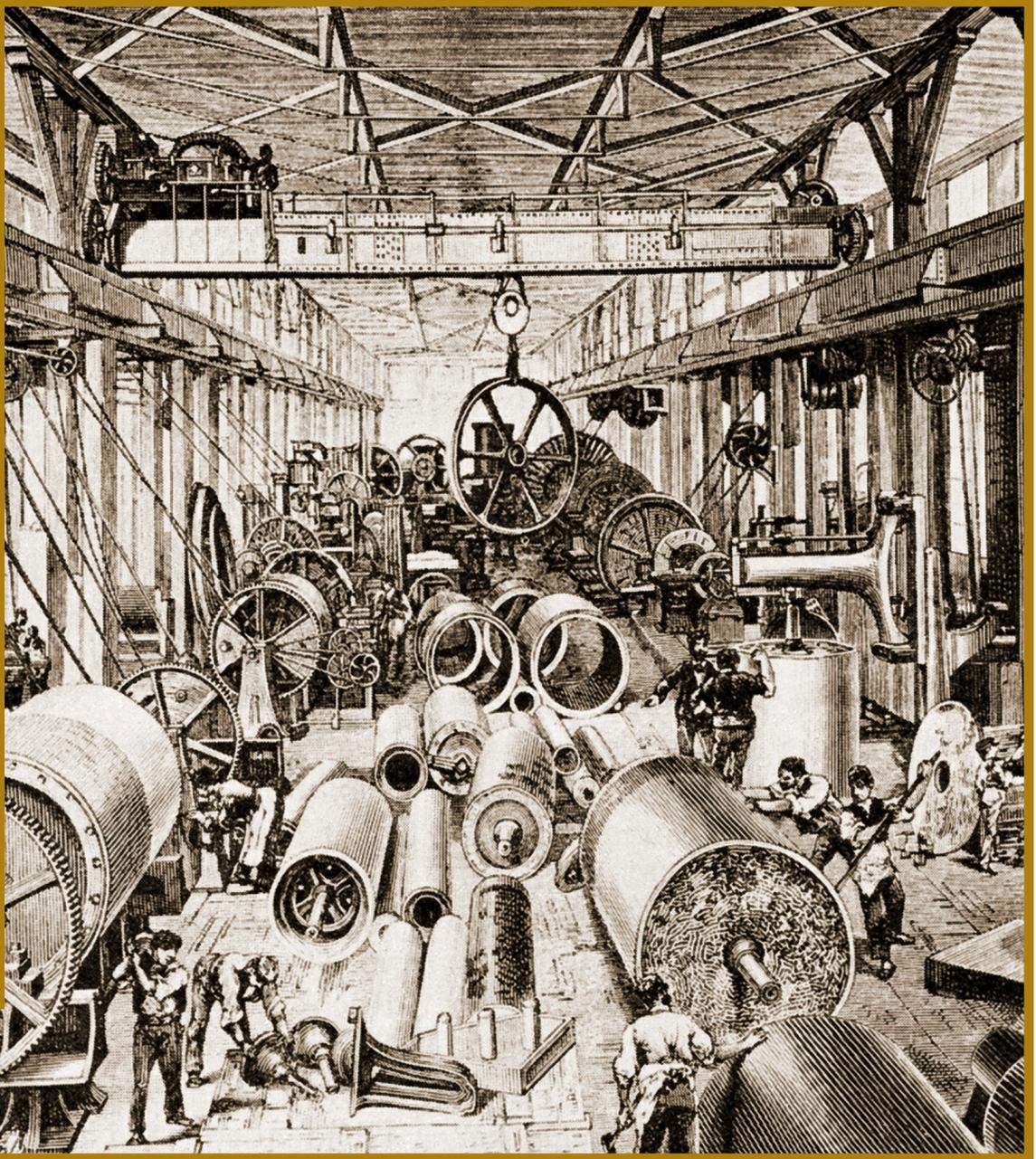


10

World History
History-Social
Science Standards
10.3.1. and 10.3.5.



Britain Solves a Problem and Creates the Industrial Revolution

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:

California Environmental Protection Agency
California Natural Resources Agency
Office of the Secretary of Education
California State Board of Education
California Department of Education
California Integrated Waste Management Board

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Key Partners:

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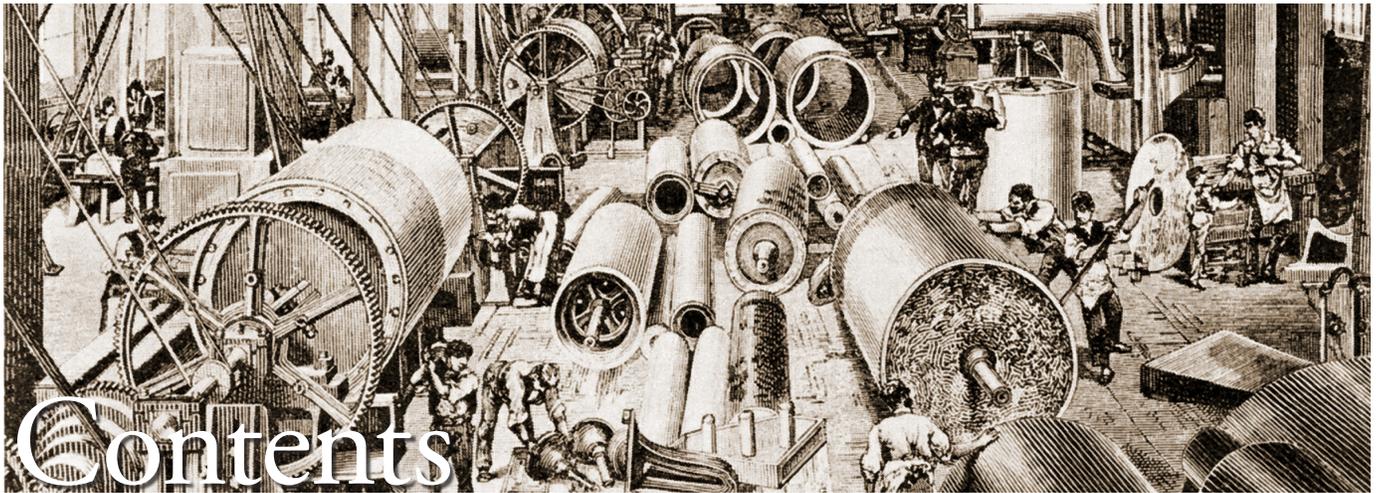
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Lesson 1 New Challenges, New Opportunities, New Technology

Key Unit Vocabulary	2
Elements of a New Revolution	4

Lesson 2 The Industrial Revolution Changes Everything

England's Changing Economy	7
Natural Resources and Industrialization	12

Lesson 3 More People, More Cotton, More Coal

Population Growth and Natural Resources	15
London's Air	17
London's Water	18
The Industrial Revolution: Effects on Natural Systems	20

Lesson 4 The Ultimate Cause of the Industrial Revolution

Analyzing the English Industrial Revolution	22
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Lesson 5 Inventions of the Industrial Revolution

Industry Pack: Coal and Iron	26
Industry Pack: Steam Power	30
Industry Pack: Cotton Textiles	36

Lesson 6 Considering the Cause

Causes of the Industrial Revolution	41
Summary	45

Key Unit Vocabulary

Lesson 1 | page 1 of 2

Capital: Wealth (money or other assets) that can be invested in a business or enterprise.

Cottage industry: A small business often operated from a home.

Ecological: Related to the study of natural systems, the interacting components, processes, and cycles within an environment, and the interactions among organisms and their environment.

Economy: The collection of activities associated with the production, distribution, consumption and exchange of goods and services within human communities and societies.

Ecosystem: A specific area, such as a kelp forest, that contains a characteristic set of interdependent species that interact with each other and the abiotic components found there.

Ecosystem goods: Tangible materials, such as timber and food, produced by natural systems, that are essential to human life, economies, and cultures.

Ecosystem services: The functions and processes that occur in natural systems, such as pollination, that support or produce ecosystem goods and help sustain human life, economies, and cultures.

Efficiency: The ratio of gain or waste to the amount of something used, expressed as a percentage.

Entrepreneurship: The organization and management of a new business built on the investment of capital and assumption of risk.

Export: To send goods to another country or state for sale or trade.

Factory: The building where workers use machines to manufacture material products (goods).

Industrial Revolution: The social and economic change that originated in Great Britain in 1750 when large-scale industrial production began.

Industrialization: Transformation of an economy from production of goods by human and animal labor to production by powered machines; or the changing of an area by creating industry, such as factories and power plants.

Industry: The businesses involved in providing a particular service or good.

Invention: An original device or process.

Labor: The work (human energy) necessary to produce material goods; or the workers who produce material goods.

Manual labor: Work that is done using human hands and power.

Material goods: Clothing, tools, furniture, and other products, that people make and purchase.

Mechanize: To convert production from human and animal-based labor to the use of machinery.

Natural resources: Materials, such as water, minerals, energy, and soil, that people use from nature and natural systems.

Natural system: The interacting components, processes, and cycles within an environment, as well as the interactions among organisms and their environment.

Patent: A legal mechanism that provides an inventor with the right to control the use, development, and profit from an invention.

Productivity: The ratio between the amount material goods produced and the amount of labor, money, or natural resources invested in production.

Key Unit Vocabulary

Lesson 1 | page 2 of 2

Scarcity: The condition wherein there is an insufficient supply or amount of something needed, such as goods or services.

Steam engine: An engine that uses pressurized steam to produce mechanical force.

Technology: The application of engineering and science to resolve a problem, or the resulting product or process.

Textile industry: The businesses involved in the production of fabric from the spinning of thread to the weaving of cloth.

Name: _____

Instructions: After reading *California Connections: New Challenges, New Opportunities, New Technology*, look for examples of each of the four key factors in developing the microchip technology and the electronics industry. Use the questions in each section to prompt your thinking, but do not let the questions limit your ideas. List as many examples as you can. (Each category is worth 2 points.)

<p>Natural Resources</p> <ul style="list-style-type: none">■ What natural resources are required to produce microchips?■ Where are these resources found?■ What ecosystems produce the natural resources you listed?	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<p>Entrepreneurship</p> <ul style="list-style-type: none">■ Who started the businesses? Who owns them?■ Who (people and businesses) took the risks of developing the new industry?	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<p>Labor</p> <ul style="list-style-type: none">■ What work needed to be done to develop and produce the microchip?■ Who did the work? (Keep in mind that labor involves harvesting the resources needed, as well as processing the resources and building microchips.)	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

Elements of a New Revolution

Name: _____

<p>Capital</p> <ul style="list-style-type: none">■ How did the entrepreneurs raise the capital needed to develop this new technology?■ Who provided the funds?	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
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Instructions: Answer each of the following questions in three to five sentences. These questions are intended to stretch your thinking beyond the reading. You are encouraged to include ideas that are not specifically mentioned in the reading. (3 points each)

1. Of the four key factors involved in developing the microchip industry (or any new industry), which do you think is most important? Why?

2. What was Santa Clara County like before the rise of Silicon Valley’s technology industries? Describe how the microchip industry changed Santa Clara County. How did the environment in the area change? How did the economy change?

Elements of a New Revolution

Name: _____

3. Technology industries are very important to Santa Clara County’s economy and culture. Describe three ways this industry-based community is connected to and influences natural systems.

4. Why might natural resources be considered the most basic capital for the development of any industrial economy? Be sure to consider both natural *systems* (ecosystems) and natural *resources* in your response.

England's Changing Economy

Lesson 2 | page 1 of 5

Name: _____

Instructions: Read your assigned article. Look for items and actions that reflect dependence on natural systems and resources; changes in technology and industrialization (entrepreneurship, capital, and labor); and the sources of energy in use. List your observations in the space for your assigned time period on the charts below. Use the questions to prompt your thinking, but do not let the questions limit your ideas. List as many examples as you can.

Natural Systems and Resources

- What natural resources are people using?
- What kinds of tools are they using? What are the tools made of?
- What are the houses made of?
- How do they heat their homes?
- What other parts of the natural system are being used?

England Circa 1600

England Circa 1700

England Circa 1800

Name: _____

Economic Systems (Technology, Entrepreneurship, Capital, Labor)

- What tools are people using?
- Are they producing goods by hand or by machine?
- What goods are people producing or selling?
- How are goods and people transported?
- Where are people working?
- Are raw materials or goods being imported or exported?
- Are there entrepreneurs involved?

England Circa 1600

England Circa 1700

England Circa 1800

Name: _____

Sources of Energy

- How is the work being done?
- What resources are people using to provide power?
- What resources are people using to provide heat?

England Circa 1600

England Circa 1700

England Circa 1800

Population Growth and Natural Resources

Lesson 3 | page 1 of 2

Name: _____

Instructions: Use the information in **More People, More Cotton, More Iron, More Coal** to answer the following questions.

Natural Resources

1. About how many times larger was the population of England in 1850 than it was in 1750?
(Hint: Divide the population in 1850 by the 1750 population.) _____ times larger
2. In 1750 England's textile industry used only 2.3 million pounds of cotton. About how much did it use in 1850? _____ million pounds
How many times larger was the consumption of cotton in 1850 than it was in 1750?
_____ times larger
3. In 1750 England produced about 28 thousand tons of iron. About how much did it produce in 1850?
_____ thousand tons
How many times larger was the production of iron in 1850 than it was in 1750?
_____ times larger
4. How many times larger was the consumption of coal in 1850 than it was in 1750?
_____ times larger
5. Which increased faster from 1750 to 1850, the population of England or the consumption of cotton and coal and the production of iron?

6. Based on this information, how does industrialization appear to relate to consumption of natural resources?

Population Growth and Natural Resources

Lesson 3 | page 2 of 2

Name: _____

Labor

The greater the population of a country, the more people are available to provide labor in the economy. The greater the population, the more people there are to buy the material goods produced. Looking at the numbers for English population growth between 1750 and 1850, choose the best way to finish each of the following sentences.

1. Between 1751 and 1801, England's population _____.
 - a. stayed about the same
 - b. increased some
 - c. increased a lot
2. Between 1801 and 1851, the population _____.
 - a. stayed about the same
 - b. increased some
 - c. increased a lot
3. Which began to increase first, the population or the consumption of cotton and iron?

4. When did the population increase the most—before or after the increase in consumption of cotton, coal, and iron?

London's Air

Lesson 3

Name: _____

John Evelyn wrote the first book on air quality in London. It was written in 1661, even before the start of the Industrial Revolution. This quote is from John Evelyn in 1662.

...London was enveloped in such a cloud of sea-coal, as if there be a resemblance of hell upon earth, it is in this volcano in a foggy day: this pestilent smoak (smoke), which corrodes the very yron [iron], and spoils all the moveables, leaving a soot on all things that it lights: and so fatally seizing on the lungs of the inhabitants, that cough and consumption spare no man.

—John Evelyn, 1662

The Inconveniencie of the Aer and Smoak of London Dissipated



Air over London, 1844

1. What do the picture and the text tell you about air quality in London at the time of the Industrial Revolution?

2. What do you think brought about these conditions?

Name: _____

This is a letter to the editor of *The Times* newspaper. Professor M. Faraday wrote the letter on July 7, 1855. He was writing about the Thames River in London.

Sir,

I traversed this day by steam-boat the space between London and Hangerford Bridges between half-past one and two o'clock; it was low water, and I think the tide must have been near the turn. The appearance and the smell of the water forced themselves at once on my attention. The whole of the river was an opaque pale brown fluid. In order to test the degree of opacity, I tore up some white cards into pieces, moistened them so as to make them sink easily below the surface, and then dropped some of these pieces into the water at every pier the boat came to; before they had sunk an inch below the surface they were indistinguishable, though the sun shone brightly at the time; and when the pieces fell edgeways the lower part was hidden from sight before the upper part was under water. This happened at St. Paul's Wharf, Blackfriars Bridge, Temple Wharf, Southwark Bridge, and Hungerford; and I have no doubt would have occurred further up and down the river. Near the bridges the feculence rolled up in clouds so dense that they were visible at the surface, even in water of this kind.

The smell was very bad, and common to the whole of the water; it was the same as that which now comes up from the gully-holes in the streets; the whole river was for the time a real sewer. Having just returned from out of the country air, I was, perhaps, more affected by it than others; but I do not think I could have gone on to Lambeth or Chelsea, and I was glad to enter the streets for an atmosphere which, except near the sink-holes, I found much sweeter than that on the river.

I have thought it a duty to record these facts, that they may be brought to the attention of those who exercise power or have responsibility in relation to the condition of our river; there is nothing figurative in the words I have employed, or any approach to exaggeration; they are the simple truth. If there be sufficient authority to remove a putrescent pond from the neighbourhood of a few simple dwellings, surely the river which flows for so many miles through London ought not to be allowed to become a fermenting sewer. The condition in which I saw the Thames may perhaps be considered as exceptional, but it ought to be an impossible state, instead of which I fear it is rapidly becoming the general condition. If we neglect this subject, we cannot expect to do so with impunity; nor ought we to be surprised if, ere many years are over, a hot season give us sad proof of the folly of our carelessness.

*I am, Sir,
Your obedient servant,
M. Faraday
Royal Institution, July 7*

London's Water

Name: _____



This cartoon is from a magazine called *Punch*. *Punch* was a magazine of humor and satire that ran from 1841 to 2002. It was known for its strong social commentary. This image ran in 1858.

Editorial cartoon in *Punch*, 1858

1. What do Faraday's letter and this cartoon tell you about water quality in London around the time of the Industrial Revolution?

2. What do you think brought about these conditions?

Analyzing the English Industrial Revolution

Lesson 4 | page 1 of 4

Name: _____

“The English Industrial Revolution” is a scholarly or academic article. Richard Wilkenson, a university historian wrote the article. The purpose of the paper is to present a new interpretation, based on historical evidence, to help other professors and students to better understand the Industrial Revolution. The writer usually states the new idea as a thesis at the beginning of the article. The rest of the article presents information and reasoning that form an argument. The goal of the argument with its corroborating evidence is to convince readers that the thesis is right.

Part 1

Instructions: Work with your partner to answer the following question. (5 points)

What is Wilkinson’s thesis in this article? Copy it word for word here:

Part 2

Instructions: Work on your own to reconstruct Wilkinson’s argument. (1 point each, 10 points total)

Wilkinson’s argument takes the form of a long list of causes and effects. The most important ideas in the argument are listed here. Put them in the correct order so the ideas flow logically from one to the next.

- a. Coal was used in place of wood as a fuel whenever possible.
- b. Coal mines became deeper and deeper.
- c. Coal that was easily mined was used up.
- d. The population of England grew.
- e. The steam engine was adapted to other uses, such as running machinery in factories, locomotives for trains, and engines in steamships.
- f. The steam engine was invented to pump water out of coal mines.
- g. The use of wood increased.
- h. Water flooded deep coal mines.
- i. Wood became scarce and expensive.
- j. Wood was used in the production of many material goods.

Analyzing the English Industrial Revolution

Lesson 4 | page 2 of 4

Name: _____

1. In the beginning _____
2. A change occurred _____
3. that caused _____
4. that caused _____
5. that caused _____
6. that caused _____
7. that caused _____
8. that caused _____
9. that caused _____
10. that caused _____

Part 3

Instructions: Read and analyze the argument with your partner. (10 points)

“Proximate” means “near,” and one meaning of “ultimate” is “farthest.” A “proximate cause” is the cause nearest the effect. For example, on the list of causes you just completed, No. 9 was the proximate cause of No. 10, No. 8 was the proximate cause of No. 9, and so on. An “ultimate cause” is the one farthest up in the chain of causes, the cause that started the chain. In the list you just completed, No. 1 and No. 2 combined to create a problem, which is No. 3. That problem was the ultimate cause of all the events (or effects) that followed. Therefore we could say:

According to Wilkinson’s article, the ultimate cause of (write in No. 10 from your list)

Analyzing the English Industrial Revolution

Lesson 4 | page 3 of 4

Name: _____

was (combine No. 1 though No. 4)

In Lesson 1, you worked with four factors that influence industrial revolutions: natural resources, entrepreneurship, labor, and capital. Into which category does Wilkinson's ultimate cause fit?

In Lesson 1, you learned a pattern that explained several success stories in the development of the microchip: a challenge presented an opportunity to find a solution that led to new technology. Apply this model to the ultimate cause in Wilkinson's article. What was the challenge that England faced in the 1600s?

What opportunity did inventors, entrepreneurs, labor, and investors (capital) see in response to this challenge?

What new technology resulted from the opportunity?

Name: _____

Part 1

Instructions: Answer the following questions with your partner.

1. What challenges faced by entrepreneurs and merchants led to the demand for more coal?

2. Which invention helped to meet these challenges? (Cut out the proper description from **Inventions: Coal and Iron** and place it here.)

1709



3. How did this invention help address this challenge?

Name: _____

4. What new challenges arose as this invention became widely used?

5. Which invention helped to meet these challenges? (Cut out the proper description from **Inventions: Coal and Iron** and place it here.)

1783



6. How did this invention help address this challenge?

Name: _____

Part 1

Instructions: Answer the following questions with your partner.

1. What challenges faced by entrepreneurs and merchants led to the development of the steam-powered engine?

2. Which invention helped to meet these challenges? (Cut out the proper description from **Inventions: Steam Power** and place it here.)

1712



3. How did this invention help address this challenge?

Name: _____

4. What new challenges arose as this invention became widely used?

5. Which invention helped to meet this challenge? (Cut out the proper description from **Inventions: Steam Power** and place it here.)

1783



6. How did this invention help address this challenge?

Name: _____

7. As the steam engine advanced, people found new applications for it. Merchants faced a challenge trying to move heavier goods and supplies on waterways. What was the challenge?

8. Which invention helped to meet this challenge? (Cut out the proper description from **Inventions: Steam Power** and place it here.)

1788



9. How did this invention help address this challenge?

Name: _____

10. Other merchants faced challenges moving goods and supplies on land. What were the challenges?

11. Which invention helped to meet this challenge? (Cut out the proper description from **Inventions: Steam Power** and place it here.)

1804



12. How did this invention help address this challenge?

Name: _____

Part 1

Instructions: Answer the following questions with your partner.

1. As demand for cotton fabrics increased, what challenges did entrepreneurs and merchants face?

2. Which invention helped to meet this challenge? (Cut out the proper description from **Inventions: Cotton Textiles** and place it here.)

1733



3. How did this invention help address this challenge?

Name: _____

4. What new challenges arose as this invention became widely used?

5. Which invention helped to meet this challenge? (Cut out the proper description from **Inventions: Cotton Textiles** and place it here.)

1764



6. How did this invention help address this challenge?

Name: _____

7. Because weaving was a complex process, it was the last step in the textile process to be mechanized. Which invention helped to meet this challenge in making production more efficient? (Cut out the proper description from **Inventions: Cotton Textiles** and place it here.)

1786



8. How did this invention help address this challenge?

9. What challenges arose with the first power looms?

Name: _____

10. How did the invention advance so the technology could be used anywhere?

Part 2

Instructions: After sharing information with your group, complete the following.

List and describe three or more ecosystem goods (natural resources) needed to industrialize the coal and iron, steam power, and cotton textiles industries.

Part 3

Instructions: Using information from this lesson, write an essay that responds to each of the following three prompts: (10 points each)

1. Describe how Great Britain’s increased demand for ecosystem goods created the opportunity for the British to improve their methods of extracting, transporting, and producing material goods from the available natural resources.
2. Describe at least one invention that improved methods of obtaining resources or producing goods.
3. Explain how demand for resources connects the coal and iron, steam power, and cotton textile industries, and how inventions during the Industrial Revolution were interrelated.

Your answer should be three to five paragraphs in length.

Causes of the Industrial Revolution

Lesson 6 | page 1 of 4

Names of group members:

Instructions: Read the information below about natural resources in Great Britain during the 18th century. From that paragraph, identify the factors that might have prompted the Industrial Revolution. List each factor below. Then explain how natural resources brought about the Industrial Revolution. (10 points)

Natural Resources

Mild climate and abundant rainfall made agriculture very successful in Great Britain. Thus, even if many people did work besides farming, there was still enough food for everyone. Because Britain is rainy and hilly, it has many streams to power the watermills that ran machines in the first factories, before the steam engine was adapted to do that job. Britain has rich deposits of coal and iron and many rivers that provided a cheap way to transport heavy cargo from the mines to the factories. Using wood charcoal and wood for fuel and building had largely depleted Britain's forests.

Read the **Statements of Evidence** regarding the Industrial Revolution. Which statements best support the idea that Great Britain's natural resources were the main cause for the Industrial Revolution? Explain why you chose those statements. (2 points)

Causes of the Industrial Revolution

Lesson 6 | page 2 of 4

Names of group members:

Instructions: Read the information below about entrepreneurship in Great Britain during the 18th century. From that paragraph, identify the factors that might have prompted the Industrial Revolution. List each of these causes below. Then explain how entrepreneurship contributed to the Industrial Revolution. (10 points)

Entrepreneurship

Business people in Great Britain had a tradition of innovation, they were open to new ideas and new ways of doing things. Beginning in the 1600s, they invested in new crops and new farming techniques. These innovations greatly increased food production, making food prices cheaper. In the 1700s, they invested in an extensive network of canals. These canals made transporting goods around the country easier and cheaper. The entrepreneurs supported the inventors whose work transformed the textile and iron industries. The government supported the efforts of entrepreneurs and inventors by providing patents. Only the holder of the patent could make money from the patented invention. Thus, patents made it worthwhile for entrepreneurs to invest their money in researching and developing new ideas.

Read the **Statements of Evidence** regarding the Industrial Revolution. Which statements best support the idea that Great Britain's entrepreneurship was the main cause for the Industrial Revolution? Explain why you chose those statements. (2 points)

Causes of the Industrial Revolution

Lesson 6 | page 3 of 4

Names of group members:

Instructions: Read the information below about labor in Great Britain during the 18th century. From that paragraph, identify the factors that might have prompted the Industrial Revolution. List each of these causes below. Then explain how labor contributed to the Industrial Revolution. (10 points)

Labor

The reforms in agriculture in the 1600s and 1700s increased food production. With greater food production, Great Britain's population grew. Growth was due, in part, to people's access to healthier food. The reforms benefited big landowners more than small farmers. Landowners hired others to work for them. Many small farmers started to earn their living through cottage industry. These workers could easily change to factory work when entrepreneurs began developing factories in the late 1700s. Mechanization made manufacturing products easier. It was common for women and children to work in factories. The increased productivity brought more profits. The improvements in agriculture also made food cheaper. Thus, workers in Great Britain had a little more money to spend than did workers in other European countries. Therefore, workers in Great Britain could more readily buy some of the new products created by the Industrial Revolution.

Read the **Statements of Evidence** regarding the Industrial Revolution. Which statements best support the idea that Great Britain's labor was the main cause for the Industrial Revolution? Explain why you chose those statements. (2 points)

Causes of the Industrial Revolution

Lesson 6 | page 4 of 4

Names of group members:

Instructions: Read the information below about capital in Great Britain during the 18th century. Identify the factors that might have prompted the Industrial Revolution. List each of these causes below. Then explain how capital contributed to the Industrial Revolution. (10 points)

Capital

Big British landowners benefited from reforms in agriculture and innovations during the 1600s. They made profits they could invest in new business opportunities. Britain developed many overseas colonies in the 1600s and 1700s. These included the colonies that would later become the United States. Merchants made big profits by buying and selling goods to people in the colonies. Therefore, they, too, had capital to invest during the the Industrial Revolution. In the early 1700s, British merchants took control of the Atlantic slave trade from the Dutch. These merchants invested some of their profits from the slave trade in the Industrial Revolution.

Read the **Statements of Evidence** regarding the Industrial Revolution. Which statements best support the idea that Great Britain's capital was the main cause for the Industrial Revolution? Explain why you chose those statements. (2 points)



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