1.5 Advances in science and technology

Steam Power and Factories



***Script**

S1 Before industrialization, many people worked by hand or used water power.

Worker 1 : This work is slow and hard.

S2 Steam engines gave people a new source of power.

Person 1 : Steam power can run bigger machines.

S3 Factories used steam-powered machines to produce goods faster.

Person 1 : We can make much more cloth now.

Worker 2 : But hours are long.

S4 Steam power helped create larger factories and mass production.

Person 3 : Everything is changing.

Person 4 : Work is moving into factories.

Vocab	Easy Definition
industrialization	the change from making goods mostly by hand to making them with machines in factories
steam engine	a machine that uses steam to create power
water power	energy made by moving water
factory	a large building where many workers use machines to make goods
machine	a tool that helps people do work faster
mass production	making large numbers of the same product
textile	cloth or fabric made by weaving or knitting

Easy Explanation:
Before industrialization, many people made goods by hand or used water power. Steam engines gave factories a new and stronger source of power. Machines could now produce goods much faster. This helped factories become larger and led to **mass production**. However, many workers still faced long hours and difficult working conditions.

Coal, Iron, Steel, and Mass Production



***Script**

S1 Coal powered factories, trains, and steam engines.

Worker 1 : Coal became a key source of energy.

S2 Iron was used for machines, tracks, and bridges.

Worker 2 : Industry needed stronger materials.

S3 Steel was stronger and could be made in larger amounts.

Person 1 : Steel changed construction and transportation.

S4 Mass production made goods faster and cheaper.

Worker 3 : We are making the same products again and again.

Vocab	Easy Definition

coal	a black rock burned to produce energy
energy source	something used to create power
iron	a strong metal used for machines, tools, tracks, and bridges
steel	a strong metal made mainly from iron
industry	businesses and factories that produce goods
raw material	a natural material used to make products
mass production	making many identical products quickly

Easy Explanation:
Industrial growth depended on important materials such as **coal, iron, and steel**. Coal powered steam engines, factories, and trains. Iron was used to build machines and railway tracks. Steel was stronger and became important for construction and transportation. Factories also began producing large numbers of identical goods more quickly and cheaply.

Railways and Steamships



***Script**

S1 Railways moved people and goods much faster.

Train : We can cross long distances more quickly now.

S2 Railways connected cities, markets, and regions.

Person 1 : Fresh goods can reach the city sooner.

S3 Steamships mode ocean travel and trade more reliably.

Person 2 : We are crossing the ocean by steam.

S4 Transportation technology increased trade, migration, and communication.

Person 3 : the world feels more connected.

Vocab	Easy Definition
railway	a system of tracks used by trains
locomotive	the engine that pulls a train
steamship	a ship powered by a steam engine
transportation	the movement of people and goods from one place to another
trade	buying and selling goods
migration	the movement of people from one place to another
market	a place or system where goods are bought and sold

Easy Explanation:
Steam-powered transportation made travel much faster. **Railways** connected cities, farms, factories, and markets. Goods could reach customers more quickly, and people could travel farther in less time. **Steamships** made ocean travel more reliable and increased international trade and migration. These technologies made different parts of the world more connected.

Telegraph and Telephone



***Script**

S1 Before electrical communication, messages traveled slowly.

Person 1 : This letter may take days to arrive.

S2 The telegraph sent messages over long distances very quickly.

Person 2 : I can send news almost instantly.

S3 The telephone allowed people to hear each other’s voices from far away.

Person 3 : Hello! Can you hear me?

S4 Communication became faster and more direct.

Person 4 : Letters were slow.

Person 5 : Now we can share news quickly.

Vocab	Easy Definition
communication	sharing information with other people
telegraph	a system that sends electrical messages through wires
Morse code	a system of dots and dashes used to send telegraph messages
telephone	a device that sends people’s voices over long distances
electrical communication	sending information using electricity
instantly	almost immediately
direct	happening without many steps in between

Easy Explanation:
Before electrical communication, letters had to travel physically and could take days or weeks to arrive. The **telegraph** allowed messages to travel over long distances very quickly. Later, the **telephone** allowed people to hear each other’s voices from far away. Communication became much faster and more direct.

Electricity Changes Everyday Life



***Script**

S1 Before electricity, people used candles, oil lamps, and gas lights.

Person 1 : Night is dim and hard to work in.

S2 Electric lighting changed homes, streets, and workplaces.

Person 2 : The room is so much brighter now!

S3 Electricity also powered streetcars and new machines.

Person 3 : The city is easier to travel in.

S4 Electricity helped cities stay active longer.

Person 4 : The city does not go dark so early.

Person 5 : Life is changing after sunset.

Vocab	Easy Definition
electricity	a form of energy used to power lights and machines
electric lighting	lighting powered by electricity
oil lamp	a lamp that burns oil to make light
gas light	a light that uses burning gas
streetcar	a city vehicle that runs on tracks, often powered by electricity
workplace	a place where people work
urban	connected to a city

Easy Explanation:
Before electricity, people used candles, oil lamps, and gas lights. Electric lighting made homes, streets, and workplaces brighter and safer. Electricity also powered new machines and **streetcars**, making city travel easier. Cities could stay active later at night, so everyday life began to change after sunset.

Cars and Airplanes



***Script**

S1 The internal combustion engine helped make cars possible.

Person 1 : This machine moves without horses.

S2 Cars changed travel and daily life.

Person 2 : Roads and cities are starting to change.

S3 In 1903, powered flight opened a new era of transportation.

Person 3 : People can fly through the air!

S4 By the early 1900s, aircraft were becoming

Vocab	Easy Definition
internal combustion engine	an engine that burns fuel inside itself to create power

automobile	another word for a car
powered flight	flight using an engine
aircraft	a machine that can fly
transportation	the movement of people or goods
route	a path used for travel
aviation	the use and development of aircraft

Easy Explanation:
The **internal combustion engine** helped make cars practical. Cars changed how people traveled and also changed roads and cities. In **1903**, powered flight showed that people could travel through the air. By the early 1900s, aircraft were becoming increasingly important for transportation and military use.

Science Changes Medicine



***Script**

S1 Scientists discovered that germs can cause disease.

Scientist 1 : Tiny organisms can spread illness.

S2 Germ theory encouraged cleaner medical practices.

Nurse 1 : Clean tools can save lives.

S3 Anaesthesia and antiseptics made surgery safer.

Doctor 1 : The patient can be treated with less pain.

S4 New discoveries improved diagnosis and disease prevention

Scientist 1 : This technology helps us see inside the body.

Vocab	Easy Definition
germ theory	the idea that tiny organisms can cause disease
microorganism	a very small living thing that can only be seen with a microscope

sterilize	to remove or kill germs on tools or surfaces
anaesthesia	medicine that prevents pain during surgery
antiseptic	a substance used to kill germs and prevent infection
X-ray	a technology used to see structures inside the body
vaccination	giving a vaccine to help protect a person from disease
diagnosis	finding out what disease or medical problem a person has

Easy Explanation:
Scientists learned that **germs can cause disease**. This encouraged doctors and hospitals to use cleaner tools and better sanitation. **Anaesthesia** reduced pain during surgery, while **antiseptics** helped prevent infection. X-rays allowed doctors to see inside the body, and vaccination helped prevent some diseases. Medicine became more scientific and safer.

Progress Has Costs



***Script**

S1 Industrial progress also created new problems.
Person 1 : The city is crowded and the air is dirty.
S2 Many workers faced long hours, low wages, and unsafe conditions.
Person 2 : Factory work can be dangerous.
S3 Technology also made war more destructive.
Train : Modern weapons are changing war.
S4 Science and technology improved life for many people, but the benefits and costs were not shared equally.

Vocab	Easy Definition

industrial progress	growth caused by new factories, machines, and technology
pollution	harmful waste that makes air, water, or land dirty
working conditions	the situation workers experience at their jobs
low wages	being paid a small amount of money
child labour	work done by children, often in difficult or dangerous conditions
destructive	causing serious damage
inequality	a situation where people do not receive the same benefits or opportunities
consequence	a result of an action or change

Easy Explanation:
Science and technology improved life in many ways, but they also created new problems. Industrial cities often became crowded and polluted. Many workers faced long hours, low wages, and dangerous conditions, and some children worked in factories. New technology also made warfare more destructive. The benefits of progress were important, but they were **not shared equally by everyone**.

Final Summary

Easy explanation

Steam engines gave factories a new source of power and helped move production from small workshops into large factories.

Coal, iron, and steel became important materials for machines, railways, bridges, ships, and mass production.

Railways and steamships made the movement of people and goods much faster and connected cities, markets, and regions.

The telegraph and telephone made communication much faster, while electricity changed homes, factories, streets, and city life.

Cars and airplanes created new forms of transportation in the late 1800s and early 1900s.

Scientific discoveries such as germ theory, anaesthesia, antiseptics, vaccination, and X-rays made medicine safer and more effective.

These advances improved life for many people, but industrialization also created pollution, unsafe working conditions, child labour, and more destructive warfare.

The main lesson is that technological progress created both **benefits and new problems**, and those effects were not shared equally.

Check Your Understanding

1. How did steam power change the way goods were produced?

_____

_____

2. Why were coal, iron, and steel important during industrialization?

_____

_____

3. How did railways and steamships change transportation and trade?

4. How did the telegraph and telephone change communication?

5. How did electricity change everyday life in cities?

6. Name two scientific or medical advances and explain how they improved health.

7. What were two negative effects of industrial or technological progress?

8. Was technological progress completely positive? Use two facts to explain your answer.

Teacher Answer Key

1. Steam power allowed machines to run more efficiently and helped factories produce goods faster and in larger amounts.

2. Coal provided energy, while iron and steel were used to build machines, railway tracks, bridges, ships, and other industrial structures.

3. Railways and steamships moved people, raw materials, and goods much faster. They connected cities and markets and increased trade and migration.

4. The telegraph allowed messages to travel quickly over long distances, while the telephone allowed people to speak directly to each other from far away.

5. Electricity provided brighter lighting, powered machines and streetcars, and allowed homes, businesses, and cities to remain active for longer hours.

6. Answers may include germ theory, anaesthesia, antiseptics, vaccination, or X-rays. Strong answers explain that these developments helped prevent disease, reduce infection or pain, or improve diagnosis.

7. Answers may include pollution, crowded cities, dangerous factory work, low wages, child labour, or more destructive military technology.

8. Strong answers should explain both benefits and costs. For example, transportation and medicine improved, but many workers faced unsafe conditions and industrial cities became heavily polluted.

Sources used for fact-checking

BC Curriculum — **Social Studies 9: Big Ideas, Curricular Competencies, and Content**

Science Museum Group — **Industrial Revolution, Steam Power, and Manufacturing**

Library of Congress — **Telegraph and Telephone History**

Encyclopaedia Britannica — **Industrial Revolution**

World Health Organization / historical public-health resources — **Germ Theory, Vaccination, and Disease Prevention**