

Exploring Infectious Diseases Assessments

The following set of assessments includes questions that can be given for homework or as quizzes depending upon how much and in what depth the material in the four modules your students have been given the opportunity to learn. The assessments are aligned to the four modules with a designated module number: some can be administered in paper and pencil, while others (Khan Academy items aligned with Modules 2 and 3) should be carried out online and the three formative assessments are performance tasks. Answers provided are in *italics*.

Module 1

Module 1 assessments consist of two open response question.

1. Choose two from the following eight epidemics, pandemics or outbreaks, and describe how each infectious agent spreads, and the social conditions that promoted its spread.

Be specific.

- a. Black Death 1347
- b. Spanish flu influenza 1918
- c. Smallpox 1775-1782
- d. Cholera; 1852-1860
- e. HIV/AIDS 1960-present
- f. SARS 2003
- g. Zika 2014-present.

Answers may be found in Module 1, Activity 2, Timeline.

2. What are two ways bacteria and viruses are similar? Different?

Similar

- *Are microorganisms*
- *Require a host*
- *Are communicable*
- *Result in symptoms of disease*
- *Elicit a cell-mediated and or humoral immune response*
- *Disrupt host functions*

Different

- *Viruses can have either DNA or RNA as the genetic material; bacteria have only DNA*
- *Viruses use host cellular machinery to reproduce*
- *Bacteria live outside host cells*
- *Bacteria can produce toxins and other substances*
- *Viruses are considered nonliving, bacteria are living*

Module 2

Assessments in Module 2 include nine online problems and one formative assessment. The nine problems are found in the Khan Academy on-line Ebola quiz.

<https://www.khanacademy.org/science/health-and-medicine/current-issues-in-health-and-medicine/ebola-outbreak/e/ebola-quiz>

Problems 1 – 6 and 8 - 9 pertain to content found in Module 2. Problem 7 that aligns with Module 3 content. Your students can work on one or more of these problems online and check their answers, getting hints when needed. Select which of the nine topics that are best aligned with what your students have had the opportunity to learn. The Khan Academy website has many excellent interactive features but below we provide a **selection** of hints and answers to four of the nine problems for you to judge which are most appropriate for your students.

Topics for each of the nine problems include:

1. Matching patients who fit the CDC criteria for Ebola
2. Selecting the way in which Ebola spreads
3. Risk level of exposure to Ebola
4. True/false Ebola facts
5. Ordering personal protective equipment for Ebola
6. Treatment for a symptomatic Ebola patient
7. R nought of 4 viruses
8. Contact tracing
9. True/false Ebola facts (2)

Problem #3

Much concern exists about behaviors that may result in exposure to the Ebola virus, especially among individuals who interact with patients with Ebola. Assume for a moment that you are in an Ebola endemic setting (e.g. Liberia) and walking around a clinic exclusively caring for Ebola patients. Using CDC criteria, categorize the risk (high risk, low risk, or no risk at all) of Ebola spreading from one person to another *during the activity described*.

No risk exposure	Low risk exposure	High risk exposure
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A 7-year-old boy wipes sweat from his mother's forehead (mother is a patient) and then rubs his own eyes.

A lab worker draws blood from a patient without wearing a gown.

	No risk exposure	Low risk exposure	High risk exposure
A worker wears gloves, a gown, a mask, and a face shield as he cleans up a patient's dirty bathroom.			
A doctor shakes a patient's hand with a torn glove.			
A patient sneezes on a doorknob, and a nurse grabs the doorknob (without any gloves) a few moments later.			
A woman walks through the waiting room of a clinic (keeping her distance from patients).			
A nurse forgets to wear a face shield while helping a patient move from the bed to a chair.			

Answers

Ebola is transmitted when an individual comes into contact with blood or body fluids of a symptomatic patient.

Low Risk Exposure examples include: being within 3 feet an Ebola patient without a gown, gloves, face mask and goggles (all also known as PPE); Being in an Ebola patient's room for an extended time without PPE; Brief physical contact such as shaking hands with an Ebola patient without PPE.

High Risk Exposure examples include: Mucous membrane (like the eyes, nose, and mouth) exposure to body fluids of an Ebola patient; Direct skin contact with body fluids of an Ebola patient; Processing blood or body fluids of an Ebola patient without a gown, gloves, face mask and goggles (PPE); Direct contact with a dead body without PPE where an Ebola outbreak is happening.

Problem #4 Ebola Facts

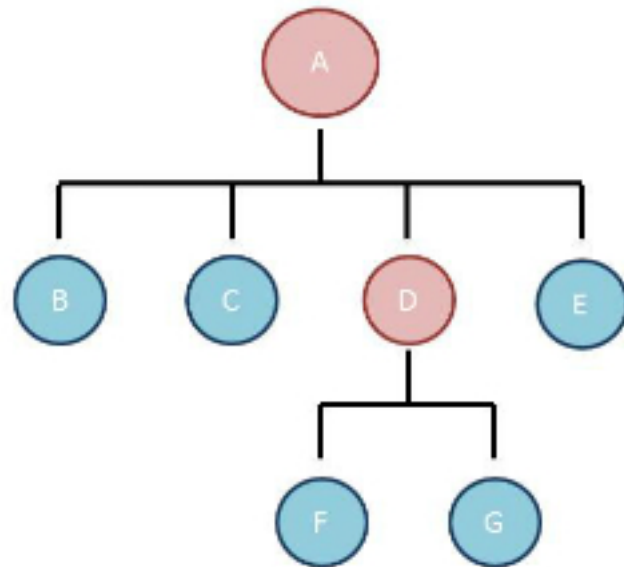
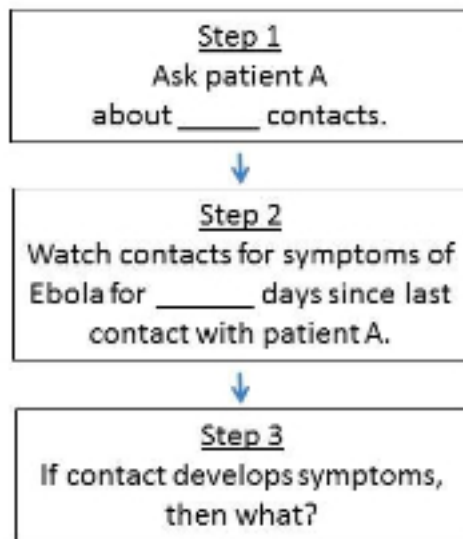
For the following statements write true or false.

1. Symptomatic patients can spread the disease to others. *True*
2. Handling clothing that may have body fluids from an infected person is a way of coming into contact with Ebola. *True*
3. Washing your hands is an effective way to help prevent the spread of Ebola. *True*
4. Ebola is typically transmitted when infected patients sneeze/cough because Ebola is an airborne infection. *False*

5. If a person comes into close contact with someone that has died from Ebola (e.g. kissing a loved one who has passed away), then he/she can contract the disease. *True*

Problem #8 Contact Tracing

Contact tracing strives to identify people who came into contact with an Ebola patient. It can be used to stop the spread of Ebola by isolating, testing, and treating known contacts if they develop symptoms. Use the following schematic to answer questions about contact tracing. Circles in blue (B, C, E, F, and G) represent people not infected with Ebola. Circles in red (A and D) represent people with Ebola.



In the above schematic, person A has Ebola.

In **step 1** of contact tracing, patient A is asked about *all contacts since they developed symptoms*.

In **step 2** of contact tracing, contacts of patient A are monitored for symptoms of Ebola for *21 days* since last contact with patient A.

Based on the diagram, person D develops symptoms of Ebola and becomes a patient.

In **step 3** of contact tracing, which of the following actions will be taken?

Select all that apply.

- Ask patient D about contacts.
- Monitor person F and person G for symptoms for 21 days.
- Administer antiviral therapy to patient D.
- Isolate person F and person G.
- Isolate patient D.
- Test patient D for Ebola.

Problem #9 Ebola Facts (2)

For the following statements write true or false.

1. Once a patient recovers from Ebola, the disease cannot be transmitted. *False: After recovery, Ebola virus can still be found in a man's semen for up to 2 months.*
2. After recovering from Ebola, patients have immunity for 10 years. *True: Patients that survive after developing Ebola develop immunity that is thought to last for up to 10 years.*
3. A point mutation would allow Ebola to change from being spread through bodily fluids to being airborne. *False: Viral mutations can sometimes affect how the virus interacts with the immune system, but the mode of transmission is generally stable and doesn't change with a point mutation.*
4. Once a person dies from Ebola, he/she can no longer spread the virus. *False: Ebola can survive in the bodily fluids of dead bodies for a number of weeks. In fact, new cases of Ebola in Western Africa have arisen from interactions with a dead body during funeral rituals.*

Formative assessment

Students identify factors that influence the spread of Ebola and measles and suggest ways that could prevent or halt outbreaks and epidemics based on their findings.

Module 3

Assessments in Module 3 include one open response item, two multiple-choice questions and a formative assessment task.

1. Describe the factors (biological and human behaviors) that may cause an outbreak of a viral disease to develop into an epidemic or not. Use your understandings from the timeline and readings in this module.
 - a) *Mode of transmission of virus: direct and indirect contact (Ebola, HIV, measles, smallpox, influenza)*
 - b) *Diseases that are spread by insect vectors: if the vectors are abundant and are found in close proximity to humans (Zika, Bubonic plague, typhus)*
 - c) *Human behavior: that result in increases in the density of vectors, such as careless disposal of trash; poor sanitation leading to contaminated water; careless food preparation; burial practices (Zika, Cholera, Salmonella, SARS, Ebola)*
2. The best treatment for an unknown viral disease is
 - a. Antibiotic
 - b. Bedrest

- c. Exercise
- d. Vaccine

3. In order to multiply a virus must



- a. Conjugate with another virus
- b. *Invade a host cell*
- c. Manufacture extra food
- d. Remain hidden

Formative Assessment

Students create a fictitious viral disease with symptoms, causative agent and mode of transmission and present it and have the class decide whether it is contagious or not.

Module 4

Assessments in Module 4 include one open response item and one formative assessment.

You have been infected by a virus. Describe the two possible sequences of events your body would undertake to destroy the virus.

Cell-mediated response

- *Macrophages engulf a virus and display antigens on its surface*
- *Helper T cells recognize these antigens and are stimulated to produce interleukin 1*
- *Interleukin 1 causes helper T cells to divide and produce interleukin-2*
- *Interleukin-2 stimulates killer T cells to divide*
- *Killer T cells attack infected cells and destroy them*
- *Macrophages clean up the mess*

Humoral response

- *Virus antigen binds to receptors on the surface of a B cell*
- *This causes the secretion of antibodies specific to these antigens*
- *Interleukin 2 stimulates B cells to divide and differentiate into memory B cells and more anti-producing B cells*
- *Antibodies bind to viruses and viral infected cells*
- *Macrophages clean up the mess*

Formative assessment

Students select a disease on the Timeline of Infectious Diseases. They prepare a diagram, drawing, animation, cartoon or other means of displaying how the immune system mobilizes to ward off infection for their chosen pathogen.