development of germ theory

nature of science

9-12

Today, the modern technology of high-power imaging and biotechnology make it possible to investigate how microorganisms spread, how they cause disease, how the immune system combats them, and even how they can be manipulated genetically.

New ideas in science are limited by the context in which they are conceived; are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly, through contributions from many

6-8

After the discovery of germs, biologists turned to the identification and investigation of microorganisms, discovering thousands of different bacteria, viruses, yeasts, and parasites and gaining a deeper understanding of the interactions between

Scientific knowledge is subject to modification as new information challenges prevailing theories and as a new theory leads to looking at old observations in a new way.

Technology is largely responsible for the great revolutions in agriculture, manufacturing, sanitation and medicine, warfare, transportation, information processing, and communications that have radically changed how people live and

Engineers, architects, and others who engage in design and technology use scientific knowledge to solve practical problems. They also usually have to take human values and limitations into account.

Current health practices emphasize sanitation, the safe handling of food and water, the pasteurization of milk, isolation, and aseptic surgical techniques to keep germs out of the body; vaccinations to strengthen the body's immune system against

Investigations of the germ theory by Pasteur, Koch, and others in the 19th century firmly established the modern idea that many diseases are caused by microorganisms. Acceptance of the germ theory has led to changes in health

Pasteur found that infection by disease organisms (germs) caused the body to build up an immunity against subsequent infection by the same organisms. He then produced vaccines that would induce the body to build immunity to a disease without

If the body's immune system cannot suppress a bacterial infection, an antibacterial drug may be effective -- at least against the types of bacteria it was designed to combat. Less is known about the treatment of viral infections, especially the common

German physician Robert Koch used a set of criteria to evaluate whether specific germs caused anthrax. He and others then used the criteria to identify the germs that cause numerous other diseases.

French chemist Louis Pasteur demonstrated that spoilage and fermentation occur when microorganisms enter from the air, multiply rapidly, and produce waste products. He showed that spoilage could be avoided by keeping germs out or by

Sanitation measures such as the use of sewers, landfills, isolation, and safe food handling are important in controlling the spread of organisms that cause disease. Improving sanitation to prevent disease has contributed more to saving human

The improvement of microscope lenses and design in the 1600s led to discovery of a vast new world of microscopically small plants and animals, among them bacteria and yeasts. Because most microorganisms do not cause disease, they are

Throughout history, people have created explanations for disease. Some have held that disease has supernatural causes. Others have used careful observation and reasoning to propose natural causes.

All living things are composed of cells, from just one to many millions, whose details usually are visible only through a microscope.

Many diseases are caused by bacteria or viruses.

3-5

There are some diseases that human beings can catch only once. After they've recovered, they don't get sick from them again. There are many diseases that can be prevented by injecting people with killed or weakened germs so that people don't catch the

K-2

Some diseases are caused by germs, some are not. Diseases caused by germs may be spread by people who have them. Washing one's hands with soap and water reduces the number of germs that can get into the body or that can be passed on to other people.