McGill

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Final Examination

VERSION #1

Viral Pathogenesis

COURSE NUMBER: 740 – SECTION: 001

APRIL 13, 2007 – 2:00 P.M.

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Student Name:		McGill ID:									

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INSTRUCTIONS

Read and follow these instructions carefully:

1. Computer sheets are provided for your answers. Do not fold or bend the sheets.

2. Print your name and student number on the front of both the question and answer sheet.

3. Read each question and its numbered answers. When you have decided which alternative is the **BEST**, mark the whole of the corresponding oval space (bubble) on your answer sheet. Avoid making any stray marks outside the oval. You may use this question booklet for rough work, and you may mark the alternatives when you are considering them.

4. Do not answer more than one mark for any question; otherwise the computer will reject your sheet. If erasing, erase **COMPLETELY**.

5. **NO PART OF THIS EXAMINATION MAY BE TAKEN OUT OF THIS ROOM UNDER ANY CIRCUMSTANCES.**

6. Marking will be on the basis of +1 mark for a correct answer; questions unanswered or wrongly answered will be tallied at "0" when totaling your score.

7. CALCULATOR, DICTIONNARIES AND TRANSLATION DICTIONNARIES ARE ALLOWED.

IMPORTANT WARNING: "The exam Security Computer Monitoring Program detects pairs of students with unusually similar answer patterns on multiple-choice examinations. Data generated by this program can be used as admissible evidence, either to initiate or corroborate an investigation or a charge of cheating under Section 16 of the Code of Student Conduct and Disciplinary Procedures."

TYPE 1 QUESTIONS:

Only one of the choices is correct. MARK 1, 2, 3, 4, or 5

1) The development of HIV resistance to antiretroviral drugs is:

   1. Related to viral mutability
   2. Attributable to mutations in viral RT and PR
   3. Inevitable in regard to all future anti-HIV drugs if current concepts are correct
   4. Caused by poor adherence to antiviral drugs and ongoing viral replication
   5. All of the above

2) The most important factors responsible for a worldwide inability to provide HIV drug access for developing countries include:

   1. Mutations in RT and PR
   2. Profit-making culture on the part of pharmaceutical companies
   3. Failure to have developed effective drugs to combat HIV disease
   4. Resistance to antiviral drugs
   5. The price of antiviral drugs

3) Problems that have arisen in regard to the development of an HIV vaccine include:

   1. HIV mutability
   2. Perceived dangers of vaccinating with attenuated viruses
   3. Subtype diversity
   4. Lack of understanding of protective correlates of immunity
   5. All of the above

4) The development of a successful protective HIV vaccine is likely to require the development of a strong mucosal immune response because:

   1. The transmission of HIV occurs across mucosal barriers.
   2. Mucosal immunity is more important than systemic immunity.
   3. IgA antibodies are more protective in general than IgG in regard to viral infections.
   4. All vaccines developed to date against sexually transmitted agents have depended on strong mucosal immunity.
   5. It is easier to generate mucosal than systemic immunity.

5) Circumcision is now considered to be a proven method to reduce HIV transmission rates and is thought to work because:

   1. Circumcised men are less likely to attract sexual partners and have less sex.
   2. Elimination of the foreskin eliminates cells that can serve as portals of entry for HIV into the body.
   3. Circumcision eliminates sexual desire.
   4. Circumcised men are more likely to use condoms.
   5. All of the above

6) The development of vaginal microbicides to prevent HIV transmission is:

   1. A proven method in the context of vaginal foams and jellies.
   2. Of value only to uninfected women but not to women already infected by HIV.
   3. Dependent on the killing of sperm cells as well as HIV.
   4. A strategy that avoids problems of HIV drug resistance.
   5. None of the above.

7) The hyperacute rejection in xenotransplantation is caused by:

   1. Activated T cells
   2. Natural killer cells
   3. Anti-alpha-Gal antibodies
   4. Cytokines
   5. Activated macrophages

Only one of the choices is correct. MARK 1, 2, 3, 4, or 5

8) Which of the following statement about endogenous retroviruses is NOT true:

1. Endogenous retroviruses exit in germline cells and associate with the host from one generation to the next.
2. Endogenous retroviruses are dead viruses without any infectivity.
3. Some endogenous retroviruses still actively express their RNA.
4. Human beings carry a significant number of endogenous retroviruses.
5. The porcine endogenous retrovirus PERV-L is classified as spumavirus.

9) The reverse transcription of HIV-1 RNA takes place in which of the following cellular compartments:

1. The nucleus
2. The cytoplasm
3. The nucleolus
4. The Golgi apparatus
5. The endoreticulum

10) Which of the following statements is NOT true about HIV-1 particles:

1. The mature HIV-1 particle has a conical core.
2. HIV-1 particle acquires the outer membrane from the cellular plasma membrane.
3. HIV-1 particle has an average diameter of 55 nm.
4. Formation of HIV-1 particles is driven by viral Gag protein.
5. Each HIV-1 particle bears two copies of viral genomic RNA.

11) The major function of the matrix domain in the formation of virus particle is:

1. Packaging viral RNA;
2. Interaction with viral protease;
3. Promoting release of virus particles.
4. Binding of Gag to cellular membranes;
5. Interaction with TSG101.

12) Which of the following statements about the nucleocapsid (NC) domain of HIV-1 Gag protein is NOT true:

1. NC is involved in the recognition of viral RNA packaging signal;
2. NC has one zinc finger motif;
3. NC promotes HIV-1 reverse transcription;
4. NC bears the late budding domain;
5. NC is indispensable for Gag multimerization.

13) Why is porcine endogenous retrovirus a particular concern in xenotransplantation comparing to the other pathogens?

1. Some of the porcine endogenous retroviruses are infectious.
2. They can infect human cells.
3. There are many types of porcine endogenous retroviruses.
4. They cannot be eradicated because their cDNA has become part of the host's chromosomal DNA.
5. They have the potential to transmit between individuals.

14) Which of the following statements about HIV-1 RNA packaging is NOT correct:

1. HIV-1 RNA is recognized by viral Gag protein.
2. HIV-1 RNA is packaged as a dimer.
3. Viral RNA packaging signal is located within the Gag coding sequence.
4. The spliced viral RNA molecules are excluded from packaging into virus particles.
5. Some cellular RNA such as tRNALys.3 is also incorporated into HIV-1 particles.

Only one of the choices is correct. MARK 1, 2, 3, 4, or 5

15) HIV-1 Gag protein has the potential to form hexameric ring structure. This feature is a result of the interaction mediated by:

1. MA
2. CA
3. SP1
4. SP2
5. p6

16) Only **one** of the following statements on HIV-1 Tat and HTLV-I Tax is correct:

1. HIV-1 Tat is a DNA binding protein.
2. HIV-1 Tat and HTLV-I Tax exert their trans-activating properties by the same mechanism.
3. HIV-1 Tat is an RNA binding protein.
4. HIV-1 Tat binds to the cellular activator CREB.
5. HTLV-I Tax is an RNA binding protein.

17) HIV-1 Rev exerts its function by the following mechanisms **EXCEPT:**

1. HIV-1 Rev binds CRM1.
2. HIV-1 Rev has a Nuclear Export Signal and a Nuclear Localization Signal.
3. HIV-1 Rev remains in the nucleus during the RNA export process.
4. HIV-1 Rev binds to the RRE RNA.
5. HIV-1 Rev requires cellular factors for its function.

18) The following mechanisms contribute to HIV pathogenesis **EXCEPT**:

1. HIV-associated Dementia caused by neuronal damage.
2. Down-regulation of CD4 by HIV-1 Vpu and Nef.
3. Down-regulation of CD4, IL2R and MHC class I by Nef.
4. AIDS-associated Kaposi Sarcoma caused by Human Herpes virus 8.
5. Monocyte infiltration in the heart.

19) Nef is a major factor in AIDS pathogenesis as demonstrated by **one** of these observations:

1. Many HIV Long Term Non-Progressors have Nef-deleted strains.
2. Nef contributes to AIDS dementia by its neurotoxicity.
3. Clinical trials with Nef-deleted HIV strains have shown no disease in humans.
4. Nef increases Rev function in cells.
5. Nef is required for HIV-1 assembly.

20) RNA-based technologies to inhibit viral replication use the following methods **EXCEPT:**

1. Small interfering RNAs.
2. Antisense RNA.
3. Ribozymes.
4. Transdominant proteins.
5. RNA decoys.

21) Ribozyme function is based on **one** of the following mechanism:

1. An RNA binding protein TRBP.
2. An RNAse called Dicer.
3. A target DNA.
4. A self-cleaving RNA.
5. Translation inhibition.

22) The following viral vectors can be used in gene therapy **EXCEPT:**

1. Adenovirus-associated virus.
2. Hepatitis B virus.
3. Herpesvirus.
4. Human adenovirus.
5. Lentiviruses.

Only one of the choices is correct. MARK 1, 2, 3, 4, or 5

23) A good retroviral vector for gene therapy has **one** of the following characteristics:

1. It is replication defective.
2. It can recombine with an AAV helper plasmid.
3. It replicates only when adenovirus gene products are present.
4. It is oncogenic.
5. It can express the transgene and the structural proteins on the same vector.

24) Vascular smooth muscle cells

1. are found in the intima in normal blood vessels.
2. can be infected by Cytomegalovirus (CMV).
3. form a single-cell layer thick covering atherosclerotic blood vessels.
4. are never found in normal blood vessels.
5. are found in all layers of normal blood vessels.

25) Atherosclerosis

1. has features identical to those found in chronic inflammatory response.
2. is characterized by endothelial cell apoptosis and death.
3. is specifically characterized by lipid accumulation, calcification and thrombosis.
4. is identical to restenosis.
5. is caused by viral infection.

26) Restenosis:

1. recapitulates atherosclerosis.
2. is the same as post-transplant atherosclerosis
3. is characterized by lipid accumulation, calcification and thrombosis
4. occurs only in response to an acute infection with Cytomegalovirus (CMV) infection
5. can occur after an atherosclerotic plaque is removed.

27) Cytomegalovirus:

1. is responsible for the increasing incidence of atherosclerosis in the Western world
2. is present in the atherosclerotic plaques of many, but not all people.
3. is responsible for restenosis.
4. peptide presentation is a key factor promoting atherosclerosis
5. causes atherosclerosis and restenosis.

28) Myocarditis is:

1. caused by the production of anti-skeletal muscle protein antibodies
2. caused by the production of anti-interferon antibodies
3. associated with the production of anti-cardiac muscle protein antibodies
4. associated with massive lipid accumulation in the heart
5. often found in patients with hypertension

29) Myocarditis

1. can be transferred by injection of murine cardiac myosin.
2. can be transferred by injection of T-cells from mice with active myocarditis.
3. can be produced by all peptides having the sequence XXXMAXXXSTXXX similar to the M7A alpha peptide
4. can be produced by none of the above
5. can be produced by all of the above.

30) Which agent is NOT associated with myocarditis

1. cytomegalovirus
2. coxsackievirus
3. chlamydia
4. all of the above
5. none of the above

31) When hearts C3H (H-2K) and Balb/c (H2-d) mice were interchanged

1. hearts were rejected more slowly if the mice had been previously infected with CMV.
2. hearts were rejected more quickly if they had been previously infected with CMV.
3. hearts were rejected in the same time frame if the CMV had been previously inactivated by irradiation.
4. hearts were rejected only if the transferred heart was latently infected with CMV.
5. hearts were rejected if the Balb/c heart was acutely infected with CMV.

Only one of the choices is correct. MARK 1, 2, 3, 4, or 5

32) When a high dose of coxsackievirus is infected into non transgenic mice or into transgenic mice overexpressing interferon gamma in the pancreas

1. all non-transgenic mice died whereas the transgenic mice did not die.
2. all transgenic mice died whereas the non-transgenic mice did not die.
3. transgenic and non-transgenic mice never developed anti-heart antibodies.
4. coxsackie virus was isolated from the non-transgenic and transgenic hearts
5. the non-transgenic mice and transgenic developed histologically evident fibrosis.

33) Anti-retroviral drugs taken by HIV patients:

1. have no impact on heart function
2. prevent the deterioration in their heart function
3. can worsen heart function
4. cause HIV-mediated structural abnormalities in the heart and so increase heart function
5. increase the production of cardiac contractile proteins and improve heart function.

34) HIV-positive pediatric patients born to HIV-positive mothers

1. have decreased cardiac function at birth that is not resolved
2. have decreased cardiac function at birth that is resolved to normal soon after birth
3. have a hyperactive heart with better than normal cardiac function
4. have a hypoactive heart
5. have normal heart function.

35) The cardiomyopathy found in HIV-positive patients:

1. can be attributed not to the virus load but to nutritional deficiencies
2. can be attributed not to the virus load but to lifestyle choices ie alcohol or drug use
3. progresses at the same speed as in patients without HIV
4. progresses at a faster speed than in patients without HIV.
5. progresses at a slower speed than in patients without HIV

36) Indicate the answer which is NOT correct of cytomegalovirus (CMV) infections

1. CMV causes increased smooth muscle cell proliferation in vitro.
2. CMV causes increased expression of adhesion molecules ICAM, VCAM and P-selectin
3. CMV causes increased synthesis of chemoattractants by endothelial cells
4. CMV is detected is endothelial cells and smooth muscle cells in atherosclerotic plaques.
5. CMV paradoxically causes decreased accumulation of activated T-cells and macrophages in atherosclerotic plaques.

37) The lipodystophy of HIV patients

1. is not really a problem
2. is unrelated to HAART therapy
3. can be reduced by diet
4. is related to HAART therapy
5. is due to co-infection with CMV

38) Myocarditis

1. is normally characterized by viremia, followed by viral clearing and then to the absence of virus
2. is normally characterized by immediate viral clearing and viral absence
3. is normally not associated with virions but is a bacterial disease
4. can only be induced when under severe stress
5. is associated with early decreased macrophage activation

39) The HIV TAT protein

1. reduces the infection of HIV in cardiomyocytes
2. increases latent CMV in doubly-infected patients causing dilated cardiomyopathy
3. is permanently increased in cardiomyocytes thereby increasing HIV infection in heart
4. reduces oxidative stress in HIV-infected cardiomyocytes
5. may increase atheroma formation in HIV-infected heart

40) Monocyte chemoattractant protein -1 (MCP-1)

1. MCP-1 expression is produced by many cells associated with atheromas
2. MCP-1 expression is increased in cytomegalovirus infected monocytes
3. MCP-1 overexpressing transgenice mice are protected from cytomegalovirus induced myocarditis
4. MCP-1 overexpressing transgenic mice injected with cytomegalovirus show increased myocarditis
5. MCP-1 is involved in viral clearing so reduces virally-induced atheroma formation

Only one of the choices is correct. MARK 1, 2, 3, 4, or 5

41) Virus infection is sometimes restricted or blocked because a cell is not its natural host. Which one of the following is a possible explanation for this host cell restriction to infection?

1. The virus is in the wrong place at the wrong time
2. The host cell expresses factors that block virus replication at a distinct step of the replication cycle
3. Cells that are not natural hosts of a virus are usually in the wrong cellular compartment
4. The host cell recognizes the virus, takes it in but then expels it
5. The virus is too small to infect some cells.

42) Infection by the virus that causes severe acute respiratory syndrome is known to occur by which the following mechanism(s)?

1. Interaction of the virus with cell surface membrane receptors
2. Cell-to-cell virus transmission
3. Transfer of virus from dendritic cells to other cells
4. Interaction with its S (Spike) protein with ACE-2 (or ACE-II) and a putative 2nd receptor named L-SIGN
5. All of the above.

43) What represent(s) some of the possible therapies to block Sars-CoV that could be developed in the future?

1. Entry inhibitors
2. Inhibitors of enzyme function
3. Vaccines
4. All of the above.
5. None of the above.

44) The virus that causes severe acute respiratory syndrome is a:

1. Retrovirus
2. DNA virus
3. Poxvirus
4. Corinthianvirus
5. None of the above

45) In the laboratory, we can use several types of drugs to block intracellular transport. Which of the following disassemble or depolymerize actin filaments?

1. Colcemid
2. Cytochalasin D
3. APOBEC 3G
4. Taxol and Nocodazole
5. Taxol

46) Viruses are obligate parasites and use the host cell's major machineries to complete their replication cycles. What have we learned from the study of how viruses interact with the host cell?

1. We can identify potential new targets to block viral replication
2. We can gain a better understanding of basic biological processes
3. We can gain a better respect for viruses in the ways they can adapt to ensure their replicative capacities
4. That we must continue to enhance our understanding of virus-host interactions.
5. All of the above.

47) Nevirapine is an anti-HIV drug that

1. binds tightly to a hydrophobic pocket close to the active site of HIV-1 RT
2. competes with natural dNTP pools
3. binds to the viral integrase
4. binds to the viral protease
5. requires intracellular, metabolic activation

Only one of the choices is correct. MARK 1, 2, 3, 4, or 5

48) HIV resistance to 3TC is based on

1. specific mutations in the RNase H domain of HIV-1 RT
2. a steric conflict between the drug 3TC and a specific mutation in the vicinity of the polymerase active site
3. specific mutations in viral proteins of the envelope
4. host defence mechanisms
5. mutations in the viral core proteins

49) The anti-HSV drug acyclovir

1. is a non-nucleoside analogue polymerase inhibitor
2. does not need to be phosphorylated
3. does not contain a regular sugar moiety
4. is a pyrophosphate analogue
5. is a protease inhibitor

50) Major resistance conferring mutations in the HIV protease

1. decrease susceptibility to protease inhibitors
2. decrease susceptibility to RT inhibitors
3. increase the viral replication capacity
4. decrease susceptibility to integrase inhibitors
5. increase susceptibility to protease inhibitors

51) How many binding sites for non-nucleoside analogue inhibitors have been identified in the hepatitis C virus RNA polymerase?

1. 2
2. 3
3. 6
4. 10
5. 15

52) How many binding sites for nucleoside and non-nucleoside analogue inhibitors have been identified in HIV-1 RT?

1. 2
2. 3
3. 6
4. 10
5. 15

53) HIV genotyping involves

1. sequences of human genes
2. sequencing of viral RT and protease genes
3. drug susceptibility measurements
4. sequencing of viral envelope proteins
5. sequencing of the viral capsid protein

54) The re-emergence of the virus that causes severe acute respiratory syndrome is believed to be:

1. Impossible since everyone has developed immunity
2. Improbable because the person who transmitted the virus in the early 1990's outbreak has perished.
3. Not possible because this is now a virus that only infects palm civets and other animals
4. Probable because people continue to eat undercooked, infected meat.
5. Possible because people possibly harbour a latent form of the virus

TYPE II QUESTIONS

For each of the questions in the following section, ONE or MORE of the suggested answers or completions are correct:

When A and C are correct	**mark 1**
When B and D are correct	**mark 2**
When A, B, and C are correct	**mark 3**
When D is correct	**mark 4**
When E is correct	**mark 5**

55) The subtypes and viral variability of HIV are attributable to:

A. Extensive viral replication and mutagenesis
B. Genetic engineering
C. The infidelity of viral reverse transcriptase
D. Intravenous drug use
E. Sexual transmission of HIV

56) HIV drug resistance can be overcome:

A. by giving combinations of effective drugs.
B. by boosting drug levels in plasma.
C. by using more potent agents.
D. none of the above.
E. use of microbicides

57) The development of a therapeutic vaccine for HIV:

A. Will eliminate HIV infection from infected hosts.
B. Depends on stimulation of antiviral immune responses.
C. Requires use of interleukins.
D. May be used in concert with antiviral drugs
E. All of the above

58) HIV genetic diversity is

A. responsible for the existence of multiple subtypes of HIV throughout the world.
B. attributable to the high error rate of HIV reverse transcriptase
C. includes the problem of HIV drug resistance
D. a problem in vaccine development.
E. All of the above.

59) HIV-1 Gag contains three functional domains that are essential for virus assembly, these domains are:

A. The membrane binding domain;
B. The Gag-Gag interaction domain;
C. The late budding domain;
D. The SP2 domain;
E. The N-terminal domain of CA.

60) HIV-1 Gag contains a late domain within the p6 region. The function of this late domain is to:

A. Promote budding of virus particles from the plasma membrane;
B. Facilitate the association of Gag with cellular membranes;
C. Bind to the cellular factor TSG101;
D. Package viral RNA into virus particles;
E. Initiate Gag-Gag interaction

61) Which of the following cellular proteins have been reported to get packaged into HIV-1 particles:

A. Staufen
B. Cyclophilin A
C. Translation elongation factor 1alpha
D. RNA polymerase II
E. Lamin A

When A and C are correct	**mark 1**
When B and D are correct	**mark 2**
When A, B, and C are correct	**mark 3**
When D is correct	**mark 4**
When E is correct	**mark 5**

62) Which of the following procedures are used to reduce hyperacute rejection:

A. Depleting the anti-alpha-Gal antibodies in the recipients.
B. Blocking the complement activation pathway.
C. Generating the GK-KO pigs.
D. Using high dose of immunosuppressants.
E. Using antibiotics.

63) Which of the following late domain sequences are found in the p6 domain of HIV-1 Gag protein:

A. PPPY;
B. PTAP
C. LYPD
D. LXXLF
E. YIGL

64) The activity of the HIV-1 trans-activator Tat involves:

A. HIV-1 Tat forms a complex with Cyclin T1 and CDK9.
B. HIV-1 Tat becomes acetylated by histone acetyltransferases (HAT).
C. CDK9 phosphorylates the carboxy terminal domain of the RNA polymerase II.
D. HIV-1 Tat recruits TFIID to the promoter.
E. HIV-1 Tat recruits TFIIB to the promoter.

65) The role of chromatin remodeling factors in HIV transcription and Tat trans-activation includes:

A. HIV-1 provirus cannot be organized in nucleosomes.
B. The chromatin remodeling complex SWI/SNF is recruited by Tat.
C. CDK9 phosphorylates Histone acetyl transferases (HAT).
D. HATs and SWI/SNF participate to nucleosome remodeling and HIV transcription.
E. SWI/SNF binds HIV-1 TAR RNA.

66) HIV associated dementia is caused by:

A. Cytokines secreted by infected microglial cells and astrocytes.
B. Neuronal damage.
C. HIV Tat protein.
D. HIV infection of neurones.
E. Fibroblast infiltration in brain.

67) Nef is a major determinant in AIDS pathogenesis as shown by:

A. It contributes to AIDS dementia by its neurotoxicity.
B. It induces oncogenicity.
C. It causes AIDS-associated Kaposi sarcoma.
D. It can induce an AIDS-like disease in transgenic mice.
E. It induces a deregulation of all RNA processing.

68) Antisense oligonucleotides used to inhibit virus replication are:

A. Peptidomimetics.
B. RNA decoys.
C. Transdominant proteins.
D. Small interfering RNAs.
E. RNA or DNA molecules

When A and C are correct	**mark 1**
When B and D are correct	**mark 2**
When A, B, and C are correct	**mark 3**
When D is correct	**mark 4**
When E is correct	**mark 5**

69) Small interfering RNAs used to inhibit virus replication:

A. Are double-stranded RNAs.
B. Are catalytic RNAs.
C. Are active in an RNA-induced silencing complex that includes the Dicer RNAse.
D. Target only RNA viruses.
E. Target only DNA viruses.

70) Safe viral vectors require the following criteria to be used in gene therapy:

A. They are transducing retroviruses.
B. They cannot induce a severe disease.
C. They are highly immunogenic.
D. They are defective viruses.
E. They are cytopathic.

71) Adeno-associated viruses (AAV) used in gene therapy have the following characteristics:

A. They are parvoviruses.
B. They require AAV helper plasmid expressing some adenovirus proteins.
C. They require AAV packaging plasmids.
D. They can package up to 40 kD of foreign DNA.
E. They induce a high virus titer.

72) Cell-to-cell transmission of viruses is important for virus propagation. Which of the following statements is/are TRUE?

A. HTLV-1's only known mode of transmission is via cell-to-cell
B. Cell-to-cell virus transmission is characterized by a rearrangement and recruitment of cell surface receptors and cytoskeleton components
C. Cell-to-cell virus transmission is a means to evade the host immune response
D. Cell-to-cell transmission is its only known mode of transmission of HIV-1
E. Cell-to-cell transmission of viruses involves a fusion between the cells

73) The replication of the virus that causes severe acute respiratory syndrome is dependent on many coordinated genetic regulatory events. Which of the following is/are true?

A. A translational frameshifting event generates a DNA that integrates into the host cell genome.
B. Proteolytic processing of a precursor protein generates smaller functional proteins.
C. Replication of this virus occurs entirely in the nucleus of the infected cell.
D. The activity of an RNA-dependent RNA polymerase (RdRp) is important for the generation of RNA early in infection.
E. The activity of a DNA-dependent RNA polymerase (DdRp) is important for the generation of RNA early in infection.

74) The appearance of the virus that causes severe acute respiratory syndrome in the human population is believed to be due to:

A. Cross-species virus transmission from the Himalayan palm civet and raccoon dog
B. Adaptation of the Spike receptor protein by introduced mutations to favour interaction with receptors that are expressed on human cells.
C. Animal reservoirs of virus.
D. Mutations in influenza virus that causes the common cold
E. Money exchange that occurs in live poultry markets in regions of China

When A and C are correct	**mark 1**
When B and D are correct	**mark 2**
When A, B, and C are correct	**mark 3**
When D is correct	**mark 4**
When E is correct	**mark 5**

75) It is believed that a small province in China was the origin of the virus that causes severe acute respiratory syndrome. What is/are the reasons that people became infected world-wide?

A. Transmission through the water supply.
B. Animals traveling with people transmit virus to other animals in other parts of the world
C. Fallout from small explosions that caused tidal waves.
D. Transmission from people travelling to other parts of the planet.
E. Bottled water made in China

76) Retroviral RNAs need to be taken from the nucleus and trafficked to sites of viral assembly and then into new virus particles. What is needed in order to achieve these trafficking events?

A. The formation of a viral ribonucleoprotein complex that is transported on the host cell cytoskeleton.
B. The action of host cell proteins.
C. The cellular vesicle trafficking machinery.
D. The action of immune molecules like HLA.
E. Nothing. The RNA diffuses from the nucleus to the site of assembly into virus particles.

77) Dominant and recessive genetic traits of the host can influence whether a virus can infect an individual or not. What types of genes have been characterized that prevent or limit infection in an individual?

A. Genes that encode cytokines like interferons (IFN)
B. Genes that encode the human major histocompatibility complex or HLA
C. Genes that encode membrane receptors
D. Genes that encode transcription factors
E. Genes that encode cytoskeleton proteins

78) During the early stages of infection virus "surfing" occurs. What is the proposed mechanism and importance for this phenomenon?

A. Viruses bump into cell protrusions called filopodia, stick non-specifically and slide along
B. Viruses bump into cell protrusions called filopodia, stick specifically to their receptors and slide along in an actin-dependent manner
C. Virus particles surf to regions of the cell where their receptors are found to allow entry
D. Virus particles surf to regions of the cell that are undergoing increased cytoskelal rearrangements and endocytosis
E. Surfing requires a flattened surface on the virus envelope to allow « surfing » on actin filaments on the outer surface of the cell.

79) What are realistic goals in current HIV therapy?

A. to suppress viral replication
B. to diminish the emergence of resistance mutations
C. to stabilize the immune system
D. to eradicate HIV
E. to cure the disease

80) Non-nucleoside analogue inhibitors of HIV-1 reverse transcriptase (NNRTIs)

A. compete with cellular dNTP pools
B. bind to the viral protease
C. bind to the RNase H domain
D. select for mutations that confer resistance to nucleoside analogs
E. bind to a hydrophobic pocket close to the polymerase active site

81) What are the factors that can affect the development of HIV resistance to antiviral compounds?

A. The accuracy of viral DNA synthesis
B. The lack of an intrinsic proof reading activity in HIV-1 RT
C. Insufficient suppression of viral replication
D. Inaccurate translation of viral proteins
E. Inaccurate translation of cellular proteins

When A and C are correct	**mark 1**
When B and D are correct	**mark 2**
When A, B, and C are correct	**mark 3**
When D is correct	**mark 4**
When E is correct	**mark 5**

82) Nucleoside analogue inhibitors of HIV-1 reverse transcriptase

A. lack the 3' OH group
B. lack the 2' OH group
C. are administered as prodrugs
D. bind to a hydrophobic pocket close to the polymerase active site
E. can block the RT-associated RNase H activity

83) High-level HIV resistance to AZT is conferred by

A. a single mutation in the RT gene
B. a single mutation in the viral protease
C. genetic alterations in the envelope
D. multiple mutations in the RT gene
E. amino acid substitutions in the Tat protein

84) Which of the following molecule(s) can promote excision of HIV-1 RT-incorporated chain-terminators, such as the AZT?

A. the template strand
B. pyrophosphate (PPi)
C. the primer strand
D. ATP
E. the RNase H domain

85) Non-obligate chain-terminators

A. interfere with hepatitis C virus replication
B. compromise nucleotide binding
C. are incorporated by the hepatitis C virus polymerase
D. lack the 3'-hydroxyl group
E. lack the 2'-hydroxyl group