

RESERVE

OBAFEMI AWOLOWO UNIVERSITY
DEPARTMENT OF MICROBIOLOGY
2010/2011 RAIN SEMESTER EXAMINATIONS

MCB 406 MEDICAL VIROLOGY

TIME ALLOWED: 3 Hrs

ANSWER ALL SECTIONS EACH IN A SEPARATE BOOKLET

SECTION A

1. i) List the major properties of viruses that make them unique among other microorganisms.
ii) Distinguish between these:
 - a) Virioids and Pseudoviruses
 - b) Defective viruses and Prions
 - c) Plantar and venereal warts
3. List and describe the major characteristics of the family Orthomyxoviridae
 - i) How are these viruses classified?
 - ii) Differentiate between Antigenic drift and Antigenic shift and show briefly the role these play in epidemiology.
3. Viruses are cultivated in rapidly metabolizing cell.
 - i) List methods used to cultivate viruses and describe in reasonable detail three of these methods underlining the advantage and disadvantages of each method.
 - ii) Describe in detail 4 outcomes of virus interactions with cells
 - iii) List the major characteristics of a transformed cell

50 Marks

SECTION B:

1. i. Using an annotated diagram summarize the Baltimore classification of viruses based on genome type and expression.
ii. Using clear illustrations, outline the Plaque Assay procedure for enumeration of virus load in a given sample.

25 Marks

3. Using the MCQ answer sheet provided, answer the following questions by shading the correct option for each question. Do not shade more than one option as this will earn you a loss of $\frac{1}{4}$ of a mark for each of such a breach. GOODLUCK.

1. Viral RNA is replicated in the host cell
A) Lysozomes B) Wall C) Nucleus D) Cytoplasmic matrix E) Mitochondria
2. Prion diseases share important clinical, neuropathological, and cell biological features with:
A) Kuru B) Fatal familial insomnia C) Gerstmann-Straussler syndrome
D) Creutzfeldt-Jakob disease E) Alzheimer's disease
3. Which of the following are obligate intracellular parasites?
A) All of the listed B) Rickettsia C) Chlamydia D) Viruses E) Bacteriophages
4. Synchronous infection of cultures with a high amount of virus, such that all cells within the culture become infected rapidly is called -----
A) multiplicity of infestation B) multiple infestation C) multiplicity of attack
D) multiplicity of infection E) multiple attack

5. Which of the following best describes adjuvants ?
 A) Certain anti-microbial substances, which are added to vaccines as preservatives.
 B) none of the listed
 C) Certain substances, which are administered simultaneously with a specific antigen to kill pathogens
 D) Certain anti-microbial substances, which are added to vaccines to prolong the shelf lives
 E) Certain substances, usually administered simultaneously with specific antigens in vaccines
6. - strand RNA viruses use ----- to synthesize mRNA, using the genome as the template
 A) host DNA-dependent RNA polymerase B) viral DNA-dependent RNA polymerase
 C) host RNA-dependent RNA polymerase D) None of the listed
 E) viral RNA-dependent RNA polymerase
7. Rubella virus is a member of the family
 A) Paramyxoviridae B) Poxviridae C) Togaviridae D) Paramyxoviridae E) Orthomyxoviridae
8. _____ is probably the most important characteristic for classification of viruses in eucaryotes
 A) Morphology B) Chemical nature of virion constituents C) Host preference
 D) Physical nature of virion constituents E) Genetic relatedness
9. Which group(s) is/are most at risk for acquiring AIDS?
 A) Prostitutes B) Homosexual/bisexual men C) Children born of infected mothers
 D) Intravenous drug users E) Bisexuals
10. A typical one-step growth analysis can be divided into serial phases as follows:
 A) Latent period, Eclipse phase, Adsorption of virus
 B) Synthetic phase, Latent period, Eclipse phase, Adsorption of virus
 C) Adsorption of virus, Eclipse phase, Synthetic phase, Latent period
 D) Adsorption of virus, Synthetic phase, Latent period, death phase
 E) Latent period, Eclipse phase, Adsorption of virus, Death phase
11. Viruses are distinct from other microbes because ----
 A) lack the genetic information which encodes apparatus necessary for the generation of metabolic energy
 B) they are produced from the assembly of pre-formed components
 C) lack the genetic information which encodes apparatus necessary for protein synthesis
 D) they do not grow or undergo division E) All of the listed
12. A major disadvantage of live vaccines is -----
 A) the possibility of overreaction of host immune response
 B) the possibility of weak immune response in the host
 C) the possibility of mutagenic variation D) none of the listed
 E) the possibility of high fatality in case of failure
13. Usually viruses are separated into several large groups based primarily on
 A) Capsid symmetry B) Diameter of the virion or nucleocapsid
 C) Presence of an envelope and ether sensitivity
 D) Nature of the host E) Nucleic acid characteristics
14. The 393-residue polypeptide of the p53 protein involved in cancer regulation contains functional domains
 A) four B) six C) three D) eight E) five
15. Which of the following is not a serological method used in virology?
 A) Complement fixation test B) Immunofluorescent test C) None of the listed
 D) Immunoblot E) Gel electrophoresis
16. Which of the following viruses has not been associated with human cancer?
 A) HTLV I and HTLV II viruses B) Influenza virus C) Epstein Barr virus
 D) Hepatitis B virus E) Human papillomavirus
17. The attributes of a good vaccine include

- A) Must be stable to retain immunogenicity, despite adverse storage conditions prior to administration and inexpensive
 B) Safe vaccine itself should not cause disease C) Long term protection ideally life-long
 D) All of the listed E) Ability to elicit the appropriate immune response for the particular pathogen
18. ssRNA viruses use viral replicase to convert ssRNA into dsRNA replicative which serves as -----
 A) template for enzyme synthesis B) template for genome synthesis C) template for reproduction
 D) template for protein synthesis E) none of the listed
19. Viroids are composed of
 A) DNA and RNA B) single-stranded DNA C) double-stranded RNA
 D) single-stranded RNA E) double-stranded DNA
20. Retroviruses make a dsDNA copy (called proviral DNA) using the enzyme -----
 A) reverse transcriptase B) reverse replicase C) forward replicase
 D) double transcriptase E) forward transcriptase
21. Which of the following methods is/are useful in the study of viruses?
 A) None of the listed B) Physical methods C) Electron microscopy
 D) All of the listed E) Chemical methods
22. What kind of embryo is often used for viral assays?
 A) Rat B) Chicken C) Cat D) Mouse E) Dog
23. Genital herpes infection is caused by -----
 A) Herpesviruses B) Herpes simplex virus II C) Herpesvirus II
 D) Adenoherpesvirus E) Herpesviruses I and II
24. dsRNA viruses use ----- to synthesize mRNA.
 A) viral RNA-dependent RNA polymerase. B) host RNA-dependent RNA polymerase
 C) host RNA-dependent RNA polymerase D) viral DNA-dependent DNA polymerase
 E) None of the listed
25. Which of the following is not an attribute of live attenuated vaccines?
 A) usually low immunogenicity B) vaccines are not infectious
 C) production is more expensive than live vaccines
 D) none of the listed E) multiple doses are required to boost immune response in host
26. Poliovirus, a member of the family -----
 A) Parvoviridae B) Orthomyxoviridae C) Herpesviridae D) Picornaviridae E) Togaviridae
27. The ___ of the influenza-enveloped virus appear to be involved in attachment to the host cell receptor site.
 A) Pili B) Flagellae C) Neuraminidase D) Hemagglutinin E) Fimbriae
28. Which hepatitis is sometimes called serum hepatitis?
 A) Hepatitis D B) Hepatitis C C) Hepatitis E D) Hepatitis A E) Hepatitis B
29. Vaccination/Immunization is generally considered as
 A) a chemotherapeutic control measure B) a prophylactic control measure
 C) none of the listed
 D) an emergency proactive chemical control measure E) an emergency proactive control measure
30. For dsRNA viruses and -strand RNA viruses, the viral RNA-dependent RNA polymerase functions both as the
 A) RNAase and the replicase B) DNAase and the replicase
 C) transcriptase and the DNAase D) transcriptase and the RNAase
 E) transcriptase and the replicase
31. Visible changes in cells that are induced by viruses and referred to as cytopathic effects may include:
 A) All of the listed B) Membrane blebbing

- C) Rounding up and detachment of cells from the culture dish and Cell lysis
 D) Production of inclusion bodies in the nucleus or cytoplasm
 E) Formation of multinucleated giant cells (syncytia)
32. Infection with HIV will result in a depletion of
 A) CD4+ cells B) CD5+ cells and CD8+ cells C) CD3+ cells D) CD1+ cells E) CD2+ cells and CD4+ cells
33. Edward Jenner began inoculating humans with material from _____ lesions
 A) Avianpox B) Cowpox C) Dogpox D) Smallpox E) Chickenpox
34. Examples of adjuvants commonly used are -----
 A) All of the listed B) Aluminum salts C) Cytokines IL-2, IL-12 and Interferon-gamma
 D) Liposomes and Immunostimulating complexes
 E) Muramyl di-peptide, derived from Mycobacterial cell wall
35. Which is the best diagnostic for AIDS?
 A) Anti-HIV antibodies in the blood B) Viral antigens C) Viral reverse transcriptase activity
 D) Viral culture E) Viral isolation
36. A parenteral route of drug administration refers to
 A) nonoral B) intravenously C) subcutaneously D) oral E) intramuscularly
37. Cell culture method is used in the study of viruses and examples are
 A) established cell lines B) immortalized cell lines C) None of the listed
 D) All of the listed E) primary cell lines
- The cold sore (fever blisters) is caused by -----
 A) Herpes simplex virus I B) Herpes simplex virus II C) Herpes simplex viruses I and II
 D) Herpesviruses E) All of the listed
39. Which of the following can be used to distinguish primary from continuous cell lines?
 A) Life span B) Derivation/Source C) Serum dependence
 D) Anchorage/Contact inhibition E) All of the listed
40. Major disadvantage of live attenuated vaccines is/are -----
 A) the danger of reversion to virulence and
 B) the danger of reversion to virulence and causing damage to immune cells of the host C) none of the listed
 D) the danger of reversion to virulence and the possibility of extensive disease in immunocompromised individuals
 E) the possibility of causing extensive disease in immunocompromised individuals
41. Enveloped viruses have a _____ shape.
 A) Roughly spherical B) Icosahedral C) Hexagonal D) Helical E) Complex
42. Which of the following is not true of Live recombinant vaccines?
 A) applies recombinant gene technology B) allows for "multivalent vaccination C) none of the listed
 D) a gene coding for an immunogenic protein from one organism is introduced into the genome of another
 E) potentially less virulent
43. Which disease has/have been completely eradicated?
 A) Mumps B) Polio and small pox C) Smallpox D) Chickenpox E) Measles and Polio
44. ssRNA viruses use viral replicase (-----) to convert ssRNA into dsRNA (replicative form).
 A) an RNA-dependent RNA polymerase B) none of the listed C) a DNA-dependent DNA polymerase
 D) a DNA-dependent RNA polymerase E) an RNA-dependent DNA polymerase
45. Selectivity has been a problem of antiviral chemotherapy because viruses
 A) degrade the drugs B) none of the listed C) use the metabolic machinery of the host
 D) are more virulent than bacteria E) are hard nuts to crack
46. Which of the following are used for the diagnoses of cancer?
 A) blood testing for specific antigens, Mammogram for breast cancer and Biopsy B) All of the listed
 C) blood testing for specific antigens, Mammogram for breast cancer, Endoscopy and biopsy

- D) Endoscopy, Radiology, and Ultrasound imaging
E) blood testing for specific antigens and Mammogram for breast cancer
47. Which of the following is associated with development of neurodegenerative disease in livestock and humans?
A) Viroids B) virions C) Prions D) Virinos E) Viruses
48. Major pathways leading to p53 activation in cancer regulation mechanism are ----- in number
A) two B) none of the listed C) four D) three E) five
49. Which of the following is NOT true of virions?
A) Contain RNA B) Contain DNA C) Are extracellular D) Reproduce independently E) Induce host metabolism
50. Which of the following is true of the biochemical replicative cycle of retroviruses?
A) The proviral DNA is integrated into the host chromosome B) None of the listed
C) Sometimes these viruses can change the host cells into tumor cells
D) The integrated proviral DNA can then direct the synthesis of mRNA E) All of the listed
51. A bacterial defense mechanism against bacteriophage is called
A) Lysogeny B) Polymerization C) Lysis D) Restriction E) Concatamerization
52. Which of the following antiviral drugs target specific steps of life cycle, especially enzymes that function in the life cycle of viruses
A) vidarabine, acyclovir, azidothymidine B) acyclovir C) All of the listed
D) vidarabine, acyclovir E) amantadine
53. Holes produced in bacterial "lawns" by viruses are called
A) Clearance B) Patches C) Lysis D) Plaques E) Colonies
54. Which of the following is not an attribute of live vaccines?
A) organisms in the vaccine must remain viable in order to infect and replicate in the host
B) maintenance of the cold chain is very important C) sensitive to adverse storage conditions
D) relatively cheaper to produce E) none of the listed
55. Given appropriate conditions, which of the following is true of established cell lines?
A) they undergo rapid genetic variation B) none of the listed C) they continue to grow in culture indefinitely
D) they cannot be contaminated by mycoplasma E) they are not useful for virus isolation
56. The most popular indirect method of counting virus particles is
A) By colony counting B) By hemagglutination assay C) By counting plaque-forming units
D) By plaque-assay E) Microscopically
57. The clinical microbiology laboratory is concerned with
A) antimicrobial testing. B) isolation of the organism C) All of the listed
D) identification of the organism. E) proper handling of specimen
58. The hepadnaviruses such as hepatitis B virus are quite different from other DNA viruses with respect to genome replication. They replicate their DNA using
A) Reverse transcriptase B) DNA-dependent DNA polymerase C) DNA ligase
D) RNA-dependent DNA polymerase E) Rnase H
59. The process by which phage reproduction is initiated in lysogenized culture is called
A) Infection B) Induction C) Enhancement D) Repression E) Integration
60. In lysogeny, a/an _____ protein keeps the prophage dormant and prevents virus reproduction.
A) Promotor B) Enhancer C) Repressor D) Inducer E) Operator
61. Which of the following is true of the p53 PROTEIN?
A) p53 PROTEIN activates genes involved in cell death pathways B) All of the listed
C) p53 protein activates a gene called p21 that encodes a protein that halts the cell cycle
D) p53 PROTEIN activates genes involved in DNA repair E) Mutated p53 gene predisposes to cancer

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62. Virulent and non-virulent viruses may do any of the following but NOT
A) Inhibit host cell RNA synthesis B) Inhibit host cell protein synthesis C) Degrade host cell DNA
D) Stimulate host cell macromolecule synthesis E) Inhibit host cell DNA synthesis
63. Which of the following is caused by a DNA virus?
A) Hantavirus pulmonary syndrome B) Colorado tick fever and Herpes C) AIDS D) Herpes E) Measles
64. Which of the following has been linked to cervical cancer?
A) Human herpes virus 8 B) Human immunodeficiency virus C) Human T-cell lymphotropic virus
D) Epstein-Barr virus E) Human papilloma virus
65. The clinical microbiologist identifies agents and organisms based on which of the following?
A) Biochemical properties B) Molecular properties C) All of the above
D) Morphological properties E) Immunological properties
66. A bacterium carrying a prophage
A) may enter the lytic cycle if stressed by UV radiation B) none of the listed C) cannot transcribe RNA
D) may divide to give daughter bacteria E) has been infected by a temperate phage
67. Which of the following is NOT transmitted by the fecal-oral route?
A) Hepatitis E B) Hepatitis A C) Poliomyelitis D) Viral gastroenteritis E) Kuru
68. Who developed the concept of specific toxicity?
A) Jenner B) Fleming C) Watson D) Pasteur E) Ehrlich
69. Viruses may cause cancer by which of the following mechanisms?
A) All of the listed B) introduction of one or more cancer-causing genes (oncogenes) into the cell
C) insertion of a promoter or enhancer next to the proto-oncogene causing an abnormal expression of this gene
D) none of the listed E) production of a regulatory protein, which activates cell division
70. Mutations in ----- and ----- are associated with tumor initiation.
A) p53 tumor suppressor gene and rat proto-oncogene B) p53 tumor induction gene and rat proto-oncogene
C) p53 tumor induction gene and ras proto-oncogene D) none of the listed
E) p53 tumor suppressor gene and ras proto-oncogene
71. Mumps virus is a member of the family -----
A) None of the listed B) Paramyxoviridae C) Togaviridae D) Poxviridae E) Orthomyxoviridae
72. Which of the following CANNOT be used to identify a virus?
A) Cell culture B) Latex agglutination C) Gram stain D) Radioimmunoassay E) Enzyme immunoassay
73. With which of the following is virus always detectable after infections?
A) Cytomegalovirus B) Varicella-zoster virus C) Epstein-Barr virus D) Hepatitis B virus E) Herpes simplex virus
74. Herpesviruses possess dsDNA) and use ----- to transcribe early genes.
A) host DNA polymerase B) host RNA polymerase C) host and virus RNA polymerase
D) virus RNA polymerase E) None of the listed
75. The infectivity of an animal virus suspension may be quantitatively measured by -----
A) electron microscopy B) plaque assay C) protein assay D) colony count E) plaque assay and protein assay
76. Russian physicians are currently using which of the following to treat bacterial infections?
A) Bacteriophage B) Plant products C) Fungi D) Viruses E) Other bacteria
77. Burst sizes for viruses typically vary between -----
A) 50 and 1,000 B) 10 and 10,000 C) 10,000 and 100,000 D) 100 and 1,000 E) 1,000 and 10,000
78. Eating meat from cattle with bovine spongiform encephalitis can cause a variant of ____ in humans

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- A) Alzheimer's disease B) Creutzfeldt-Jakob disease C) Geistmann-Straussler-Scheinker syndrome
D) Kuru E) Fatal familial insomnia
79. The larger the _____, the better the chemotherapeutic agent.
A) therapeutic dose B) therapeutic index C) selective toxicity D) spectrum E) toxic dose
80. Varicella-zoster virus is a member of the family -----
A) Paramyxoviridae B) Poxviridae C) None of the listed D) Herpesviridae E) Orthomyxoviridae
81. Which of the following is true for dsRNA viruses and -strand RNA viruses?
A) none of the listed B) the viral RNA-dependent RNA polymerase functions as the replicase
C) the host RNA-dependent RNA polymerase functions both as the transcriptase and the replicase
D) the viral RNA-dependent RNA polymerase functions as the transcriptase
E) the viral RNA-dependent RNA polymerase functions both as the transcriptase and the replicase
82. Which of the following may affect proteins and nucleic acids, but NOT viruses?
A) Heat B) Drastic pH changes C) All of the listed D) Denaturation E) Enzyme treatment
83. Which of the following is not true of sub-unit vaccines?
A) require booster doses to boost host immune response
B) involves use of purified proteins of the organism with potential to stimulate protective immunity
C) none of the listed D) generally with low immune response
E) generally safe; less side reactions at injection sites
84. Which of the following are normally used for inactivating organisms in the preparation of attenuated?
A) formaldehyde and beta-propiolactone B) beta-propiolactone and alcohol C) chloroform and alcohol
D) chloroform and formaldehyde E) formaldehyde and alcohol
85. +strand RNA viruses use their genome as -----
A) None of the listed B) - sense DNA C) - sense mRNA D) + sense mRNA E) + sense DNA
86. Parvoviruses possess ssDNA) and use ----- for all biosynthetic process
A) virus and host enzymes B) host enzymes C) All of the listed D) virus enzymes E) None of the listed
87. Poxviruses possess dsDNA and use to replicate the viral genome.
A) viral and host DNA polymerase B) All of the listed C) viral RNA polymerase
D) host DNA polymerase, E) viral DNA polymerase
88. The virus burst size of an infected cell culture is defined as -----
A) the average size of the virus produced, per infected cell B) the total amount of infectious virus produced
C) the ratio of amount of infectious virus produced to the initial amount introduced
D) the amount of infectious virus produced per infected cell E) none of the listed
89. A/an _____ is specifically able to have a long-term relationship with the host known as lysogeny
A) DNA phage B) Temperate virus C) Virion D) Adsorbed virus E) RNA phage
90. Viruses can be purified based on their size and density by use of
A) Differential centrifugation B) Filtration C) Gradient centrifugation D) Precipitation E) All of the listed
91. The central theme of the Baltimore system of classification of viruses is that -----
A) all viruses must generate minus strand mRNAs from their genomes
B) all viruses must generate positive strand DNAs from their genomes
C) all viruses must generate positive strand mRNAs from their genomes
D) none of the listed E) all viruses must generate minus strand DNAs from their genomes
92. Live attenuated vaccines are those in which -----
A) virulence factors of the pathogen have been artificially reduced B) none of the listed
C) replicative factors of the pathogen have been artificially reduced
D) replicative factors of the pathogen have been damaged
E) virulence factors of the pathogen have been destroyed

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93. Which of the following is not true of cancer (tumor) cells?
A) can be benign (nonspreading) or malignant B) none of the listed C) some can undergo metastasis
D) they are mortal in normal circumstances E) can be induced by chemical, physical and biological agents
94. Major components of the mode of action of adjuvants include -----
A) Enhancement of the recruitment of antigen-specific T and B cells to the site of inoculation
B) Activation of antigen-presenting cells to secrete cytokines
C) Allowing maximal exposure to dendritic cells and specific T and B lymphocytes
D) Trapping of antigen in the tissues E) All of the listed
95. Which of the following tests is used to determine the minimal lethal concentration?
A) All of the above B) Broth dilution test C) Dilution susceptibility tests
D) plaque assay test E) Agar dilution test
96. Poxviruses possess dsDNA and use to synthesize early mRNA.
A) none of the listed B) viral and host RNA polymerase C) host RNA polymerase
D) viral RNA polymerase E) viral DNA polymerase
97. Vaccines generally contain -----
A) live or killed organisms B) live organisms C) synthetic engineered antigens
D) live and killed organisms E) live or killed organisms or antigens of the pathogen
98. Herpesviruses possess dsDNA and use for DNA replication
A) viral DNA polymerase B) All of the listed C) viral RNA polymerase
D) host DNA polymerase E) viral and host DNA polymerase
99. Animal virus particles enter susceptible cells by -----
A) endocytosis B) osmosis C) none of the listed D) electrophoresis E) plasmapheresis
100. Which of the following refers to specific procedures used to prevent unwanted microorganisms from contaminating clinical specimen?
A) Disinfectant technique B) Needle aspiration C) Catheterization D) Intubation E) Aseptic technique
101. A unique advantage of live vaccines is that -----
A) pathogen become more potent by the chemical treatment
B) pathogen becomes more virulent and hence more immunogenic
C) pathogen is dead and hence less infectious
D) pathogen can still replicate in the host E) none of the listed
102. Which of the following statements is most correct?
A) Human interferon is very effective in the treatment of viral infections B) none of the listed
C) Human interferon is used to treat some viral infections
D) Human interferon can be used to treat viral infections because it acts like antibodies
E) Human interferon has been found useful for the treatment of AIDS
103. The use of whole live organisms in the study of viruses is generally scanty used today because -----
A) Breeding & maintenance of animals infected with viruses is expensive
B) Results obtained are not always reproducible, due to host variation
C) Whole animals are complex systems, in which it is sometimes difficult to interpret
D) All of the listed
E) Unnecessary or wasteful use of experimental animals is morally repugnant
104. Viruses require _____ for growth.
A) Animals B) Plants C) Living cells D) Fungi E) Bacteria
105. Intracellular structures formed during many viral infections, is called _____, which can directly disrupt cell structure.
A) Chromosomal disruptions B) Inclusion bodies C) All of the listed
D) Cytocidal bodies E) Prokaryotes

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