)
- 18 Name the immunodiagnostic technique involving use of I<sup>125</sup> (Radioimmunoassay)
- 19 Give example of one enzyme used in ELISA (Alkaline phosphatase, horseradish peroxidase and beta galactosidase)
- 20 Define titer (Highest dilution of serum capable of agglutinating or precipitating antigen.)

Q 2A What is CALT? Describe its role in an immune response

08

Skin, keratinocytes, Langerhans cells, intraepidermal lymphocytes list and their description (2 marks each)

The skin is an important anatomic barrier to the external environment, and its large surface area makes this tissue important in nonspecific (innate) defenses.

The epidermal (outer) layer of the skin is composed largely of specialized epithelial cells called keratinocytes. These cells secrete a number of cytokines that may function to induce a local inflammatory reaction.

In addition, keratinocytes can be induced to express class II MHC molecules and may function as antigen-presenting cells. Scattered among the epithelial-cell matrix of the epidermis are Langerhans cells, a type of dendritic cell, which internalize antigen by phagocytosis or endocytosis.

The Langerhans cells then migrate from the epidermis to regional lymph nodes, where they differentiate into interdigitating dendritic cells. These cells express

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high levels of class II MHC molecules and function as potent activators of naive TH cells.

The epidermis also contains so-called *intraepidermal lymphocytes*.

These are similar to the intraepithelial lymphocytes of MALT in that most of them are CD8 T cells, many of which express T-cell receptors, which have limited diversity for antigen. These intraepidermal T cells are well situated to encounter antigens that enter through the skin and some immunologists believe that they may play a role in combating antigens that enter through the skin. The underlying dermal layer of the skin contains scattered CD4 and CD8 T cells and macrophages. Most of these dermal T cells were either previously activated cells or are memory cells.

- Q 2B** Elaborate on structure & function of mononuclear phagocytes **07**  
Diagram, description of monocyte, macrophage ( each 2 marks)  
Function (each 1.5 marks)

OR

- Q 2C** Describe biological consequences of complement activation **08**  
Enlist any 4 (2 marks), Description of any 2 (6 marks = 3 marks each)
1. MAC can lyse a number of broad spectrum of cells-
  2. Cleavage products of complement mediate inflammation
  3. C3b & C 4b binding facilitates opsonisation
  4. Neutralisation of viral infectivity
  5. Clearance of immune complexes

- Q 2D** With the help of suitable diagram discuss the formation & development of red & white blood cells **07**  
Diagram (3 marks), Description- various cell lineages, lymphoid, myeloid – different cell types (4 marks)

- Q 3A** Give an account B cell development by Thymus independent antigen **08**  
Antigens that can activate B cells in the absence of direct participation by T<sub>H</sub> cells are T independent antigens. (1 mark), 2 types –Type 1 & Type 2.. (1 Mark) 1 example each (1 mark), description (each type 2.5 marks)

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**Q 3B** Describe functions of different types of T cells 07  
Functions of these cells with reference to markers they carry -T<sub>H</sub>, T<sub>c</sub>, CTL, T<sub>s</sub> cells (T<sub>H</sub> cells , T<sub>c</sub>, CTL function 2 marks each, T<sub>s</sub>- 1 mark)

OR

**Q 3C** Discuss structure of T cell receptor: CD 3 complex with the help of suitable diagram 08

Structure diagram (3 marks) & description (3 marks), Role (2 marks)

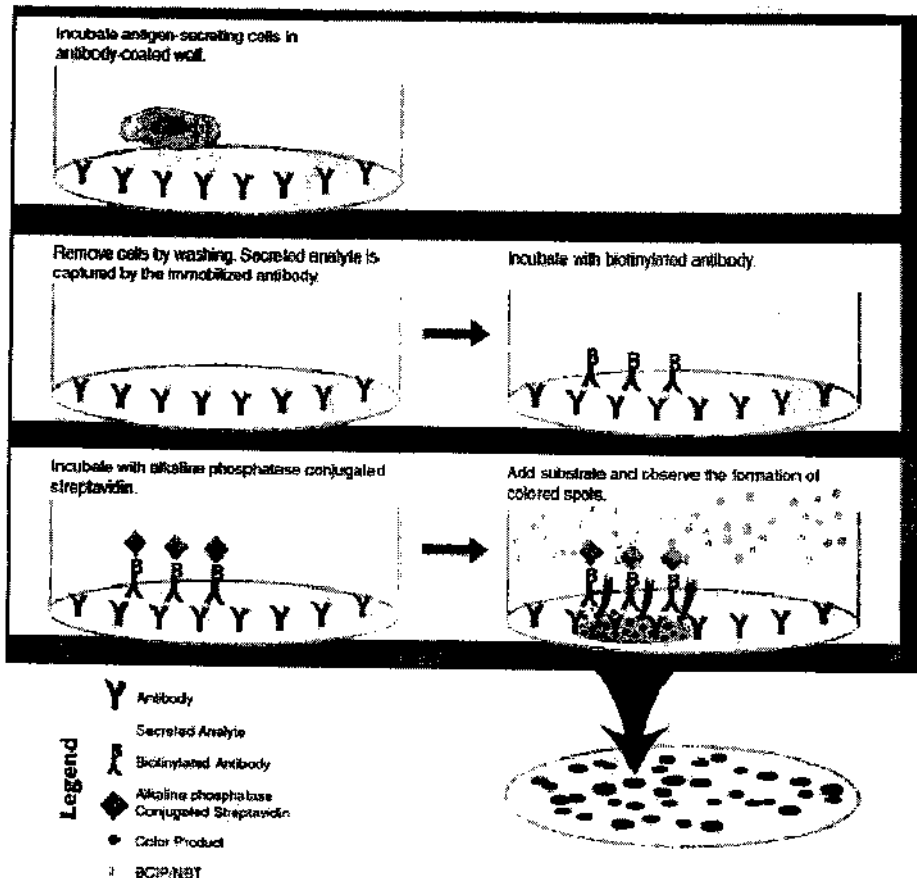
**Q 3D** Elaborate on development & maturation of B cells 07

Diagram (2marks), Pro-B cells, Pre- B cells , role of stromal cells ( 5 marks)

**Q 4A** Describe ELISPOT assay 08

Explanation of the steps four steps 4X2 M

**ELISPOT Assay Procedure**



**Q 4B** Give a brief account on Ouchterlony technique and its application 07



1. Line of identity, non-identity, partial identity with diagram 2X3M

Application: To identify the different antigens and to study similarity in the epitope of two antigen qualitatively 1M

OR

Q 4C Explain principle and application of Fluorescent antibody technique

08

1. Principle: Concept of fluorescence: 1M
2. Examples of fluochrome to tag antibody: Fluorescein, rhodamine, phycoerythrin 1M
3. Direct FAT with diagram 2M
4. Indirect FAT with diagram 2M
5. Applications :Identification of number of sub population of T cells

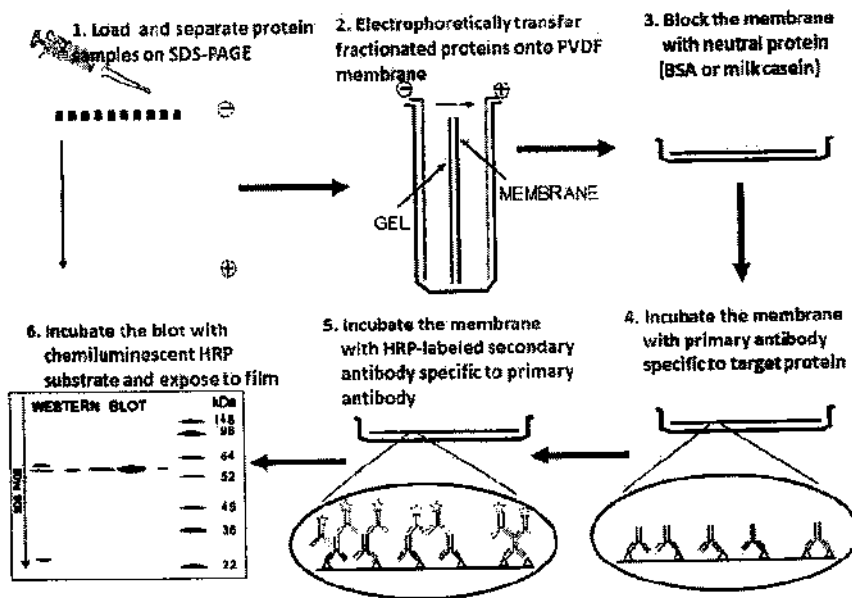
Identification of bacterial sp. Detection of antigen antibody complexes in autoimmune diseases, localization of hormones etc. (any 2 : 2M)

Q 4D With a suitable example discuss application of western blot in immunodiagnostics.

07

Procedure : 5M

**Western Blotting Procedure**



Applications: 2M (Any 2)

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Identification of protein in a complex mixture of protein, identification of specific antibody, confirmatory test for HIV, determine whether patient had antibody that reacts with viral proteins

15

**Q 5** Write Short notes on any three of the following

**A** Lymph node

Diagram, structure 3 marks, function 2 marks

**B** Complement mediated deficiencies

List out any 3 deficiencies 1.5 marks, description of any 2 (3.5 marks)

**C** MHC & disease susceptibility

Diseases associated with particular MHC alleles –autoimmune disorders, certain viral diseases, disorders of complement system, some neurological disorders, several different allergies, concept of relative risk with formula (2 marks), relationship between MHC alleles & development of disease (1marks), reduction in MHC polymorphism predisposes particular species to infectious disease (2 mark)

**D** Hemagglutination

1. Definition: 1M

Blood typing: 4M

**E** Complement fixation test

1. Complement facilitates destruction of antigen antibody complex 1M

2. Step 1: Patient's serum, known antigen and known complement are added 1M

3. Step 2: The mixture of step one is sensitized SRBCs are added 1M

4. Interpretation 2M

Haemolysis of RBC –Negative test: Ag absent

No haemolysis of RBC – Positive test : Ag present