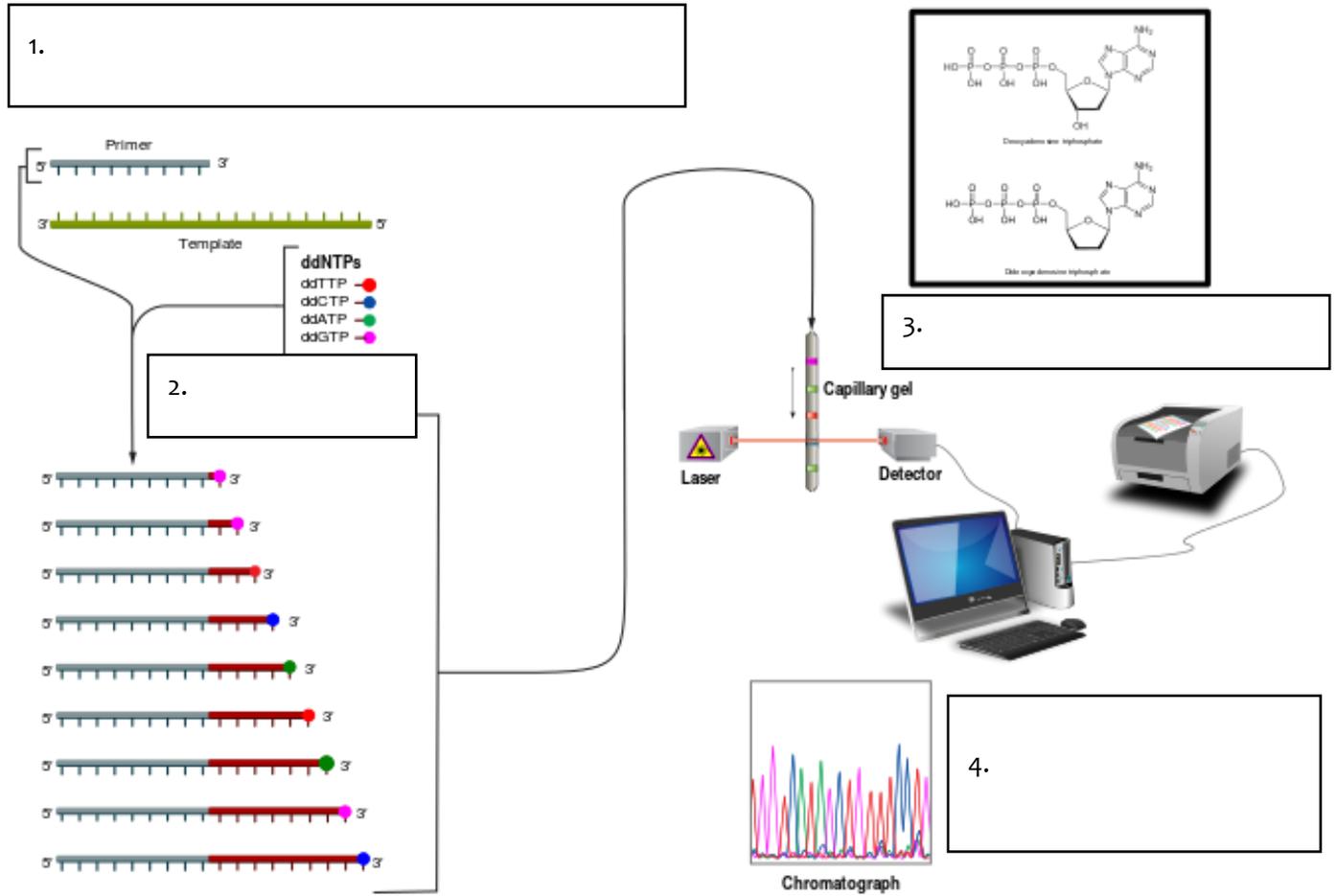


Lesson 1.1

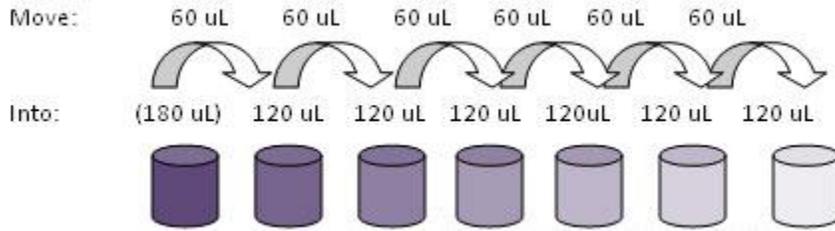
1. Define medical intervention. What are 3 medical interventions that Sue Smith would have encountered during her infection with *Neisseria meningitidis*.
2. How is PCR used with bioinformatics to identify a pathogen? Explain each step that is shown in the diagram below:



3. How is ELISA used to detect antigen in a patient? What are the steps? (Draw & Label)

4. What is an antibody? Draw it below and label.

5. What is the dilution factor and protein concentration in each tube?



Tube Dilution Factor: N/A _____ _____ _____ _____ _____ _____

Total Dilution Factor: N/A _____ _____ _____ _____ _____ _____

Protein concentration: 12,000 ng/mL _____ _____ _____ _____ _____ _____

6. How does ELISA provide both qualitative and quantitative results? How can these results be used when treating a patient?

7. Describe the relationship between antigen, antibody, and pathogen. Draw and label.

8. Which of these is not treatable with antibiotics? Explain why.

- a. botulism b. the flu c. *Salmonella* food poisoning d. meningitis (caused by *Neisseria meningitidis*)

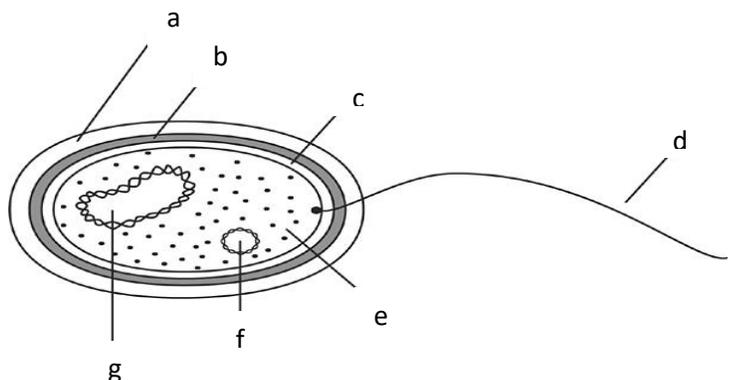
9. Once an outbreak is identified, what can scientists do to diagnose, treat, and prevent future spread of disease?

Lesson 1.2

10. What type of pathogen is *Neisseria meningitidis*? What can be used to treat it?

11. On the bacterium, label the following structures:

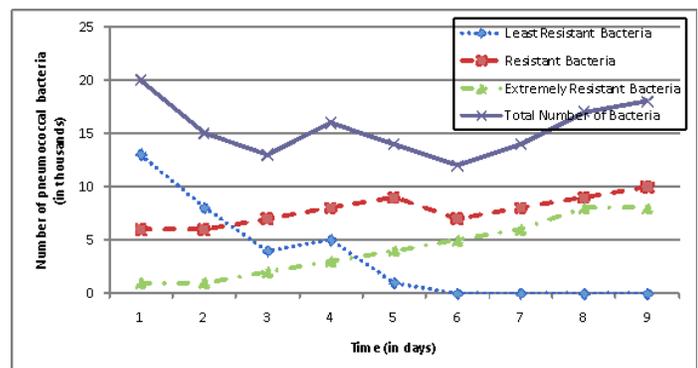
- a. capsule
- b. cell wall
- c. flagellum
- d. cell membrane
- e. nucleoid region
- f. pilli
- g. plasmids
- h. ribosomes



12. Most bacterial cells keep from bursting in a hypotonic environment by:
- an efficient water pump
 - a tough cell membrane
 - pumping large quantities of salts into the cell
 - a rigid cell wall
 - a stiff capsule
13. Identify the differences between Gram + and Gram –
14. Small circular DNA called _____ carry accessory genes separate from those of the bacterial chromosome.
15. **Matching:** Match the class of antibiotic with its mode of operation.
- | | |
|-----------------------------------|---|
| a. Sulfonamides (Sulfa drugs) | _____ interfere with the formation of cell wall. |
| b. Fluoroquinolones | _____ interfere with the supercoiling of DNA in the bacterial chromosome. |
| c. β -Lactams or penicillin | _____ prevent protein synthesis. |
| d. Tetracyclines | _____ interrupt folic acid biosynthesis |
16. A patient goes comes into the student health center at her university because she’s feeling extremely run down and is beginning to spike a fever. She complains of a stiff neck and a headache, and after the examination, the doctor sends the patient to the lab where they take samples of her blood, urine, and lymph to use for diagnostic laboratory tests. A portion of her sample undergoes microscopic analysis. The laboratory technician views the slide and sees red, rod-shaped cells. The cells also test resistant to antibiotics that inhibit protein synthesis and folic acid synthesis.
- Is the bacteria gram positive or gram negative?
 - What class of antibiotics should be used to treat this infection and why?
17. The method of antibiotic resistance used by bacteria that involves the removal of the antibiotic by a membrane pump from the cell before it has a chance to act on its target is called
- Mutation
 - Destruction or Inactivation
 - Egress
 - Effect
 - Efflux
18. Explain the importance of taking antibiotics as prescribed.
19. Describe and explain how actions that humans are taking contribute to bacteria becoming resistant to commonly used antibiotics.

Use the graph to the right to answer questions 18 – 20:

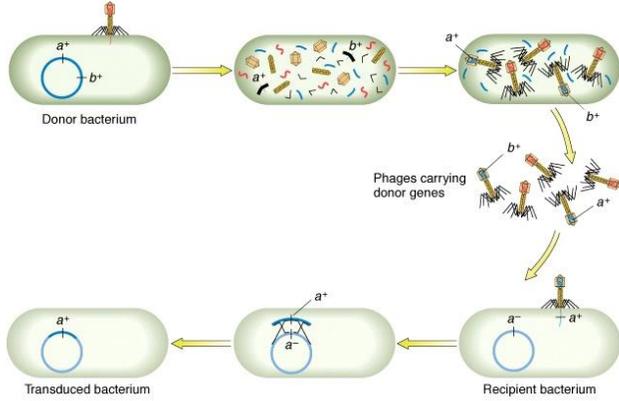
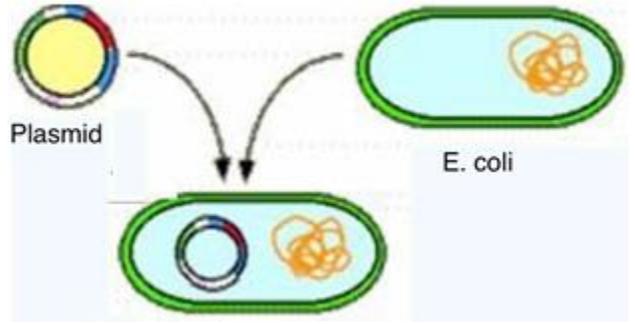
- What likely happened on Day 3 to cause the results seen on Day 4?
- What likely happened on Day 4 to cause the results seen on Day 5?
- What do you predict will happen to this patient?



23. Name the type of genetic transfer occurring in each picture. Give a short description of the mechanism.

A. _____

Description _____

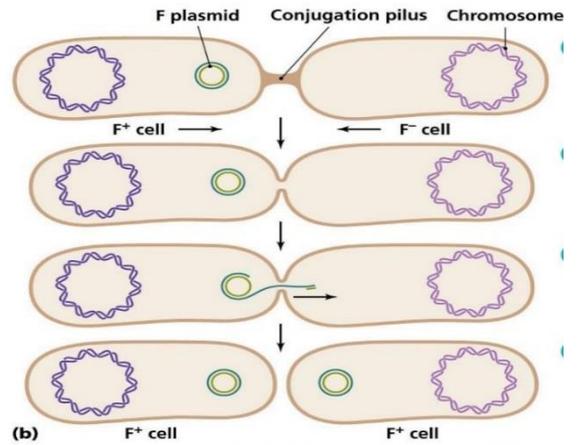


C. _____

Description _____

B. _____

Description _____



24. What type of DNA is transferred in bacterial conjugation?

Lesson 1.3

25. What is sound? How does sound travel?

26. How do frequency and amplitude of sound affect how it is interpreted by humans?

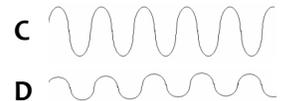
27. Which sound would be interpreted as high pitched? (A or B?)



28. Which sound would be interpreted as soft? (C or D?)



29. Which sound is a loud, high pitched? (Circle one)



38. Describe 3 medical interventions available for patients with hearing loss.

39. Explain the cochlear implant debate. Give two arguments for each side.

Lesson 1.4

40. Who is Edward Jenner and what is his contribution to public health?

41. What is a vaccine and how does it activate the immune system? Thoroughly explain this process.

42. Why is a booster shot sometimes needed?

43. How can vaccines be used to eradicate disease?

44. What is the difference between active & passive immunity? Explain each. Is a vaccine classified as active or passive?

45. How are vaccines made?

46. Explain how herd immunity works.

47. _____ Similar Pathogen a. vaccine that is produced from an altered pathogen for a different disease
- _____ Live Attenuated b. vaccine that is almost completely devoid of pathogenic ability but still able to induce an immune response
- _____ Killed c. vaccine that is harmless and inactivated when treated with formalin, which allows it to mimic a substance normally secreted by the bacteria
- _____ Toxoid d. vaccine that uses only the antigen best suited for the immune response instead of the entire microbe
- _____ Subunit e. vaccine that is new and it uses the pathogen's genetic material to code for the antigens important in immunity
- _____ Naked-DNA f. vaccine that is inactivated and causes a weaker immune response, which means multiple doses or boosters are necessary

48. How are plasmids engineered and used to move genetic information? Draw and label.

49. Name 2 essential enzymes and describe their roles in recombinant DNA technology.

50. Which restriction enzyme should be used to cut the plasmid?

Restriction Enzymes	DNA Sequence (both strands are represented)
Bam HI	G GATCC CCTAG G
Eco RI	G AATTC CTTAA G
Hpa I	GTT AAC CAA TTG

Plasmid DNA:

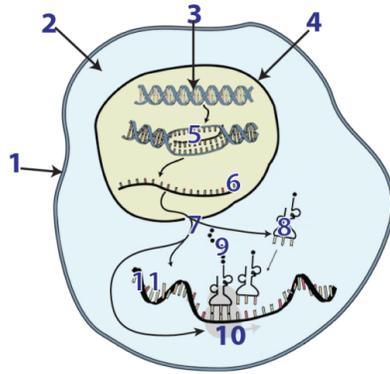
c g g g g a t c c t c t a g a g t c g t t a a c c t g c a g g c
g c c c c t a g g a g a t c t c a g c a a t t g g a c g t c c g

51. How is attack rate calculated and how can it be used to determine the possible source of an outbreak?

52. What is the difference between a cohort study and a case-control study? Which does the following description qualify as: Researchers want to determine how using ear buds affects hearing. A group of high school students from South Mecklenburg High School that use ear buds and a group of students who do not use ear buds are followed over 10 years and hearing tests are completed annually.

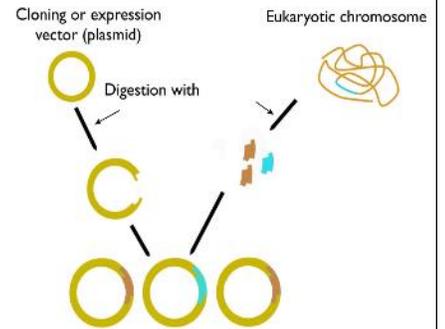
Label the following diagrams:

(#'s 5 & 6) **Process & Explanation:**

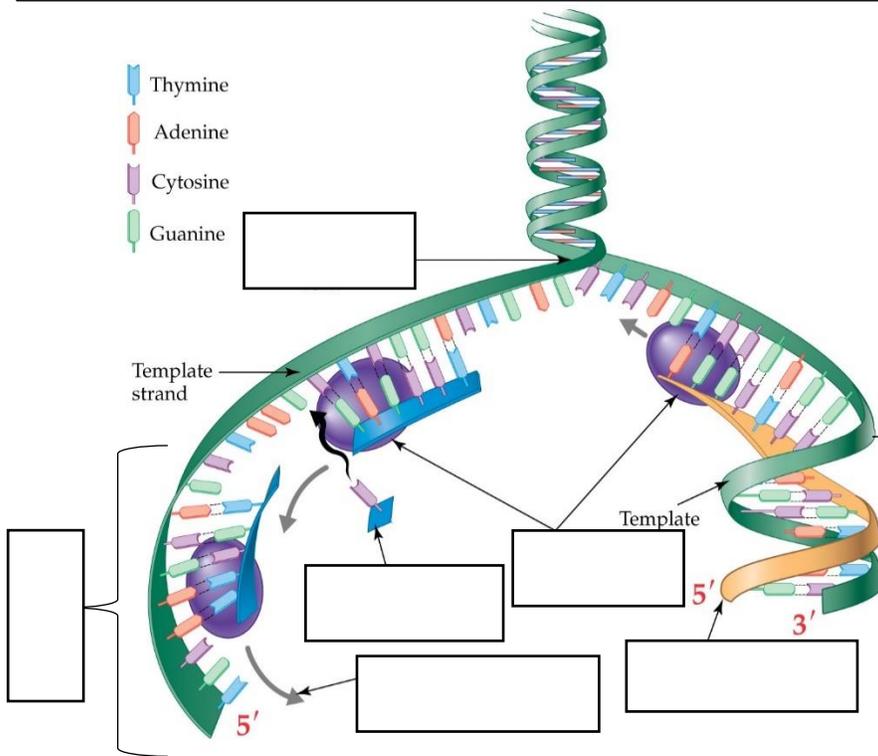
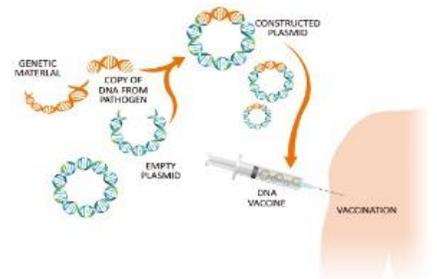


(#'s 8 - 10) **Process & Explanation:**

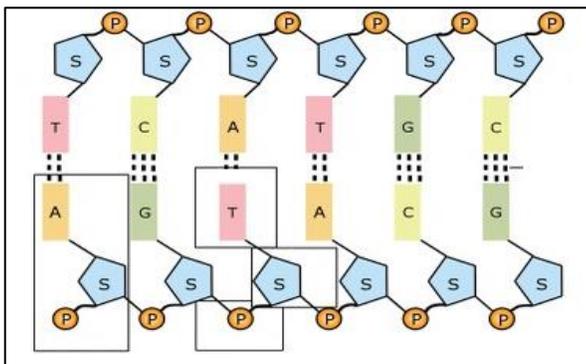
Process & Explanation:



Type of vaccine & Explanation:



Process & Explanation:



Direction of strand: _____

Direction of strand: _____