1. Briefly define or explain the following terms.

a. Infection

b. Virulence:

c. Virulence factor

d. Pathogenicity:

e. Antigen

f. Antibody

g. T-cell

i. Autoimmune disease

j. Secondary or anamnestic response
2. List four (4) types of virulence factors, describe them and list their effects or actions.

(i) 

(ii) 

(iii) 

(iv) 

3. For the statements below match the term that best fits the description (enter the term’s letter)
   a. Microbes that produce obvious clinical disease are called:_____
   b. Microbes producing disease in weakened or immune compromised hosts are called:_____
   c. Microbes that colonize or infect but produce no disease are called:_____
   d. Persons who completely recover from an illness but continue to shed the infecting organisms are called:_____
   e. Infections in which the organisms persist in the body and there can be repeated episodes of illness or disease symptoms are called:_____
   f. Conditions resulting from an illness from which a person recovers but then later develops another type of disease are called:_____
   g. Abiotic objects, such as surfaces, toys, towels, doorknobs, that can become contaminated with infectious microbes and from which pathogens can be transferred to human are called:_____
   h. Media or materials, including water and food, that can result in human exposure to infectious microbes are called:_____
   i. Animals such as rodents and arthropods that can transmit microbes to humans are called:_____
   j. Places where organisms can live, accumulate or persist outside of a host are:_____

A. Opportunistic pathogen  F. Carriers 
B. Sequelae  G. Vehicles
C. Fomites  H. Chronic or recrudescent
D. Frank Pathogens  I. Reservoirs
E. Vectors  J. Commensals or Non-pathogens
4. The "Payment et al., 1991, Study" on the risks of gastrointestinal illness from drinking water estimated that the percentage of GI illness attributable to tap water was (circle the correct one):

a. negligible  b. 10%  c. 25%  d. 50%  e. None of these

b. This study design was: ______________ (Pick from the following list and enter the number).
   1. Case-control, 2. Ecological, 3. Randomized Controlled Trial.

5. Of the processes or steps listed below, indicate those that occur in localized (L) infections and those that occur in systemic (S), disseminated or generalized infections.

a. _______ Organism enters body and reaches target site of infection.

b. _______ Organism enter/adheres to host cells and multiplies at site of infection.

c. _______ Infection spreads within site.

d. _______ Symptoms of illness may appear

e. _______ Infection spreads to lymphatic system and bloodstream.

f. _______ Microbe proliferates in other target organisms

g. _______ Symptoms of illness become more severe

h _______ Host defenses are successful in controlling and eliminating pathogens

i _______ Protective immunity is produced, at least temporarily.

6. List or describe five (5) characteristics of an ideal or desirable indicator of fecal contamination of water and other environmental media

(i) _____________________________________________________________

(ii) ___________________________________________________________

(iii) ___________________________________________________________

(iv) ___________________________________________________________

(v) ___________________________________________________________
7. For the pathogens listed below, choose one or more indicators that would likely be reliable for them and brief reasons for your choices

(i) Non-spore forming enteric bacterial pathogens
Indicator(s): ____________________________

(ii) enteric viral pathogens
Indicator(s): ____________________________

(iii) protozoan parasite pathogens
Indicator(s): ____________________________

Indicators:
Escherichia coli
Enterococci:
Somatic coliphages
Male-specific coliphages
Clostridium perfringens spores

8. In the table below, enter the names of 3 bacterial, 3 viral and 3 protozoan pathogens that have caused drinking waterborne outbreaks in the United States

<table>
<thead>
<tr>
<th>Pathogen Type</th>
<th>Pathogens Causing Waterborne Outbreaks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria</td>
<td></td>
</tr>
<tr>
<td>Virus</td>
<td></td>
</tr>
<tr>
<td>Protozoa</td>
<td></td>
</tr>
</tbody>
</table>
8. In the table below, enter the names of 3 bacterial, 3 viral and 3 protozoan pathogens that have caused recreational waterborne outbreaks in the United States in recent years

<table>
<thead>
<tr>
<th>Pathogen Type</th>
<th>Pathogens Causing Waterborne Outbreaks:</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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</tr>
</tbody>
</table>

9. Most outbreaks of drinking waterborne disease from groundwater sources could be prevented if the water was treated by:

10. Most outbreaks of drinking waterborne disease from surface water sources could be prevented if the water was treated by:

11. List four (4) deficiencies, characteristics or factors of drinking water supplies that are associated with waterborne disease outbreaks:

   a. ________________________________________________
   b. ________________________________________________
   c. ________________________________________________
   d. ________________________________________________

12. The two main components of the immune system are:

    _______________ immunity mediated by ___________, and
    _______________ immunity mediated by ___________
13. For the microbes shown below, enter the letters of the causative microbe(s) also listed below. (Note: more than one microbe may cause an indicated disease)

a. Hepatitis A virus  h. Orthomyxovirus
b. *Shigella dysenteriae*  i. Enterotoxigenic *E. coli*
c. *Naegleria fowleri*  j. Poliovirus
d. Norovirus  k. *Entamoeba histolytica*
e. Rotavirus  l. *Legionella pneumophila*
f. Hepatitis E virus  m. *E. coli* O157:H7
g. *Salmonella typhi*  n. *Vibrio cholerae*

Infectious hepatitis__________
Dysentery__________
Gastroenteritis__________
Primary amoebic meningoencephalitis__________
Aseptic Meningitis__________
Acute pneumonia__________
Cholera______
Enteric fever______
Hemolytic uremic syndrome______
Flaccid paralysis______
Influenza (“the flu”)______
Guillain Barre Syndrome:______
Winter vomiting disease______

14. Briefly define or describe and diagram the "iceberg concept" of infectious disease and illness at the cell and whole animal (or human) levels. (If you need more room, use the reverse side.)
15. Briefly define or describe and diagram the “tip of the iceberg” concept that relates to the detection and reporting of infectious disease outbreaks at the national level relative to the infectious disease burden in the population. Be sure to include (list) the key steps or factors responsible for the relevance of this concept.

16. Circle the correct response to the following statements about foodborne disease in the USA.
   a. Foods responsible for most of the reported foodborne outbreaks in the USA are:
   b. For reported foodborne outbreaks, the most frequent place where food was eaten was at:
   c. Notable recent outbreaks in the USA caused by ground beef have been due to:
   d. Based on case fatality rate, most foodborne disease deaths are caused by:
   e. Based on recent estimates the annual number of foodborne disease cases in the USA is about:
      1. \textgreater 100,000,000, 2. about 75,000,000, 3. 1,000,000, 4. 100,000, 5. 10,000

17. The number of states in the CDC Foodnet surveillance system for foodborne disease is:
   a. All states
   b. 28
   c. 14
   d. 7
18. List five (5) **portals of entry and exit** of pathogens from human and animal hosts

(1)  
(2)  
(3)  
(4)  
(5)  

19. 18. List five (5) **transmission routes** of pathogens to infect human hosts

(1)  
(2)  
(3)  
(4)  
(5)  

20. List the four (4) main categories of **water-related** disease, briefly define or describe them and give an example of a pathogen and its disease for each one.

(1)  
(2)  
(3)  
(4)