1. Which of the following statements best defines a virus?
   a. A virus is an extracellular free—living microorganisms capable of self replication
   b. A virus is composed of infectious proteins that are capable of self replication
   c. A virus is an intracellular parasite composed of DNA or RNA and a protein coat
   d. A virus is an intracellular parasite composed of DNA and RNA, a protein coat, and a lipid envelope.

2. Which of the following statements is true?
   a. All negative stranded RNA viruses have helical symmetry
   b. All arboviruses are negative stranded
   c. All negative stranded RNA viruses are enveloped
   d. All negative stranded viruses encode a reverse transcriptase

3. Which of the following viruses has helical symmetry?
   a. Rabies virus
   b. Influenza virus
   c. Measles virus
   d. All of the above

4. Which of the following virus families contains the rabies virus?
   a. Orthomyxoviridae
   b. Paramyxoviridae
   c. Polyomaviridae
   d. Rhabdoviridae

5. Which of the following viruses replicate in the nucleus?
   a. Hepatitis A virus
   b. Poxvirus
   c. Measles virus
   d. Influenzavirus
6. Which of the following viruses encode their own polymerases to produce mRNA?

a. HTLV-1 - retrovirus
b. HIV-1 - RT

c. Respiratory syncitial virus (−) sense RNA virus

All of the above

7. Which of the following statements is true?

a. Mutations in HIV are due to mistakes made by reverse transcriptase only.
b. Mutations in HIV are due to mistakes made by reverse transcriptase and by a host cell DNA dependent RNA polymerase (RNA Pol II).
c. Mutations in RNA genomes are infrequent compared to DNA genomes
d. Mutations are not driven by selective pressure from drug treatments.

8. Which of the following viruses have a segmented genome?

a. Rotavirus 11 segments
b. Parainfluenzavirus
c. Picornavirus
d. Paramyxovirus

9. Which of the following statements are true?

a. Cytopathic effects are characteristic for individual viruses.
b. Shortly after infection a virus loses its identity and becomes non-infectious.
c. Proteins for replication are produced early after infection and structural proteins are produced later.
d. All of the above

10. Which of the following statements are true?

a. Adsorption is enhanced by the presence of multiple receptors.
b. Differences in host range and tissue tropism are often due to the presence or absence of receptors.
c. Viruses encode envelope glycoproteins and glycolipids.
d. All of the above.
e. A and B only
11. Which of the following statements is false?
   a. Some enveloped viruses enter cells by direct membrane fusion.
   b. Some enveloped viruses enter cells by receptor mediated endocytosis.
   c. Some non-enveloped viruses enter cells by receptor mediated endocytosis.
   d. Some non-enveloped viruses enter cells by fusion at the plasma membrane.
   e. None of the above

12. Which of the following statements is false?
   a. All negative stranded RNA viruses are enveloped.
   b. Most RNA viruses replicate in the cytoplasm.
   c. All DNA viruses replicate in the nucleus. \( \text{Poxviruses} \)
   d. None of the above
   e. None of the above

13. Which of the following statements is false?
   a. All DNA viruses use host cell polymerases for replication.
   b. All RNA viruses use their own polymerases for replication.
   c. Retroviruses use a host cell polymerase to produce mRNA.
   d. Hepadnaviruses encode a reverse transcriptase.
   e. All of the above

14. Which of the following viruses produces a polyprotein that is subsequently cleaved to produce functional proteins?
   a. Influenza virus \(- R_{IN} \)
   b. Measles virus \(- R_{IN} \)
   c. Hepatitis A virus \( \text{RNA virus} \)
   d. Hepatitis B virus \( \text{DNA virus} \)
   e. None of the above
   f. C and D only

15. True or False
   a. Herpes-virus encoded DNA polymerase is a target of the drug acyclovir.

16. True or False
   a. RNA viruses must encode their own polymerases.
17. Which of the following viruses has icosahedral symmetry?
   a. Poliovirus - **picornavirus**
   b. JCV
   c. BKV
   d. Parvovirus
   e. All of the above
   f. B and C only

18. True or False
   a. Viruses synthesize their own lipid envelope.

19. Which of the following viruses are enveloped?
   a. JCV
   b. BKV
   c. Poliovirus
   d. Rabies virus
   e. C and D only

20. Which of the following does a hemagglutination assay measure?
   a. The presence of virus
   b. The presence of antiviral antibodies
   c. The presence of red blood cells in infected tissue
   d. The number of red blood cells in a host infected with hemolytic anemia virus.

21. True or false.
   a. Mutations are responsible for antigenic drift seen in influenza viruses.

22. True or False
   a. Retroviruses use two error prone polymerases for replication, one is virus encoded and the other is host cell encoded.

23. Which of the following retroviruses are associated with **adult T cell leukemia** in humans?
   a. HTLV-III
   b. HTLV-I
   c. MoMLV
d. RSV

24. Which of the following orthomyxoviruses has the greatest potential for virulence and epidemic spread?

   a) Influenza A
   b) Influenza B
   c) Influenza C
   d) Parainfluenza virus

25. Influenza virus subtypes are based on which of the following viral antigens?

   a. M1 and M2 proteins
   b. PA and PB1 proteins
   c. PB2 and NP proteins
   d) HA and NA proteins

26. True or False

   a. Influenza viruses replicate in the cytoplasm of host cells.

27. True or False

   a. Influenza viruses have a segmented genome.

28. True or False

   a. Major antigenic shifts are due to mutations in the HA or NA genes.

29. True or False

   a. All influenza viruses have an animal reservoir.

30. Which of the following influenza viruses are sensitive to the anti-viral drugs amantadine and rimantadine?

   a) Influenza A
   b) Influenza B
   c) Influenza C
   d) All of the above
   e) A and B only
31. Which of the following influenza viruses are sensitive to Zanamivir and Oseltamivir?
   a. Influenza A
   b. Influenza B
   c. Parainfluenza virus
   d. All of the above
   e. A and B only

32. Which of the following viruses are the most important respiratory pathogen in infants?
   a. Parainfluenzavirus
   b. Respiratory syncitial virus
   c. Influenza A virus
   d. Reovirus

33. Which of the following parainfluenza viruses are only associated with upper respiratory disease?
   a. Parainfluenza type 1
   b. Parainfluenza type 2
   c. Parainfluenza type 3
   d. Parainfluenza type 4

34. True or False
   a. Rhinoviruses which cause the common cold and poliovirus which causes paralytic poliomyelitis belong to the same virus family.

35. Which of the following viruses belongs to the family paramyxoviridae?
   a. Measles virus
   b. Mumps virus
   c. Rubella virus
   d. All of the above
   e. A and B only

36. True or False
   a. The major clinical manifestation of mumps virus infection is parotitis.
37. The presence of Koplik's spots is diagnostic for which of the following?
   a. Rubella virus infection
   b. Chicken-pox
   c. Measles
   d. Mumps

38. Which of the following viruses carries the most risk for fetal damage during the first trimester?
   a. Measles virus
   b. Mumps virus
   c. Rubella virus
   d. Chicken pox

39. True or False
   a. Measles, mumps, and rubella are preventable by vaccination with a live-attenuated vaccine termed the MMR vaccine.

40. True or False
   a. All three serotypes of poliovirus are associated with paralytic poliomyelitis.

41. True or False
   a. The Sabin poliovirus vaccine is contraindicated in immunosuppressed individuals.

42. Belonging to the hepatadnavirus family, this partially double stranded partially single stranded DNA virus chronically infects 350-400 million people worldwide:
   a. HAV
   b. HBV
   c. HCV
   d. HCC
43. HBV can best be diagnosed by testing the patient for all of the following except:
   a. HBs or Hbe antigen
   b. HBV DNA
   c. The level of liver enzymes in sera (multiple causes of AST/ALT etc.)
   d. Antibodies against HBV antigens (not a test specific to HBV - only indicates liver damage)

44. Which drug inhibits HBV polymerase and can cause depression as a primary side effect.
   a. IFN-2alpha
   b. Lamivudine
   c. Adefovir
   d. Entecovir

45. What characteristic does NOT determine whether a patient should begin treatment after HBV diagnosis.
   a. Clinical symptoms
   b. Biochemical activity and elevation of liver enzymes
   c. Histological analysis of liver biopsy reveals fibrosis and necrosis
   d. Seropositive blood test

46. True or False
   a. The majority of HCV infections result in spontaneous recovery while chronic hepatitis is a less common outcome.

47. Which of the following herpesviruses are associated with ano-genital lesions?
   a. HHV 1
   b. HHV2
   c. HHV3
   d. HHV4
48. Which of the following herpesviruses establishes latency in B cells?
   a. HSV-2
   b. CMV
   c. VZV
   d. EBV

49. The drug, AZT, belongs to which of the following class of anti-retrovirals?
   a. Nucleoside reverse transcription inhibitors
   b. Non-nucleoside reverse transcriptase inhibitors
   c. Protease inhibitors
   d. Integrase inhibitors

50. Anti-retrovirals targeted at the HIV protease inhibit which of the following steps in the viral life cycle?
   a. Receptor binding and entry
   b. Reverse transcription
   c. Genome replication
   d. Viral maturation
51. The most appropriate specimen to collect in a pediatric patient with a possible viral respiratory illness is which of the following:
   a. Nasopharyngeal swab  
   b. Nasal wash or aspirate  
   c. Expectorated sputum  
   d. Bronchoalveolar lavage

52. Isolation of a patient with Respiratory Syncytial Virus is required because the virus is transmitted by which of the following routes:
   a. Fecal-oral contamination and fomites  
   b. A blood transfusion  
   c. Large aerosol droplet and fomites  
   d. Bite by an arthropod vector

53. Effective fecal-oral contamination occurs with Hepatitis A because of which of the following factors listed:
   a. World-wide distribution  
   b. Non-enveloped virus  
   c. Asymptomatic shedding  
   d. All of the above

54. Infection with Influenza A/B is best controlled by which of the following measures:
   a. Vaccination  
   b. Mass elimination of infected birds  
   c. Inhibiting human, animal, and bird cohabitation  
   d. Prophylactic therapy with an antiviral for at-risk patients

55. A 10 year old female that presents with a fever and vesicular rash on hands, soles of feet, palate and face in August is likely to have which of the following viral etiologies:
   a. Adenovirus  
   b. Varicella Zoster virus  
   c. Herpes  
   d. Enterovirus
Select the correct answer by circling the NUMBER (i.e. i, ii,iii etc) corresponding to the correct choice

**Question 1. Protozoal parasites in general**
A. Are multicellular pathogens
B. Cause acute infections which immediately progress to active disease without chronicity or latency
C. Do not increase their numbers upon infecting their host
D. Typically cause high eosinophilia
E. Are always extracellular and thus easy to detect

- A is correct
- ii. B is correct
- A and B are correct
- C is correct
- C and D are correct
- D is correct
- D and E are correct
- None are correct

**Question 2. Regarding either Entamoeba or Giardia infections.**
A. Each organism sheds 300 - 3000 eggs per day
B. Resides preliminary in body cavities such as the intestines and illicits eosinophilia
C. Relapsing disease in Giardia is due to changing the antigenic properties of their surface antigen
D. Much of the disease is caused by eggs lodging in deep tissue
E. Are both protozoal infections

- A and D are correct
- B and E are correct
- C and D are correct
- C and E are correct
- All are correct

**Question 3. Regarding Entamoeba, Giardia and Trichomonas infections.**
A. One risk factor for infection/disease is sexual activity
B. All initiate host contact at an epithelial surface
C. Re-infection is common
D. Institutionized individuals are among high risk groups
E. Are regularly treated with Metronidazole (flagyl)

- A and C are correct
- B and C are correct
- C and E are correct
- A and E are correct
- All are correct
**Question 4. Regarding Entamoeba infections.**
A. Trophozoites never form Amoebomas; large space-filling voids that can be mis-diagnosed as tumors
B. Do not cause extra-intestinal abscesses which Cryptosporidia does
C. Disease presents as dysentery (bloody diarrhea with pain and intestinal ulcerations)
D. The clinical picture without laboratory diagnosis never resembles inflammatory bowel disease

i. A is correct
ii. B is correct
iii. C is correct
iv. D is incorrect
v. All are correct

**Question 5. Regarding both Entamoeba and Giardia infections.**
A. Both can be transmitted via the oral/fecal route
B. Both produce multinucleate cysts that are passed anally
C. ~90% of the infected individuals are typically asymptomatic for disease
D. The form responsible for much of the disease is the trophozoite
E. Is controlled for the most part by mucosal immunity

i. A and B are correct
ii. B and C are correct
iii. C and D are correct
iv. A and D are correct
v. All are correct

**Question 6. African Trypanosomes T. brucei**
A. Are associated with waves of parasitemia that are related to parasite surface antigen variability
B. Are involved in disrupting CNS functions in the final stage of the disease.
C. Can successfully invade macrophages. All extracellular forms
D. never cause cervical lymph node inflammation

i. A and B are correct
ii. B and C are correct
iii. C and D are correct
iv. A and D are correct
v. All are correct

**Question 7. Some human resistance to clinical leishmanial disease can be conferred by**
A. Glucose 6-Phosphate deficiency
B. b-Thalassemia deficiency
C. Sickle Cell Anemia carrier state
D. Duffy Blood Group absence

i. A and C are correct
ii. A and B are correct
iii. B and C are correct
iv. A and D are correct
v. None are correct
Question 8. African Trypanosomes, Trypanosoma brucei ssp
A. Are strict hemoflagellates
B. Are strictly extracellular parasites.
C. Is responsible for human sleeping sickness.
D. Is usually transmitted through the bites of the Tsetse fly

i. A and B are correct
ii. B and C are correct
iii. C and D are correct
iv. A and D are correct
v. All are correct

Question 9. Toxoplasma gondii
A. Infections are typically asymptomatic in healthy individuals
B. Transmitted transplacentally / via Organ transplant/Oocyst inhalation & consumption/Transfusions.
C. Has broad tissue tropism but primarily infects brain and muscle and macrophage cells.
D. Is an opportunistic infections prevalent in AIDS patient/can cause encephalitis

i. A and B are correct
ii. B and C are correct
iii. C and D are correct
iv. A and D are correct
v. All are correct

Question 10. Latent Toxoplasma gondii infections in high risk HIV infected individuals is of potentially grave consequences because of
A. Diminished CD4+ surveillance may result in re-activation of latent infections and cause encephalitis
B. The increased risk of anemia, Blackwater fever and high IgE titers
C. The risk of developing sleeping sickness a neurological outcome of the infection
D. The risk of Amoeboma formation.

i. A is correct
ii. B is correct
iii. C is correct
iv. D is correct
v. All are correct

Question 11 Cryptosporidium parvum infections
A. Causes high volume intestinal fluid secretion, electrolyte imbalance and massive water loss
B. Hyperimmune bovine colostrum can passively confer protective anti-cryptosporidia antibodies
C. Are transmitted by insect vectors
D. Occurs only in young children

i. A and B are correct
ii. B and C are correct
iii. C and D are correct
iv. A, B and D are correct
v. All are correct
Question 12. Plasmodium vivax infections
A. May produce dormant sporozoites (hypnozoites) in the liver of infected individuals.
B. Is transmitted by the Blackfly (The Buffalo gnat)
C. May take about 1 – 28 days to produce symptoms in infected individuals
D. Will invade all RBCs.

i. A and B are correct
ii. B and C are correct
iii. C and D are correct
iv. A and C are correct
v. All are correct

Question 13. Blood smears from a child with fever, disorientation and blurred vision failed to reveal any unusual extracellular agents. Differentiative thin blood smears showed the following unusual cell in alarmingly large numbers. Select the answer below that best describes the image seen.
A. Intestinal epithelia infection with cryptosporidia rosette
B. Toxoplasma rosette form in an infected macrophage
C. T. cruzi infected cardiac cell
D. Leishmania infected macrophage.

i. A is correct
ii. B is correct
iii. C is correct
iv. D is correct
v. None are correct

Question 14. Some key points about Toxoplasmosis are
A. It can infect some of the cells that Leishmania infects
B. Usually lots of infection (asymptomatic/latent cases) but little disease in healthy infected individuals
C. Confirming the parasite as the underlying basis of disease is difficult since antibody titres are quite prevalent in the general population.
D. Antibiotics such as Spiramycin are useful for pregnant women
E. Serology in AIDS patient is difficult due to their inability to produce the diagnostic rise in Abs

i. A is correct
ii. B is correct
iii. C is correct
iv. D is correct
v. E is correct
vi. All are correct

Question 15. Enterobius vermicularis and their eggs are seldom found in solid excreta because
A. Worms migrate to and survive in the alveolar space
B. They take up residence in the hepatic portal vein where the deposit their eggs in the tissue
C. Worms migrate to perianal regions outside of the body where they release their eggs
D. The infection only occurs in house pets and humans are accidental consumers of eggs

i. A is correct
ii. B is correct
iii. C is correct
iv. D is correct
v. None are correct
Question 16
The greatest risk Toxoplasma gondii infections pose to developing fetuses occurs
A. In the last trimester of pregnancy when the mother is exposed to Toxoplasma for the first time
B. Occurs only in the last trimester of pregnancy when the mother is exposed to
   Toxoplasma for the second time eliciting a more vibrant immune response
C. Is only of consequence if the mother is immune compromised
D. Occurs in the first trimester of pregnancy when mother are exposed for the first time

i. A is correct
ii. B is correct
iii. C is correct
iv. D is correct
v. All are correct

Question 17
Organ transplant recipients are at risk for Toxoplasmosis because
A. They may harbor latent Toxoplasma infections that may be re activated as a consequence of
   immune suppressive drug treatment (employed to minimize organ rejection)
B. They can acquire infections from donor organs carrying latent Pseudocysts or infected cells
C. Of sexual practices which facilitate transmission
D. Of predisposition to Sickle Cell disease

i. A and C are correct
ii. B and D are correct
iii. C and D are correct
iv. A and B are correct
v. All are correct

Question 18. A 32 year old woman with acquired immunodeficiency syndrome (AIDS) who
lived with 3 cats in her country home for the past 3 years has episodes of confusion and
seizures. She presents with no other symptoms. A computer tomography (CT) scan of her
brain indicates ring enhanced cavitary brain lesions. She has no history of travel to the
tropics. What is the most likely cause of these lesions?
A. Plasmodium ovale
B. Entamoeba coli
C. Toxoplasma gondii
D. Cryptosporidium parvum
E. Enterobius

i. A is correct
ii. B is correct
iii. C. is correct
iv. D is correct
v. E is correct

Question 19. Some key points regarding Plasmodium falciparum (Pf.) diagnosis are
A. Infections can sometimes clinically manifest like Babesia infections
B. Pf. clinical manifestations can include chills and fevers which are similar to P. vivax
C. Pf. Infection is often diagnosed by thin blood smears
D. Individuals lacking a spleen (which normally functions to remove parasite infected/deformed RBCs
   are at grave risk for more severe infections and even death
Question 20. Some key points regarding *Plasmodium* infections are
(A) Are usually transmitted by the bites of the black fly
(B) They never give rise to conditions of non-sterilizing (clinical) immunity
(C) Although they cause infections, they never cause disease in black Americans
(D) When it occurs, periodicity of fever in infected individuals is related to parasite replication and lysis of red cells.

i. A is correct
ii. B is correct
iii. C is correct
iv. D is correct
v. All are correct

Question 21. Natural resistance to some malarial infections and/or disease has been demonstrated in black African populations who are
(A) Duffy Blood Group antigen positive
(B) Glucose-6-Phosphate dehydrogenase deficient
(C) Duffy blood group antigen negative
(D) already infected with *P. falciparum*
(E) already infected with other non-plasmodial parasites

i. A and B are correct
ii. B and C are correct
iii. C and D are correct
iv. D and E are correct
v. All are correct

Question 22. 'Blackwater fever' is a manifestation of hemoglobin accumulation/oxidation in renal tubules resulting from excessive red cell lysis/hemoglobinuria. It is
(A) Symptomatic of severe (secondary) malarial infections
(B) Occurs only with drugs used to treat *Toxoplasma* infections
(C) The common name given to *S. japonicum* infections transmitted through water contact
(D) A consequence of urinary tract infection by *S. japonicum* and parasite egg deposition.

i. Only A is correct
ii. B and C are correct
iii. B and D are correct
iv. Only B is correct
v. All are correct
Question 23. A recipient of a blood transfusion develops intermittent fever with one to two fever free days between fever attacks. He/she has never had such episodes before. Thin blood smear analysis shows the following.

Based on your interpretation of the images below select the best answer.

A. The infection is likely to be caused by Plasmodia
B. The infection is most likely P. falciparum rather than P. vivax
C. Based on the characteristic structures shown above, the patient is infected with Babesia.
D. The infection is Leishmania donovani.

i. A and B are correct
ii. A and C are correct
iii. B and C are correct
iv. C and D are correct
v. All are correct

Question 24. Plasmodia falciparum is the most serious and potentially fatal of all malarias because of its ability to

A. Invade all cells of the reticuloendothelial system
B. Because of its ability to cause severe relapses → no relapse, only recrudescence
C. Because it survives exclusively in the spleen and liver
D. Because it can never be eliminated once an infection has been acquired

i. A is correct
ii. A and B are correct
iii. B is correct
iv. A and D are correct
v. All are correct

Question 25. Chloroquine is often used as an effective drug in treating malarial infections. However, the limitation of using this drug is

A. It must always be used in combination with Mefloquine
B. It is only effective in individuals with sickle cell anemia
C. The increasing incidence of drug resistance must be considered
D. There is no limitation, Chloroquine remains 100% effective

i. A is correct
ii. B is correct
iii. C is correct
iv. D is correct
v. All are correct

Question 26. Stages in the life cycle of Plasmodia include

A. Oocysts, Tachyzoites, Pseudocysts and Bradyzoites
B. Epimastigotes, trypomastigotes and Amastigotes
C. Sporozoites, liver schizonts and oocysts
D. Merozoites and Ring-like trophozoites

i. A and B are correct
ii. B and C are correct
iii. C and D are correct
iv. A and D are correct
v. All are correct
Question 27. The wave of parasitemia and concomitant fever seen in T. brucei infected individuals
A. Is rare and only occurs in sickle cell carriers
B. Coincides with increases and decreases in parasite numbers in the blood of infected individuals
C. Coincides with increases and decreases in anti-parasite surface antigen antibody in the blood of infected individuals
D. Is identical to that seen in individuals with Chagas disease

1. A and B are correct
2. B and C correct
3. C and D are correct
4. A and D are correct
5. All are correct

Question 28. Trypanosoma cruzi infections can progress from an acute phase to a latent and subsequently chronic phase. The chronic phase of infection is associated with
A. Amastigote forms infecting muscle cells and macrophages
B. The ‘Mega syndrome’ in which bodily organs are enlarged
C. The presence of Chagomas
D. Reduced sensitivity to drug treatment

1. A and C are correct
2. B and D are correct
3. C and D are correct
4. A and B are correct
5. All are correct

Question 29. Entamoeba histolytica infections generally occur
A. In the intestines where Cryptosporidia and Giardia also colonize
B. Can become systemic although this is rare
C. Has a high incidence of transmission via oral/anal contact
D. Can be latent/asymptomatic infections and become activated by immunosuppression

1. A and C are correct
2. B and D are correct
3. C and D are correct
4. A and B are correct
5. All are correct

Question 30. Giardia lamblia infections
A. Resemble Entamoeba histolytica infections in their target organs/tissue and symptoms
B. Can be exacerbated by IgA deficiencies
C. Never occurs via anal contact
D. Sometimes manifest themselves as digestive disorders resembling metal deficiencies

1. A and C are correct
2. A and D are correct
3. B and C are correct
4. B and D are correct
5. All are correct