



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (BT)/SEM-2/MBT-202/2011

2011

IMMUNOLOGY

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

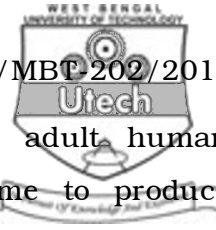
10 × 1 = 10

i) A patient with severe asthma gets no relief from antihistamines. The symptoms are most likely to be caused by

- a) interleukin-2
- b) slow-reacting substance A (leukotrienes)
- c) serotonin
- d) bradykinin.



- ii) Penicillin is a hapten in both humans and mice. To explore the hapten-carrier relationship, a mouse was injected with penicillin covalently bound to bovine serum albumin and, at the same time, with egg albumin to which non-penicillin was bound. Of the following, which one will induce a secondary response to penicillin when injected into the mouse 1 month later ?
- a) Penicillin
 - b) Penicillin bound to egg albumin
 - c) Egg albumin
 - d) Bovine serum albumin.
- iii) C3 is cleaved to form C3a and C3b by C3 convertase. C3b is involved in all of the following *except*
- a) altering vascular permeability
 - b) promoting phagocytosis
 - c) forming alternative pathway C3 convertase
 - d) forming C5 convertase.
- iv) An Rh-negative woman married to a heterozygous Rh-positive man has three children. The probability that all three of their children are Rh-positive is
- a) 1 : 2
 - b) 1 : 4
 - c) 1 : 8
 - d) 1 : 6.



- v) A primary immune response in an adult human requires approximately how much time to produce detectable antibody levels in the blood ?
- a) 12 hours
 - b) 3 days
 - c) 1 week
 - d) 3 weeks.
- vi) A recipient of a 2-haplo type MHC-matched kidney from a relative still needs immunosuppression to prevent graft rejection because
- a) graft-versus-host disease is a problem
 - b) minor histocompatibility antigens will not be matched
 - c) minor histocompatibility antigens will be matched
 - d) complement components will not be matched.
- vii) What is the role of class II MHC proteins on donor cells in graft rejection ?
- a) They are the receptors for interleukin-2, which is produced by macrophase when they attack the donor cells
 - b) They are recognized by helper T cells, which then activate cytotoxic T cells to kill the donor cells
 - c) They induce the production of blocking antibodies that protect the graft
 - d) They induce IgE which mediates graft rejection.



- viii) Chemically induced tumors have tumor-associated transplantation antigens that
- are always the same for a given carcinogen
 - are different for two tumors of different histologic types even if induced by the same carcinogen
 - are very strong antigens
 - do not induce an immune response.
- ix) Poliomavirus (a DNA virus) cause tumours in nude mice (nude mice do not have a thymus, because of a genetic defect) but not in normal mice. The best interpretation is that
- macrophages are required to reject poliomavirus-induced tumours
 - natural killer cells can reject poliomavirus-induced tumours without help from T-lymphocytes
 - T-lymphocytes play an important role in the rejection of polimavirus-induced tumours
 - B-lymphocytes play no role in rejection of poliomavirus-induced tumours.
- x) Your patient became ill 10 days ago with a viral disease. Laboratory examination reveals that the patient's antibodies against this virus have a high ratio of IgM to IgG. What is your conclusion ?
- It is unlikely that the patient has encountered this organism previously
 - The patient is predisposed to IgE-mediated hypersensitivity reaction
 - The information given is irrelevant to previous antigen exposure
 - It is likely that the patient has an autoimmune disease.



- xi) The main advantage of passive immunization over active immunization is that
- it can be administered orally
 - it provides antibody more rapidly
 - antibody persists for a longer period
 - it contains primarily IgM.
- xii) Which one of the following is the best method of reducing the effect of graft-versus-host disease in a bone marrow recipient ?
- Matching the complement components of donor and recipient
 - Administering alpha interferon
 - Removing mature T-cells from the graft
 - Removing pre-B-cells from the graft.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. After infection with HIV-1 it takes a long time before AIDS develops in most patients. Answer the following :
- What happens immediately after infection and during the long clinically silent period with respect to virus load, CD4 T cells and the immune response against the virus, and
 - What is the reason that clinical immunosuppression finally sets in ? Name two bacterial components/substances that bind to Toll-like receptors on monocytes and macrophages and stimulate production of pro-inflammatory cytokines (e.g. II-I, TNF- α)

2 + 2 + 1



3. State two genetic and two environmental risk factors for the development of autoimmune disease. Several bacteria that cause meningitis produce a capsular polysaccharide. Name 3 such bacteria, and describe the role of the capsule in development of meningitis. What is GALT ? 2 + 2 + 1
4. There are at least 3 different mechanisms by which bacteria can survive in macrophages. Mention those mechanisms and give example of bacteria able to use these respective mechanisms. Antigen presenting cells have been shown to present lysozyme peptide 46-61 together with the class II IAK molecule. When CD4₊TH cells are incubated with APCs and native lysozyme or the synthetic lysozyme peptide 46-61, TH-cell activation occurs.
- a) If chloroquine is added to the incubation mixture, presentation of the native protein is inhibited, but the peptide continues to induce TH-cell activation. Explain why this occurs.
- b) If chloroquine addition is delayed for 3 h, presentation of the native protein is not inhibited. Explain why this occurs. 3 + 2
5. In an immunology laboratory exercise, you are studying the response of mice injected intradermally with complete antibodies to the IgE Fc receptor (Fc_{R1}) or with Fab fragments of such antibodies.
- a) Predict the response expected with each type of antibody.
- b) Would the responses observed depend on whether the mice were allergic ? Explain. How do you explain better antigen presentation of an APC if grown in cholesterol rich medium ? 2 + 2 + 1



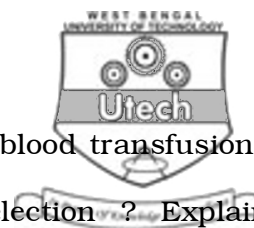
6. In patients with infectious mononucleosis a disease cause by the so called EBV – lymphocyte counts in patients increase manifold over those in healthy individuals. Does this mean that the immune system reacts against the virus ? Due to genetic defects a person X has no antibodies and a person Y has no T-lymphocytes. Which person is more likely to succumb to
- a) influenza
 - b) diphtheria
 - c) malignant myeloma ? 2 + 1 + 1 + 1

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. What is the advantage of secondary antibody over primary antibody in diagnosis ? What is the mechanism of action of immunosuppressive drug ? What are their side effects ? How do you explain that graft rejection is attributed to antibody diversity ? What are the difficulties to produce any antidote against AIDS ? What are antigenic drift and antigenic shift ? 2 + 3 + 2 + 3 + 3 + 2
8. Explain the role of HLA-DM/DO interaction in the loading of peptides to MHC ? What is MLR ? What do you mean by humanized antibody, diabodies and single chain antibody ? Describe one method of humanized antibody production. How does antidiotype vaccine work ? How do you use dendritic cell for antitumour therapy ? 2 + 2 + 3 + 3 + 2 + 3



9. Which property of RBC helps it in easier blood transfusion?
What is clonal deletion and clonal selection? Explain
immunoglobulin super family. How are bacterial non-
peptides presented as antigen? How is ELISPOT assay done
? What is the significance of conjugate vaccine? How is
reverse vaccinology performed? 1 + 2 + 2 + 3 + 3 + 2 + 2
10. How does tumour evade our immune system? How do
NSAID and DMARD help in rheumatoid arthritis? Write
down the molecular pathogenesis of multiple sclerosis.
Describe the mechanism of joining of two genes of an
immunoglobulin. 3 + 2 + 2 + 4 + 4
11. How do you tackle when you are allergic to a necessary
drug? How does yoga therapy help in asthma patients?
Complement is both a component of innate and adaptive
immunity. Explain how are our own cells resistant to
complement mediated lysis? What is clonal energy? What is
the cause of SCID and its therapy? 3 + 3 + 2 + 2 + 2 + 3
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