

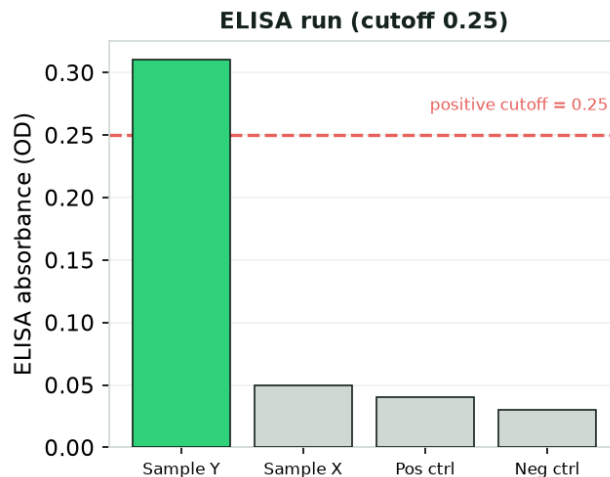
Unit 1 Practice Test

Medical Interventions (Genetics of Disease) · Unit 1: How to Fight Infection

Name: _____ Period: _____ Date: _____

Choose the BEST answer for each question. 16 questions. Give yourself 40 minutes and no notes, like the real test. The answer key is on the last page: check your work only after you finish.

1. A student runs an ELISA and finds that every well turned blue, even the wells that never got a sample. Her notes say she rinsed the plate once between steps instead of three times. Which explanation fits best?
 - A. The rinse washed away the antigen, so the substrate reacted with the plastic instead
 - B. Enzyme-linked antibody that never bound was left behind and changed the substrate's color
 - C. The samples were too concentrated, so their color spread across the plate into the empty wells
 - D. The substrate was added too early, before any antibody could reach the wells
2. The chart shows one ELISA run. The positive control should have turned strongly blue. What should the lab report for Sample X and Sample Y?



- A. Sample X negative and Sample Y positive, because each is compared with the cutoff
 - B. Both samples negative, because the positive control shows the test runs low today
 - C. Sample Y positive only, because a reading above the cutoff cannot be a failed reaction
 - D. No result for either sample: the positive control failed, so the whole run must be repeated before reporting
3. On another ELISA plate the cutoff is 0.25. The negative control reads 0.52, the positive control reads 1.40, and two samples read 0.48 and 1.10. What does the negative control tell you?
 - A. Something other than binding is making color, so neither sample can be called until the run is repeated
 - B. The plate worked, because the positive control reads far higher than the negative control, so both samples can be called
 - C. Both samples are positive, because both of them read above the 0.25 cutoff
 - D. The cutoff should be moved to 0.53 so that the two samples can still be called

4. A rapid test was compared with a lab test that confirms infection. Of 40 people who have the infection, 34 got a positive rapid result. Of 250 people who do not have it, 240 got a negative rapid result. Find the rapid test's sensitivity.
- A. 96%
 - B. 15%
 - C. 85%
 - D. about 77%
5. A clinic raises its ELISA cutoff from 0.20 to 0.40 so that fewer healthy people get a scary positive result. What is the trade-off?
- A. Some infected people with weak readings are now called negative, so sensitivity goes down
 - B. More healthy people now land above the line and are called positive, so specificity goes down
 - C. Sensitivity and specificity both go up, because the test is now stricter
 - D. Nothing changes, because the color in each well stays exactly the same
6. A bacterial culture holds 60,000 cells/mL. You make four 1:10 serial dilutions in a row. Each new tube gets 1 mL from the tube before it plus 9 mL of broth. How many cells/mL are in tube 4?
- A. 60 cells/mL
 - B. about 9.1 cells/mL
 - C. 6 cells/mL
 - D. 0.6 cells/mL
7. You need 20 mL of a patient sample diluted 1:10. How much sample and how much diluent go in the tube?
- A. 2 mL sample + 20 mL diluent
 - B. 2 mL sample + 18 mL diluent
 - C. 18 mL sample + 2 mL diluent
 - D. 2 mL sample + 8 mL diluent
8. A sequencer gives this DNA read: GCTTAGAC. Which sequence would pair with it, lined up base for base beneath the read?
- A. CGAAUCUG
 - B. ATCCGAGT
 - C. GCTTAGAC
 - D. CGAATCTG
9. A 450-base read from a wound isolate is run through nucleotide BLAST. Hit A: identity 88%, coverage 97%, E-value $3e-95$. Hit B: identity 100%, coverage 12%, E-value $1e-15$. Hit C: identity 98%, coverage 100%, E-value $2e-140$. Which hit is the best match to the whole read?
- A. Hit B, because it is the only hit with 100% identity
 - B. Hit A, because it covers almost all of the read
 - C. Hit C, because it lines up the whole read closely and has the smallest E-value
 - D. None of them, because a real match needs 100% identity across 100% of the read length
10. A read from a patient's wound swab matches a *Staphylococcus aureus* reference sequence with 99.6% identity, 100% query coverage and an E-value of 0.0. Which claim does this result support?
- A. The read is very similar to the *S. aureus* reference sequence that it lined up with
 - B. *S. aureus* is what made this patient sick
 - C. There is a 99.6% chance the patient has an *S. aureus* infection
 - D. The bacteria in the swab are resistant to antibiotics

11. A patient record in an outbreak file says a stool sample was sent to the lab, but no result is written anywhere. A classmate wants to mark the patient "not infected." What should your case notes say?
- A. Negative, since a positive result would have been written down
 - B. Positive, since a doctor would only order the test if the patient was sick
 - C. Leave the stool test out of your notes so the record looks complete
 - D. Stool result not stated, with a note that this lab result is needed to compare explanations
12. On your contact map, a line joins Person 4 and Person 9 because both ate from the same food truck on Monday. Person 9 got sick first. Which statement can the map support by itself?
- A. Person 9 passed the infection to Person 4, since Person 9 got sick first
 - B. Person 4 and Person 9 share an exposure: the food truck on Monday
 - C. The food truck is the source of the outbreak, since both people ate there
 - D. Person 4 and Person 9 are sick with the same pathogen
13. Which notebook entry would let a classmate repeat your ELISA sample loading exactly?
- A. 50 μ L of each sample into wells A1 to A4 in Table 1 order, new tip each time, then 5 minutes at room temperature.
 - B. Loaded all of the samples carefully into the plate, measured the right amounts, and waited the right amount of time before the next step.
 - C. Wells A1 and A3 turned blue and wells A2 and A4 stayed clear, so samples 1 and 3 were positive.
 - D. Followed the ELISA procedure from the class handout with no problems at all.
14. You just finished measuring zones on a plate of live bacteria and need to write in your notebook. What should you do first?
- A. Write quickly with your gloves still on, then take them off and wash your hands at the end of class
 - B. Wipe your gloves on your lab coat so they are clean enough to hold a pencil
 - C. Pull the gloves off by the fingertips, and wash your hands only if they look dirty
 - D. Peel each glove off inside-out, throw both away where your teacher says, then wash your hands before writing
15. Drug Y disks are placed on plates of three bacterial strains, and all the plates are grown the same way. The zones of inhibition are Strain P 30 mm, Strain Q 18 mm and Strain R 7 mm. Which strain most likely has the highest MIC for Drug Y?
- A. Strain P, because the drug had to spread the farthest across the plate to stop it growing
 - B. Strain Q, because its zone is in the middle of the three
 - C. Strain R, because it grew closest to the disk, where the drug is strongest
 - D. All three have the same MIC, because they were tested with the same disk
16. According to the zone chart for this organism, Drug M counts as susceptible at 18 mm or more, and Drug N counts as susceptible at 26 mm or more. On the plate, the Drug M zone is 20 mm and the Drug N zone is 24 mm. Which reading is correct?
- A. Drug N works better, because its zone is bigger than the Drug M zone
 - B. The organism counts as susceptible to Drug M but not to Drug N
 - C. The organism counts as susceptible to both drugs, because both zones are over 18 mm
 - D. The organism counts as susceptible to neither drug, because neither zone reached 26 mm

Answer key

Unit 1 Practice Test · Medical Interventions (Genetics of Disease) · Unit 1: How to Fight Infection

Check your answers only after you finish. The Skill column gives the skill number in your study guide: for every miss, reread that skill, then try the question again.

#	Answer	Skill	Why
1	B	1	Washing removes reagent that did not bind, so short rinsing leaves unbound enzyme-linked antibody that colors wells with no target in them.
2	D	1	A clear positive control means a reagent or step failed, so none of the plate's readings can be trusted until the run is repeated.
3	A	1	A negative control with no target should stay below the cutoff, so color there means background signal that a sample reading cannot be separated from, and the run is repeated.
4	C	2	Sensitivity is true positives divided by everyone who has the infection, $34 / 40 = 85\%$, while 96% is the specificity ($240 / 250$), 15% is the share of infected people missed ($6 / 40$), and 77% is the share of positive results that are true ($34 / 44$).
5	A	2	A higher cutoff clears more healthy people (specificity up) but misses infected people whose readings fall between 0.20 and 0.40 (sensitivity down).
6	C	3	Each 1:10 step divides by 10, so 60,000 becomes 6,000, then 600, then 60, then 6 cells/mL after four steps.
7	B	3	A 1:10 dilution is 1 part sample in 10 parts total, so 20 mL needs 2 mL of sample and 18 mL of diluent.
8	D	4	In DNA, G pairs with C and A pairs with T, so GCTTAGAC pairs with CGAATCTG, and U appears only in RNA.
9	C	4	Hit C covers the whole read at 98% identity with the smallest E-value, while Hit B matches only 12% of the read and Hit A is less similar with a larger E-value.
10	A	4	BLAST measures how similar a sequence is to references, so it supports similarity only, not cause of illness, a probability of infection, or drug resistance.
11	D	5	A missing result is unknown rather than negative, so it is recorded as not stated along with the result that would help.
12	B	5	A contact map records stated connections, so it shows the shared exposure but not the direction of spread, the source, or which pathogen each person has.
13	A	6	A repeatable entry gives exact volumes, locations, order and handling details, while results and words like carefully cannot be repeated by someone else.
14	D	6	Peeling gloves inside-out traps whatever is on the outside, and washing removes anything that reached your skin, because microbes cannot be seen.
15	C	7	For one drug, the smallest zone means the strain grew where the drug was most concentrated, so Strain R needs the most drug to stop it and has the highest MIC.
16	B	7	Each zone is read against its own drug's cutoff, so 20 mm meets Drug M's 18 mm while 24 mm falls short of Drug N's 26 mm, and zones from different drugs are not ranked.