STEM Sims™

Gram Staining

Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.

Start learning right now about how to identify different bacteria. Take the following brief quiz to see how much you already know about how to tell which bacterial infection is present in an individual. See the bottom of page 4 to check your answers.
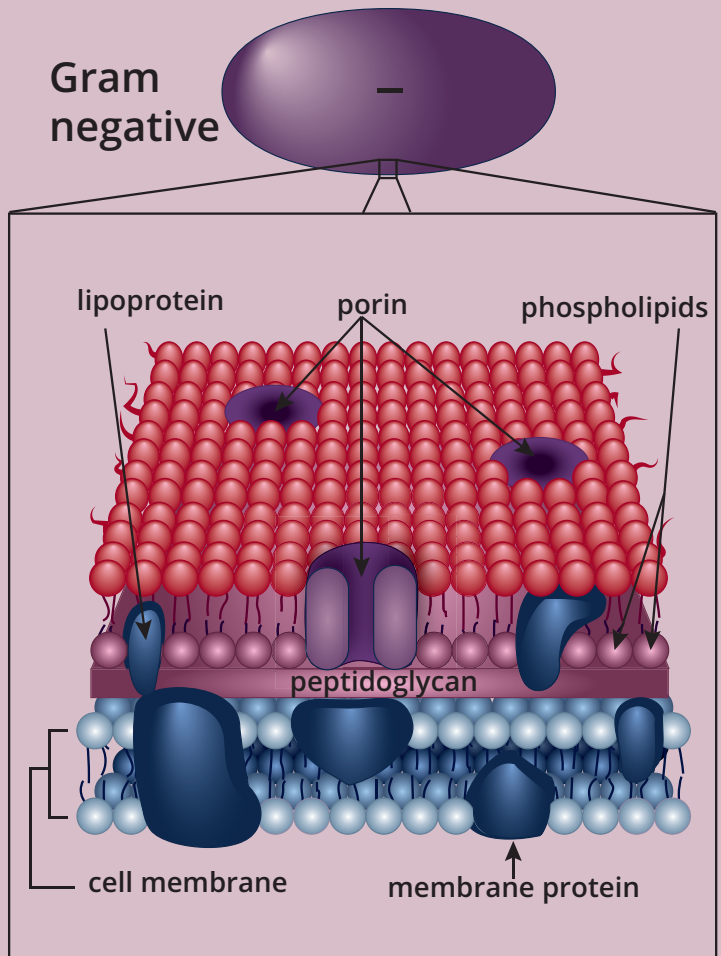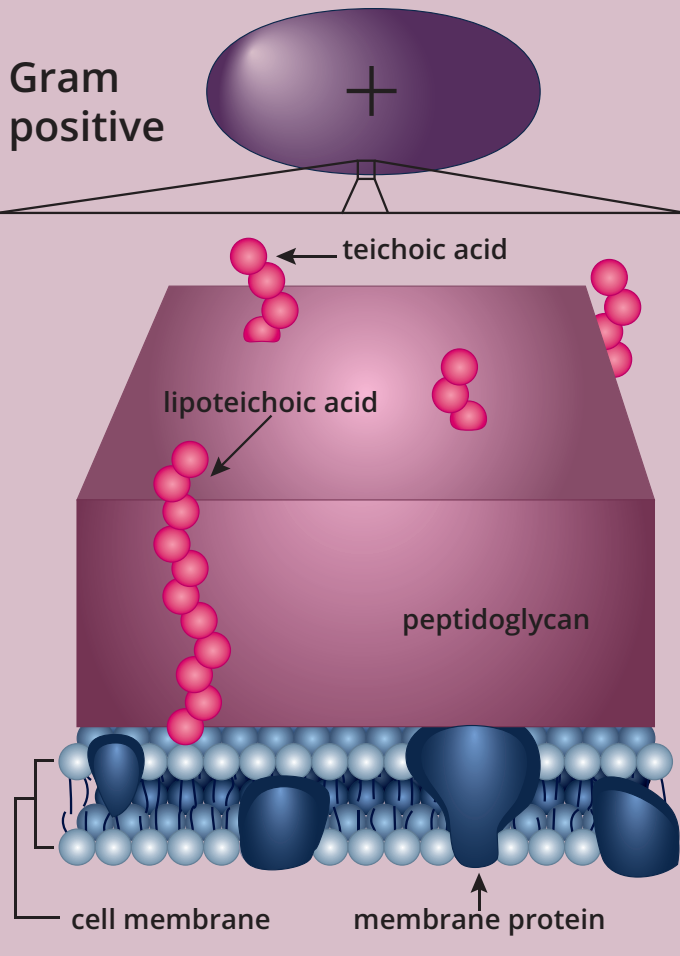
1. Bacteria of the type cocci are almost always harmful to humans.
    a. true
    b. false

2. Some bacteria cluster together into groups of two or more individuals. Which is *not* a commonly found shape of a group of cocci bacteria?
    a. chain
    b. square
    c. cubic
    d. pyramid

3. Bacteria have been found living in all of the following locations *except*:
    a. on the moon.
    b. in very deep ocean trenches.
    c. on radioactive wastes.
    d. next to boiling water vents.

4. There are more bacteria living in and on your body than there are human cells that make up your body.
    a. true
    b. false

5. Many antibiotics used to treat bacterial infections are derived from the substances given off by which other organism?
    a. viruses
    b. protozoans
    c. fungi
    d. lipids

Staining Password

A clinical laboratory scientist wanted an easy way to remember her password to her bank account. She decided to write down a series of statements, with the answer to each gram staining statement forming her password. If the answer to the statement was "gram positive," she symbolized this by the letter "P." A "gram negative" answer was represented by the letter "N." Can you determine her password? See the bottom of page 4 to check your answer.
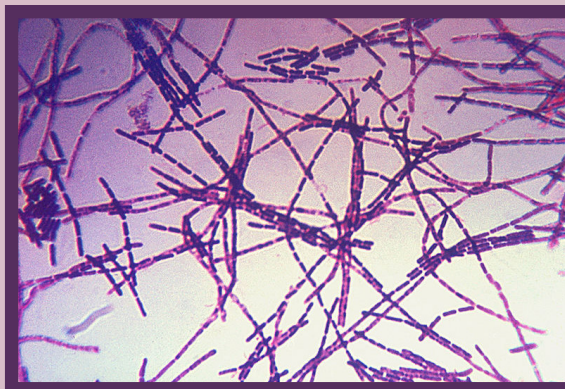
	Statements about Gram Staining	Password Letter
1	Contains lots of phospholipids	
2	Has many lipoproteins	
3	Cell membrane has a positive charge	
4	Has thicker peptidoglycan layer	
5	Has more teichoic acid	
6	Contains more porins	
7	Has more lipoteichoic acid	

Gram positive +

teichoic acid

lipoteichoic acid

peptidoglycan

cell membrane   membrane protein

Gram negative −

lipoprotein   porin   phospholipids

peptidoglycan

cell membrane   membrane protein

Gram Staining

If it works, keep using it

Hans Christian Joachim Gram (1853 – 1938) is credited with developing one of the most widely used methods, called Gram staining, to identify and classify bacteria into one of two major classes. In 1884 while studying patients with pneumonia, he noticed that two bacteria, *Streptococcus pneumoniae* and *Klebsiella pneumoniae*, accepted and retained common biological stains differently. He went on to invent a procedure that even to this day over 140 years later, is most often used as the first step in bacterial infection identification. If you've ever visited your doctor suffering with an extremely bad sore throat and your physician swabbed your throat (just about making you gag), you and your bacteria have been an active participant in Gram's method.

The Gram Stain technique classifies bacteria into either gram positive or gram negative groups. Once placed into one of these groups, medical staff then further analyze the shape and other characteristics of the bacteria to pinpoint its identification. Table 1 below shows a number of common diseases caused by bacterial pathogens and their classifications.

Disease	Bacteria	Gram positive or negative
Anthrax	*B. anthracis*	+
Botulism	*C. botulinum*	+
Diphtheria	*C. diptheriae*	+
Lyme Disease	*B. burgdoteri*	-
Tetanus	*C. tetani*	+
Whooping Cough	*B. pertussis*	-

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Answers: Page 2 Answers: 1) b, the shape does not determine whether bacteria are harmful or not to humans, 2) d, 3) a, 4) a, 5) c. **Page 3 Answers: Staining Password :** 1) N, 2) N, 3) P, 4) P, 5) P, 6) N, 7) P.