**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Bacteria Explorer Student Guide:**

Use the website found at: <http://www.oum.ox.ac.uk/bacterialworld/bacteriaexplorer/>

The 5 types of bacteria are:

1.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**6. Branched**

These bacteria form long filament structures. Unlike other bacteria, which are individual cells, the branching filament is essentially one entity.

Unlike other chains of individual rods or cocci bacteria, these bacterial trees are not made of individual cells. Instead, chromosomes of genetic information are located \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ all along the structure.

Colonies of Streptomyces in the soil release a molecule called geosmin, and this molecule is responsible for the smell of damp soil after a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!

**7. Comma (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) and Spiral (Spirillum)**

Many free-living bacteria are either spiral (spirillum) or comma shaped (vibrio). Unlike the spirochaetes, whose shape allows them to move through viscous (thick) substances, these bacteria do not live in viscous environments so do not need to be so tightly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Comma- and spiral-shaped bacteria are very similar to rods, but with a degree of twisting in their shape. It is possible to switch a single \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in a comma-shaped bacterium to turn it into a rod-shape bacterium!

**8. Rod (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)**

Rods are the most common shape of bacterium, but rod species come in many different lengths and widths.

Bacteria which actively swim are propelled along by a rigid helix-shaped flagellum, or many flagella. These are powered by a small ‘electric’ motor operating across the bacterial membrane which can rotate at up to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ revolutions per second.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are tiny, hair-like strands on the surface of many bacteria. Different types are used to pull a bacterium along a surface, exchange DNA with other bacteria (sex pili), or create an immune response to pathogens.

The image shows two E. coli strain colonies fighting with toxins. Detecting an attack from the red strain, cells in the lower strain colony launch a massive collective counterattack. Green colour indicates toxin production.

There are many rod-shaped species, but a very famous one is Escherichia coli (E. coli). Although known for causing food poisoning, in fact \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ strains are completely harmless and are used intensively in research laboratories.

**9. Sphere (\_\_\_\_\_\_\_\_\_\_\_\_)**

The sphere, or coccus, is a common bacterial shape, and cocci tend to be very small - only about one micron across. Sometimes cocci join in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or other configurations.

Spherical bacteria like these *Staphylococcus aureus* can't grow larger because their cell wall would need to be thicker to contain outward pressure from material inside the cell, but if the cell wall is too thick nutrients and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cannot pass through.

Cocci bacteria are not able to actively \_\_\_\_\_\_\_\_\_\_\_\_\_\_, so they either drift around in their environment or colonize surfaces.

Lots of cocci have a protective \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ layer on the outside of the cell, as do some other shapes. The capsule is often linked to an ability to cause disease. It can also protect the bacterium from white blood cells. The image is of *Neisseria cocci*, with the capsule showing as a fuzzy layer outside the cells.

**10. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (SPIROCHAETES)**

Spirochaete bacteria are long and very thin - around 10-15 microns long, but just one micron wide - with a tight spiral shape. Many spirochaetes cause \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Like other bacterial shapes, spirochaetes swim using a rigid, corkscrew-shaped structure called a flagellum, but in spirochaetes it is located \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the cell rather than outside.

The human immune system often reacts to the flagella on bacteria, but in spirochaetes flagella are internalized, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ them from our immune system. This protects the bacterium from an immune response.

Spirochaetes like this *Borrelia burgdorferi* are able to move effectively through viscous environments. As they enter a more viscous substance the helix \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and they speed up through the thicker material.