

Circle the **BEST** answer from the choices available. Be sure to read **all** of the alternatives.

1. What effect might the injection of soluble CD4 molecule have on the immune system of an AIDS patient?
 - a. **It might serve to prevent the attachment of mature HIV-1 viral particles to the helper T cell membrane.**
 - b. It might bind to CXCR4 chemokine receptors and initiate chemotaxis.
 - c. It might bind to CD3 molecules and activate T cell function.
 - d. All of the above.
 - e. None of the above.

2. Some forms of autoimmune disease result from autoantibodies that bind to receptors on the cell surface. Antibodies that bind to these receptors can cause disease by
 - a. Activating complement and causing cell lysis
 - b. Blocking normal ligand binding to the receptor
 - c. Providing persistent stimulation through the receptor that is not regulated normally
 - d. **All of the above**
 - e. None of the above

3. Oncofetal antigens are defined as antigens
 - a. expressed on the tumors of all embryos.
 - b. **normally expressed by fetal tissue, but also expressed on certain tumors.**
 - c. that are encoded by oncornaviruses.
 - d. that are detected by immunoprecipitation with antibodies specific for glycoproteins.
 - e. none of the above.

4. Autoimmune disease has been treated experimentally by giving a lethal dose of irradiation, followed by injection of bone marrow from a healthy donor. How would you monitor the success of the transplanted material in the regeneration of the immune response in the irradiated host?
 - a. Measure the ability of cells from the peripheral blood of the patient to proliferate in response to stimulation with lectin.
 - b. Measure the levels of circulating antibody.
 - c. Count the number of circulating lymphocytes in the peripheral blood.
 - d. **All of the above (a-c).**
 - e. none of the above (a-c).

5. The Ames assay is designed as an inexpensive test of a chemical's mutagenic potential. What must be true for this assay to work as an indicator of mutation caused by the test chemical?
 - a. there must be no histidine in the assay system
 - b. the mutations caused by the chemical cannot be substantial deletions
 - c. the chemical must be soluble in an aqueous system
 - d. **all of the above must be true**
 - e. none of the above can be true

6. The general name for normal genes that, when altered in specific ways, contribute to cancer formation is
 - a. angiogenic factors
 - b. complement genes

- c. **proto-oncogenes**
 - d. sarcoma genes
 - e. all of the above
7. When skin is transplanted in syngeneic exchanges there is a stage where the skin can appear pinker than once the graft has become well established. The cause of this change is often a result of
- a. vascular leakage and bruising
 - b. **excess capillary overgrowth caused by angiogenic factors**
 - c. increased red pigmentation in the transplanted tissue
 - d. all of the above
 - e. none of the above
8. The human condition DiGeorge syndrome is a disease that results from a lack of the thymus. What mouse mutation is an example of the same defect in immune competence?
- a. SCID
 - b. **nude**
 - c. NOD
 - d. beige
 - e. motheaten
9. HIV infection has been successfully treated in a few human patients by whole body irradiation followed with transplantation of hematopoietic stem cells from a CCR5 mutant donor. Why might this work?
- a. the absence of CCR5 means that the patient is unable to sustain any viral infection.
 - b. **since CCR5 is a coreceptor for HIV, the speed of HIV viral infection is diminished, and normal hematopoiesis by the transplanted immune cells can keep up with cell death caused by the virus**
 - c. CCR5 is responsible for chemotactic movement, enabling rapid responses to the viral infection
 - d. CCR5 is an important part of class I antigen presentation, enabling CTL killing of virally infected cells
 - e. none of the above are true
10. Why do immune cells die or become dysfunctional as a result of HIV infection?
- a. Infected cells become targets for CTL killing
 - b. HIV-infected cells can cause multinucleated syncytia that lose functional capacity
 - c. HIV-infected cells can autofuse, resulting in highly vesiculated cells that lose functional capacity
 - d. **all of the above**
 - e. none of the above
11. In analyzing the genotypes of Tasmanian Devils, the authors of the paper compared a number of microsatellite loci. Microsatellite are
- a. **a small region of replicated DNA motifs that can range from 1-6 base pairs in length and are repeated in short tandem repeats of 5-50 sequences.**
 - b. small fragments of DNA that are produced by the endonucleases of apoptosis
 - c. fragmented DNA produced by oncornavirus infection leading to cancer
 - d. repetitive genetic elements that encode transcription factors
 - e. all of the above represent different examples of microsatellites

12. Telomerase is an important enzyme on which cancers depend since
- this enzyme maintains the ends of chromosomes and thus chromosomal stability**
 - this enzyme is an example of a kinase oncogene
 - this enzyme activates apoptosis
 - this is an angiogenic factor
 - this enzyme is a lipase
13. Why does anti-CD4 antibody treatment extend the average allograft survival time more than anti-CD8 antibody treatment?
- because anti-CD4 can kill macrophages
 - because anti-CD4 will disrupt the contribution to many different immune mechanisms that includes CTLs while anti-CD-8 only disrupts CTL function**
 - because anti-CD4 antibody is better at activating complement
 - because anti-CD8 activity is an activator of helper T cell function
 - none of the above are true
14. What is a possible undesirable outcome of transplanting bone marrow to allogeneic recipients that have had whole body irradiation to erase their own immune response?
- they can develop systemic lupus erythematosus
 - they can develop DiGeorge syndrome
 - they can develop a specific allergic phenotype to peanuts
 - they can develop graft versus host disease**
 - all of the above are possible
15. This question is related to the llama antibody paper. The authors used phage display to identify binding partners for the *M. furfur* fungus. What technique was used to identify the original sequences that were then used in the remainder of the study?
- they used ELISAs to purify the llama antibody that bound to *M. furfur* fungal protein
 - they used phage display of llama V region genes to purify phage clones with the correct binding profile for *M. furfur* protein
 - they immunized a set of different llamas and then tested each by ELISA to identify the llama that had randomly produced the best antibody profile**
 - they used surface plasmon resonance to measure antibody dissociation kinetics
 - none of the above are correct
16. In the recently announced Nobel prize for Medicine and physiology, Jim Allison was recognized for his work with the CAR-T therapy that is now being used to treat human cancers of specific types. How does this therapy work?
- Cytokines are injected into the patient to activate specific receptors producing an anti-tumor response
 - cytokines are used to activate host cells before they are reinjected into the patient
 - immune cells are removed from the tumor, activated *in vitro* and then reinjected into the same patient
 - a donor immune cell is modified to attack host MHC class I that is expressed on the patient's tumor. These cells are then injected into the patient to treat the cancer.

- e. **Recombinant T cell receptors that have been engineered to include an antigen binding region that is specific for a tumor-specific- or tumor-associated-transplantation antigen and coupled to a transmembrane region and a signaling region are transfected into host T cells before reinsertion in the patient. This establishes a durable immunity against the tumor**
17. Which of the following is **NOT** a function of metallothionein?
- Decrease toxic effect of heavy metals
 - Acts as a free radical scavenger
 - Metabolizes cysteine residues**
 - Serves as a reservoir for essential heavy metals
 - Interacts with membrane bound receptors
18. If metallothionein is injected in a mouse that is injected with collagen to induce a rheumatoid arthritis-like condition, it has been found to:
- Decrease the severity of joint damage
 - Alter anti- and pro-inflammatory cytokine levels
 - have no obvious effect in treated mice
 - A and B**
 - none of the above are true
19. Why are camelid antibodies (for example llama antibodies) a useful potential therapeutic treatment?
- they are very heat-stable antibodies
 - these antibodies can function in the presence of detergents and other molecules that would disrupt antibodies from other mammals
 - these antibodies are much smaller and thus are better able to reach further into tissues
 - answers a,b, and c are all true**
 - all of the above answers are false
20. Which of the following is **NOT** true about HIV binding (attachment) to a target cell?
- GP120 binds to a receptor on CD4+ cells
 - HIV binding requires a receptor
 - Binding triggers fusion of the viral and host cell membranes
 - Nucleoside analogs interfere with GP120 rearrangement required for binding**
 - CCR5 and CXCR4 mutations can block HIV from entering the cell
21. Hepatitis B vaccines are composed of the hepatitis B virus surface antigen and do not intact virus. This is an example of a(n) _____ vaccine.
- Live virus vaccine
 - Attenuated vaccine
 - Subunit vaccine**
 - DNA vaccine
 - Biolistic vaccine
22. Which of the following cytokines is a common therapeutic target for treating autoimmune diseases?
- Tumor necrosis factor- α (TNF- α)**
 - Concanavalin A (ConA)

- c. Lipopolysaccharide (LPS)
 - d. Phytohemagglutinin (PHA)
 - e. Interleukin-10 (IL-10)
23. Which of the following HIV proteins is most important for final maturation of the HIV particle?
- a. Polymerase
 - b. Protease**
 - c. Integrase
 - d. Reverse transcriptase
 - e. CCR5
24. Which of the following classes of antiretroviral drugs prevents the conversion of viral RNA to DNA?
- a. Stem cell therapy
 - b. Fusion inhibitors
 - c. Nucleoside analogs**
 - d. Integrase inhibitors
 - e. Protease inhibitors
25. Which of the following assays is a surrogate for cell proliferation?
- a. ³H-thymidine incorporation assay**
 - b. Ames assay
 - c. ELISA
 - d. Phage display assay
 - e. Boyden chamber assay
26. Which of the following therapies would NOT be likely to enhance graft survival in graft recipients?
- a. Total lymphoid irradiation
 - b. Immunosuppressive drugs
 - c. Elimination of passenger leukocytes from the transplanted tissue
 - d. Blocking monoclonal antibodies (against IL-2R, for example)
 - e. Adjuvant therapy**
27. A patient with a MHC class II deficiency (an example is the Bare Lymphocyte syndrome):
- a. Will experience decreased viral susceptibility
 - b. Will have an excess of activated complement that binds to MHC class II⁺ cells
 - c. Will experience declines in T_H/APC interactions and a resulting immunodeficiency**
 - d. Will develop an autoimmune disease called Bare Lymphocyte Adenopathy (BLA)
 - e. Will have decreased insulin levels
28. What evidence is there that changes in gene regulation can cause cancer?
- a. EC cells from teratocarcinomas will continue to make cancer cells when transplanted into adult mice
 - b. EC cells from teratocarcinomas will produce normal tissue cells when transplanted into blastocysts that are then implanted into pseudopregnant female mice for gestation.**
 - c. the Ames assay shows that mutagens are usually carcinogens

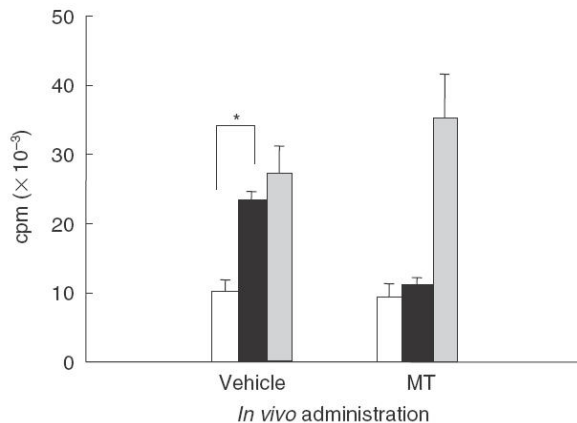
- d. *Salmonella typhimurium* histidine auxotrophs are able to revert to prototrophic growth after exposure to mutagens
 - e. there is no evidence of non-mutagenic events causing cancer
29. What kind of event can support tumor growth past a limit imposed by diffusion of nutrients?
- a. **angiogenesis**
 - b. complement inactivation
 - c. macrophage activation
 - d. telomerase inactivation
 - e. all of the above
30. Apoptosis ordinarily serves to prevent the development of an autoimmune response to the dying cells. This is because:
- a. The apoptosis of macrophages will limit their ability to present antigen
 - b. Apoptotic cell death eliminates the inter-digital tissues in the hands of the fetus
 - c. **Apoptosis prevents the release of immunogenic intracellular antigens that would promote inflammation.**
 - d. Antibodies to the Fas ligand and receptor are formed
 - e. Necrosis follows the apoptotic process
31. Genome Wide Associational Studies (GWAS) can be used to address which of the following experimental questions?
- a. **What are the loci associated with risk for the onset of Type 1 diabetes?**
 - b. What are the mechanisms of transformation that a carcinogen employs to produce lung cancer?
 - c. What is the effect of a CD28 mutation on CTL cell mediated cytotoxicity?
 - d. What cytokines are overexpressed in individuals that have inflammatory bowel disease?
 - e. All of the above
32. Why does the CD4/CD8 ratio flip as patients progress in AIDS?
- a. the number of CD4 cells increase as the disease progresses
 - b. CD8 cells are depleted as they attach the virus
 - c. the number of macrophages expressing CD4 increases with disease progression
 - d. the number of each cell type do not change, but the ratio does
 - e. **CD4 cells decrease in number for several reasons, including CTL killing of virally infected targets**
33. What is the significance of TGF- β induction by MT in the required reading paper that explored the anti-inflammatory effect of MT in a model of rheumatoid arthritis?
- a. **this cytokine usually operates as an immunosuppressive cytokine that blocks the progression of some inflammations**
 - b. this cytokine activates the complement cascade
 - c. this cytokine is able to block the enzymatic activity of cyclooxygenase-2
 - d. this cytokine depletes the T cells in the thymus
 - e. the paper described all of the changes listed above

NAME _____

MCB 4211, _____

Student ID# _____

34. In the paper describing MT as a therapeutic agent in the development of rheumatoid arthritis, the experiments included a measure of proliferation when mice were treated with vehicle or with MT, and then lymph node cells from those treated animals were cultured in the presence of collagen (black bars) or the lectin PHA (grey bars) or with no added stimulant (open bars). Why is the PHA response greater than the collagen response in both treatment groups?



- there are more cells that will proliferate in the presence of a polyclonal activator than are specifically responsive to collagen**
- PHA is an agglutinin and thus clumps and kills the cells
- the collagen is an extracellular matrix proteins and stimulates cells to adhere
- PHA is a better activator because it provides nutrients for the cells
- all of the above are true

35. What is the difference between a TSTA, tumor specific transplantation antigen and a TATA, tumor associated transplantation antigen?
- both are expressed on T cells, but only TSTA are expressed on B cells
 - only TSTAs are viral antigens
 - some TATAs are also found on embryos or fetal tissues**
 - all of the above are true
 - none of the above are true

36. What kinds of genes are important in tumorigenesis?

- kinases
- phosphatases
- telomerases
- transcription factors
- all of the above**

37. Why is AIDS now treated simultaneously with multiple different antagonists of the HIV life cycle?

- the HIV polymerase is error prone, making a simple single target approach susceptible to breakout mutants that are resistant to the therapy**
- each drug targets a different serotype of HIV
- the dose makes the poison, so using multiple drugs means that each drug can be used at a lower dose.
- all of the above are true
- none of the above are true

38. What is the Hayflick limit?

- the number of T cells that are normally present in a healthy person
- the number of cell divisions that a cell normally can undergo before senescence**
- the number of complement genes that are active

NAME _____

MCB 4211,

Student ID# _____

- d. the number of genes that must be mutant to make a cancerous phenotype
 - e. the distance a cell can chemotax
39. What is an example of a viral antigen associated with cancer?
- a. EBV antigens
 - b. HIV antigens
 - c. Human papilloma virus antigens
 - d. Hepatitis antigens
 - e. **all of the above**
40. Why would an anti-idiotypic antibody be useful for treatment of a B cell tumor?
- a. **it might activate complement and kill the specific B cell tumor, leaving other B cells alone**
 - b. it would activate the T cell compartment to kill the tumor
 - c. it would suppress complement activation
 - d. it would prevent metastasis
 - e. it would activate PMNs