



a place of mind

FACULTY OF EDUCATION

Department of
Curriculum and Pedagogy

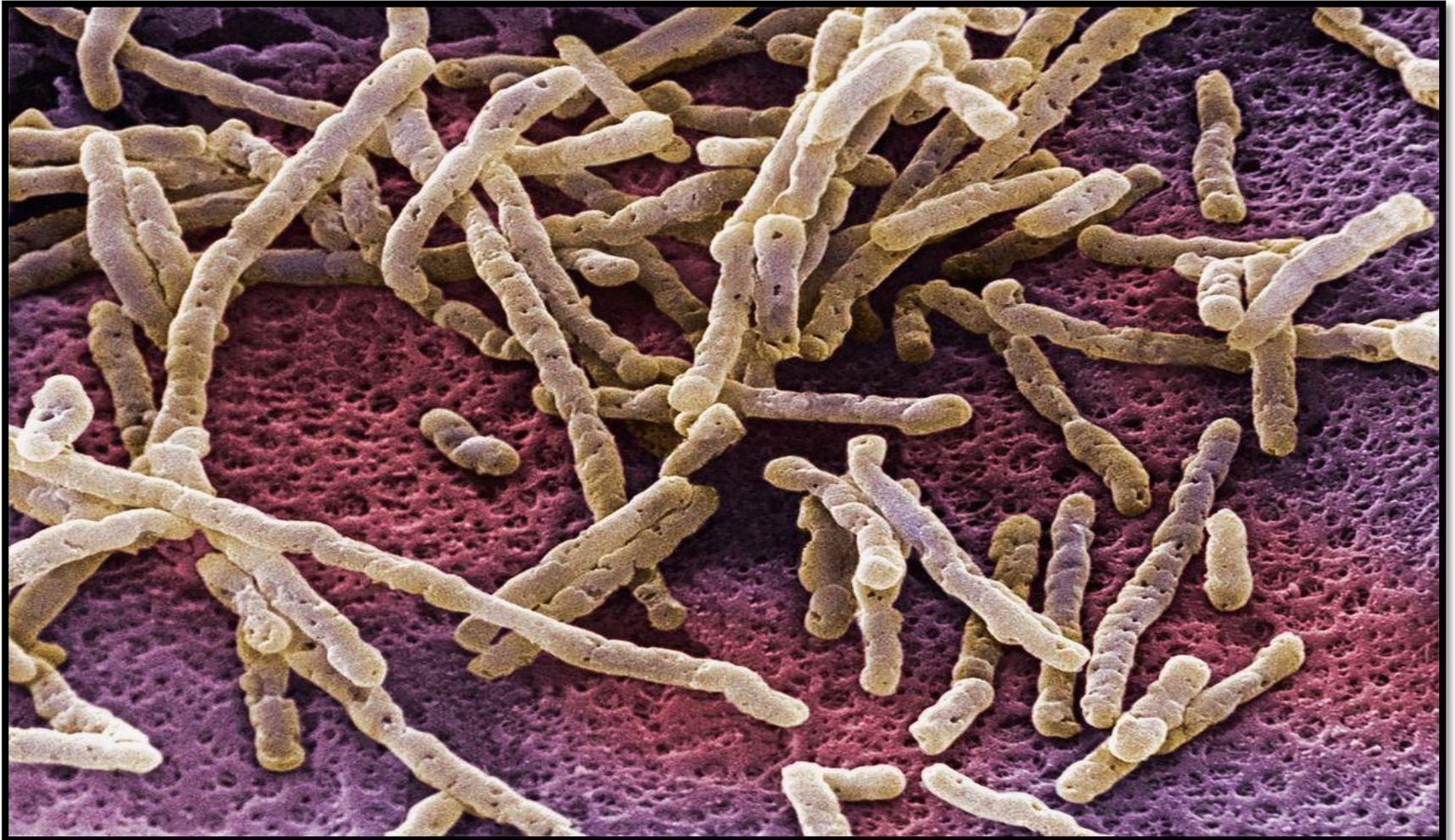
Biology

Microbiology:

Bacteria I

Science and Mathematics
Education Research Group

Bacteria I



Bacteria I

Information on previous slide:

The image represents:

Clostridium bacteria, one of many bacterial types that live in human digestive tracts, have been linked to gut ailments.

Image by David Phillips, Visuals Unlimited/Corbis

For more information, visit the “**What Lives in Your Gut?**”

<http://news.nationalgeographic.com/news/2013/01/120104-human-gut-microbes-bacteria-health-diet/>

Question 1

What is microbiology?

- A. The branch of science that studies chemistry and biology.
- B. The branch of science that studies microscopes and organisms.
- C. The branch of science that studies stars and planets.
- D. The branch of science that studies microorganisms.
- E. The branch of science that studies biology.

Solution I

Answer: D

Justification:

Microbiology is the branch of science that studies microorganisms – bacteria, viruses, protozoal parasites and fungi. These organisms can only be seen under the microscope, so we call these organisms microorganisms. The word “microbiology” also refers to the size of these microorganisms.

Question II

How do bacteria reproduce by conjugation?

- A. A mutation occurs in the parent cell.
- B. Two haploid cells fuse to form a diploid cell.
- C. The parent cell divides into two daughter bacterium cells.
- D. DNA is transferred from one bacterium to a second bacterium.
- E. DNA is replicated and evenly divided into two new cells.

Solution II

Answer: D

Justification:

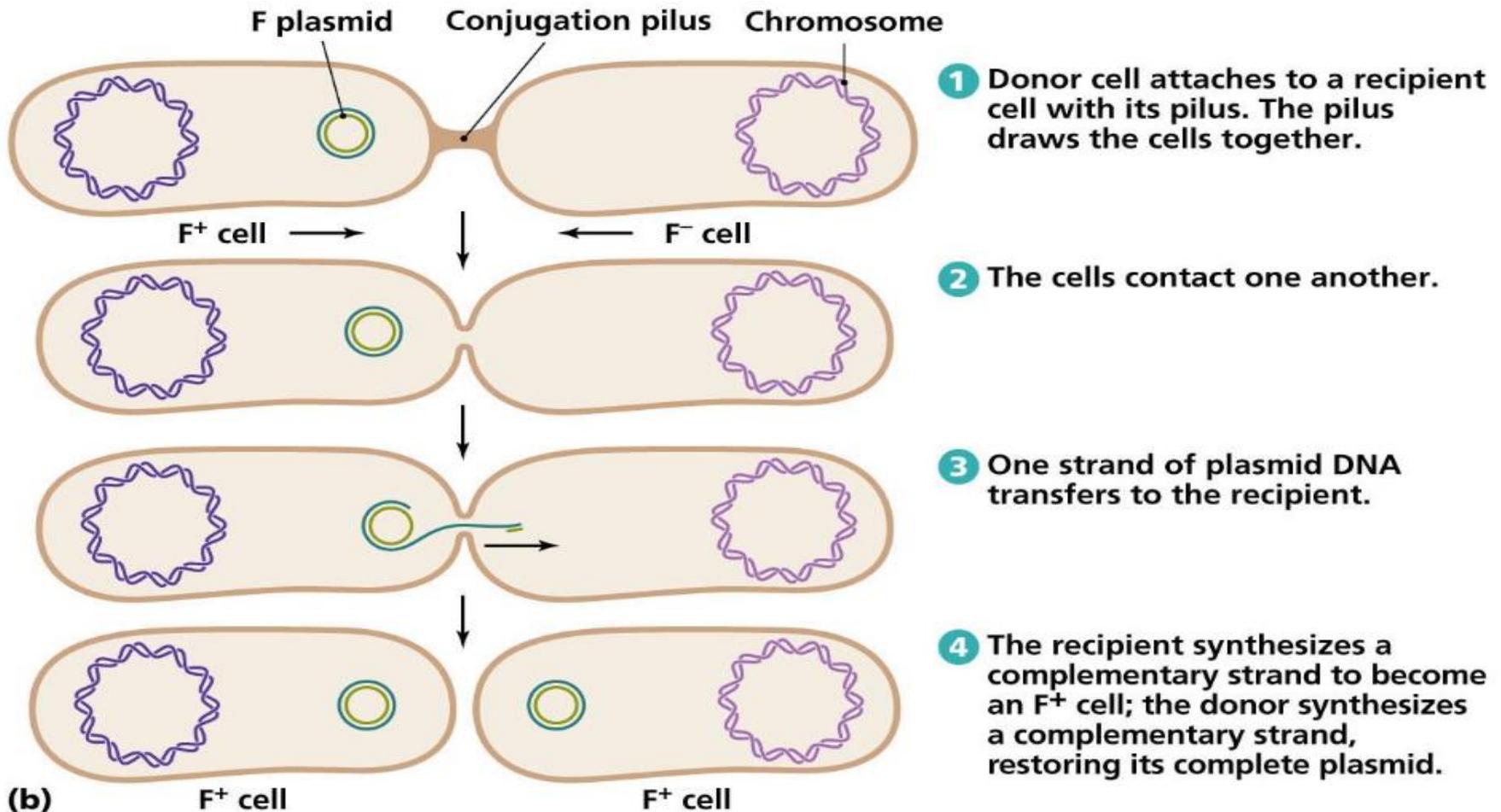
Reproduction by conjugation (bacterial conjugation) involves the transfer of genetic material (DNA) between bacteria cells by direct cell-to-cell contact or by a bridge-like connection. (FYI: the word 'bacterium' is the singular form of 'bacteria')

Bacterial conjugation is often treated the same as sexual reproduction or mating.

See following slides for bacterial conjugation mechanism

Solution II Continues

Example: Mating of F⁺ and F⁻ Bacterial Strains (E. coli)



Solution II Continues

Additional explanation: F+ and F- cells

The F plasmid is a self-transmissible plasmid found in some strains of *E. coli*. Cells that possess one or more copies of the F plasmid are called F+ cells and cells lacking the F plasmid are called F- cells. The previous diagram illustrates several stages in the transfer of the F plasmid from F+ to F- cells.

Question III

Some bacteria are spread through the air. In which of the following interactions is there the **least possible** chance of bacteria spreading?

- A. Through contaminated water and food.
- B. Through sexual contact.
- C. Through contact with humans or animals.
- D. Through well-treated human waste disposals.
- E. Through transmission from one part of the body to another part.

Solution III

Answer: D

Justification:

Different bacteria spread in different ways. But bacteria often spread through contaminated water (e.g. Cholera), contaminated food (e.g. E coli food poisoning), sexual contact (e.g. Syphilis), the air, when infected people sneeze or cough (e.g. Tuberculosis), contact with animals (e.g. Anthrax), touching infected people (e.g. strep throat) and from one part of the body, where they are harmless, to another part, where they cause illness (as when *E coli* spreads from the intestines to the urinary tract). Human waste treatment involves many different processes in order to remove contaminants from sewage water so that it can be once again reused. The process of disinfection removes bacteria from the water, either through chlorination, exposure to UV light, ozone, or sodium hypochlorite. Read more: <http://www.humanillnesses.com/original/At-Ca/Bacterial-Infections.html#ixzz3SF4Paz2A>

Question IV

How are bacteria different from other living organisms?

- I. Bacteria do not have a membrane enclosing their nucleus.
- II. Most bacteria can reproduce on their own without a host cell.
- III. Some bacteria need a host cell to reproduce and survive .
- IV. Each bacterial cell contains an endomembrane system, a system of membranes that exchange materials.
- V. Both cystol and ribosomes make up the cytoplasm in bacterial cells.

A. I, II, IV

B. I, II, III

C. III, IV, V

D. II, III, V

E. I, IV, V

Solution IV

Answer: B

Justification:

Bacteria do not have a membrane enclosing their nucleus, however their genetic material (DNA) is concentrated together in the bacterial cell. Also, most bacteria can reproduce on their own without having to invade other living cells, however, some bacteria do need to live inside another cell just as viruses do (e.g. chlamydia).

Only eukaryotic cells have the endomembrane system which functions as a system of membranes that exchange materials. Also, both cytosol and ribosomes make up the cytoplasm in eukaryotic cells not bacterial cells.

Question V

The human microbiota is the aggregate of microorganisms (bacteria) that reside in and on the human body. What is the approximate number of bacteria in/on a human body?

- A. Approximately 100 trillion microbes.
- B. Approximately 100 billion microbes.
- C. Approximately 100 million microbes.
- D. Approximately 100 thousand microbes.
- E. Approximately 100 microbes.

Solution V

Answer: A

Justification:

The human microbiota is the aggregate of microorganisms (bacteria) that resides in and on a human body. These bacteria live in the saliva and oral mucosa, in the conjunctiva (inside of the eyelids), on the skin, and in the gastrointestinal tracts. The average human has over 100 trillion microbes in and on their body.

Read more: <http://bigthink.com/amped/humans-10-human-and-90-bacterial>

Extra information on Bacteria

TED-Ed:

You are your microbes.

<https://www.youtube.com/watch?v=1X8p0vhsWRE>

TED-Ed:

What causes antibiotic resistance?

<https://www.youtube.com/watch?v=znnp-lvj2ek>