

SECTION
1

Reinforcement

Fossil Fuels

Directions: Complete the table below by placing a check mark (✓) beneath the headings of the substances that have each characteristic described in the first column.

Characteristic	Petroleum	Natural gas	Coal
1. is a fossil fuel			
2. forms from plants and animals			
3. forms only from plants			
4. is a solid			
5. is a liquid			
6. is a gas			
7. is made up of hydrocarbons			
8. is a source of energy			
9. is a nonrenewable resource			
10. is pumped from wells			
11. is separated using fractional distillation			
12. is also called crude oil			
13. is transported long distances through pipes			
14. is mined from Earth			
15. produces polluting substances when burned			
16. produces thermal energy when burned			
17. can be used to produce electricity			
18. is the least polluting fossil fuel			

SECTION

1

Enrichment

Oil from the Arctic

Oil is the leading source of energy in the United States. It supplies about 40 percent of our total energy needs. One of our largest domestic sources of crude oil comes from the icy, frigid area of Alaska called the North Slope. Under the North Slope's frozen ground, called permafrost, lies the Prudhoe Bay Oil Field. It is the largest oil deposit ever discovered on the North American continent. It holds over 22 billion barrels of oil. About half of this oil is expected to be recovered by current methods of production.

The Alaskan Pipeline

The Alaskan Pipeline was built to carry the oil from Prudhoe Bay to the port of Valdez, Alaska. The pipeline was completed in 1977, cost \$8 billion, and took three years to build. The 1,300 km pipeline is 1.25 m in diameter. It has 1.25 cm thick walls designed to withstand the extreme Alaskan environment. The pipe is insulated with 10 cm of fiberglass and jacketed with galvanized steel. It carries 1.6 million barrels of oil per day, about 15 percent of the total United States production.

Above Ground Portions

On its way from Prudhoe Bay to Valdez, the pipeline crosses three mountain ranges and hundreds of running rivers and streams.

Only half of it is buried. The above-ground portion snakes along on its supports 3 to 4.5 m above the ground. Each support consists of steel posts with a crossbeam between them. The reinforced pipeline rests on the supports with room to sway from side to side in the event of earthquakes or expansions or contractions caused by temperature changes.

The Design of the Pipeline

The pipeline wasn't placed above ground just because it was easier to build that way. The reasons for this related mainly to environmental and safety concerns. Oil travels through the pipeline at about 60°C. In order to prevent the permafrost from thawing, which would make the pipeline unstable, the pipeline was elevated. At points where caribou migration routes would have crossed the elevated pipeline, it has been buried and refrigerated to leave these routes undisturbed. A series of safety valves provides further protection to the environment. These valves close automatically if the oil flow stops or reverses on uphill stretches. It is also possible to shut off whole sections of the line if leaks or spills should occur.

1. Look at a map of Alaska. Find Prudhoe Bay and Valdez. What type of terrain does the Alaskan Pipeline travel through?

2. Many people feared that the Alaskan pipeline would damage the environment that it passed through. What precautions have been taken to protect the environment along its route?

3. Do you think that all of the planning, work, and cost of building the Alaskan pipeline was worth the final product—domestic oil? Explain your answer.
