The development of Germ Theory	A revolution in surgery	Improvements in public health
Scientists thought microbes were caused by disease and appeared because of illness. This was the theory of spontaneous generation. Instead of blaming microbes, people looked for miasmas. Louis Pasteur was employed in 1857 to find the explanation for the souring of sugar beet used in fermenting industrial alcohol. His answer was to blame germs in the air. He proved there are germs in the air by sterilising water and keeping it in a flask that didn't allow airborne particles to enter. This stayed sterile – but sterilised water kept in an open flask bred microbes again. In 1861, Pasteur published his germ theory which proved that bacteria caused diseases. This idea was taken up by Robert Koch in Germany, who began to isolate the specific bacteria that caused particular diseases, such as TB and cholera. It was Koch who realised that antibodies could help destroy bacteria and build up immunity against disease. However, back in France it was Pasteur who developed the first vaccines since Jenner, with vaccines for chicken cholera, anthrax and rabies. In his laboratory Koch also pioneered the use of stains to see bacteria more clearly under a microscope. His assistant, Julius Petri, invented the Petri dish to help in this process and the science of bacteriology developed rapidly. Koch's research led to a study of disease prevention and the treatment of disease by vaccines and immune serums, a branch of medicine now called immunology. Paul Ehrlich (Germany: 1890s) reasoned that, if certain dyes could stain bacteria, perhaps certain chemicals could kill them. He set up a private laboratory and a team of scientists. By 1914 they had discovered several 'magic bullets' - compounds that would have a specific attraction to disease-causing microorganisms in the body, and that would target and kill them. These were methylene blue (for malaria), trypan red (for sleeping sickness) and Salvarsan (for syphilis) - although Salvarsan was more effective than the other two. Most *vaccines*, however (eg one developed by Robert Koch against TB in 1891), were not successful. And against acute infectious disease, doctors were largely powerless. They carried, as one medical historian wrote, 'a box of blanks'. So people looked elsewhere for their cures - sometimes in strange places.	In 1800, surgeons tried various ways to ease suffering of patients – e.g. getting them drunk, knocking them out and giving them opium. Nitrous Oxide or 'laughing gas' was discovered by Sir Humphry Davy. It was never really widely used as Davy's findings were published in a book that was not well known, the book was given an obscure name. Ether used by J.R. Liston during a leg amputation. However, it had very unpleasant side effects. Chloroform used by James Simpson and some friends at his home. They realised that it could be used as during surgery. However, it led to unexplained deaths. The dose given could not be measured or controlled. The development of anaesthetics such as chloroform, which was discovered by James Simpson in 1847, greatly improved the success rate of surgery. Anaesthetics weren't always popular though as they were uncomfortable for patients. Some doctors believed that pain was good for healing, people didn't understand how they worked and the side effects on the body were not properly recognised. The final breakthrough came when Queen Victoria accepted the use of chloroform as an anaesthetic during the delivery of her eighth child. Until Louis Pasteur's pioneering work on germ theory in the 1850s, surgeons left wounds unprotected. They reused bandages and rarely washed their hands or surgical equipment before operations. In 1864, Joseph Lister introduced an antiseptic spray that by 1866, reduced the death rate in patients by 45.7 per cent. His spray was not used for long though, because carbolic acid actually damages the tissues and breathing it in causes many problems for doctor as well as patient. More successful was the special dressings he developed which contained carbolic acid to keep the wound clean. After 1860, the work of Florence Nightingale began to improve standards of nursing in Britain, and to improve cleanliness in hospitals. She increased respect and reputation for nurses and established training schools. During her time there the death rate in Scutari fell from 43 per cent to 2 per cent. She believed in prioritising cleanliness and fresh air, work which was reported in British newspapers. By 1900 there were 64,000 trained nurses. By the late 1890s Lister's antiseptic methods led to aseptic surgery and the introduction of sterile instruments in operating theatres. By 1898 rubber gloves were used and surgeon's hands were scrubbed clean beforehand.	In the 19th century, governments adopted 'the preventative principle' – implementing public health measures to prevent disease: In 1848, during the cholera epidemic, the government set up the Board of Health under Edwin Chadwick, which had the power to clean streets and build sewers. After 1853, smallpox inoculation was made compulsory and free. In 1854, John Snow discovered the connection between contaminated water and cholera by plotting the course of a cholera outbreak in the Broad Street area of London. He noticed that all the victims used the same water pump. When he removed the handle from the pump, the epidemic ended. In 1861, Pasteur published his work on germ theory. He proved there are germs in the air by sterilising water and keeping it in a flask that didn't allow airborne particles to enter. This stayed sterile – but sterilised water kept in an open flask bred microbes again. In 1875, the Public Health Act **forced** local councils to take responsibility for public health. Streets, sewers and water supplies had to be kept clean and healthy and all councils had to employ inspectors to enforce the laws. In 1876, the Act of Parliament allowed women to enter the medical profession. Elizabeth Garrett Anderson became the first woman to qualify as a doctor in Britain. In 1890, the Housing of the Working Classes Act allowed councils to demolish overcrowded and dirty slums. Laws were put in place that required towns to take more responsibility for planning, design and maintenance of streets, buildings and street safety.