Natural Resources

Classification of Natural Resources

Natural resources are materials obtained from nature that are used to fulfill our basic needs. They can be broadly classified into two types based on their availability:

- **Inexhaustible Natural Resources:** These are resources that are present in unlimited quantities and cannot be exhausted by human activities. Examples include sunlight and air.
- **Exhaustible Natural Resources:** These resources are limited in quantity and can be depleted by human use. Examples include forests, wildlife, minerals, coal, petroleum, and natural gas.

Human Impact on Natural Resources

Human activities can lead to the depletion of exhaustible natural resources. For example, overuse of water, air pollution, and soil degradation can reduce the availability of these

resources. It is important to use natural resources judiciously to ensure their availability for future generations.

Natural Resources Solved Examples

Example 1: Classify the following as inexhaustible or exhaustible natural resources: sunlight, coal, air, petroleum.

Solution:

- Sunlight - Inexhaustible
- Coal - Exhaustible
- Air - Inexhaustible
- Petroleum - Exhaustible

Example 2: Why is it important to conserve exhaustible natural resources?

Solution: Exhaustible natural resources are limited and can be depleted by human activities. Conserving them ensures their availability for future generations and helps maintain environmental balance.

Natural Resources Practice Set

- **Level 1:** Name two inexhaustible natural resources.
- **Level 2:** Explain why coal is considered an exhaustible natural resource.
- **Level 3:** Discuss the impact of human activities on the availability of natural resources and suggest ways to conserve them.

Natural Resources Answer Key

- **Level 1:** Sunlight and air.
- **Level 2:** Coal is exhaustible because it is formed over millions of years from dead plants and is limited in quantity. Human consumption can deplete coal reserves.
- **Level 3:** Human activities like deforestation, pollution, and overuse of resources reduce their availability. Conservation methods include sustainable use, recycling, afforestation, and using alternative energy sources.

Coal

What is Coal?

Coal is a black or brownish-black sedimentary rock primarily composed of carbon along with hydrogen, sulfur, oxygen, and nitrogen. It is formed from the remains of plants that lived millions of years ago.

Formation of Coal

Coal forms in swampy areas where dead plant material accumulates. Over millions of years, this material is buried under soil and rock layers. Heat and pressure cause physical and chemical changes, converting the plant material into coal through a process called carbonization.

Types of Coal

- **Peat:** The initial stage with least carbon content.
- **Lignite:** Brown coal with higher carbon content than peat.
- **Bituminous Coal:** Soft coal widely used for power generation.
- **Anthracite:** Hard coal with the highest carbon content and energy.

Uses of Coal

Coal is used as a fuel for cooking, generating electricity in thermal power plants, and in industries such as steel manufacturing. It was also historically used in railway engines to produce steam.

Products of Coal

- **Coke:** A tough, porous, almost pure carbon substance used in steel manufacturing and metal extraction.
- **Coal Tar:** A thick black liquid containing about 200 substances, used to make dyes, drugs, explosives, perfumes, plastics, paints, and photographic materials.
- **Coal Gas:** A fuel obtained during coke production, used in industries and historically for street lighting.

Environmental Impact

Burning coal releases carbon dioxide, a greenhouse gas contributing to global warming and climate change. Responsible use and alternative energy sources are important to reduce environmental harm.

Coal Solved Examples

Example 1: Describe the process of coal formation.

Solution: Dead plants in swampy areas get buried under soil and rock. Over millions of years, heat and pressure cause carbonization, converting the plant material into coal.

Example 2: List three products obtained from coal and their uses.

Solution:

- Coke - Used in steel manufacturing.
- Coal Tar - Used to make dyes, drugs, and plastics.
- Coal Gas - Used as fuel in industries.

Coal Practice Set

- **Level 1:** What is coal primarily made of?
- **Level 2:** Explain the difference between bituminous coal and anthracite.
- **Level 3:** Discuss the environmental effects of coal usage and suggest alternatives.

Coal Answer Key

- **Level 1:** Carbon.
- **Level 2:** Bituminous coal is soft with moderate carbon content; anthracite is hard with the highest carbon content and energy.
- **Level 3:** Coal burning releases greenhouse gases causing pollution and global warming. Alternatives include solar, wind, and natural gas.

Petroleum

What is Petroleum?

Petroleum is a dark oily liquid found underground between rock layers. It is formed from the remains of marine organisms that died millions of years ago and were subjected to heat and pressure.

Formation and Deposits

Dead marine organisms settled at the sea bottom and were covered by sand and clay. Over millions of years, heat and pressure transformed them into petroleum and natural

gas. These accumulate in porous reservoir rocks beneath impervious rock layers, with water at the bottom, oil in the middle, and gas at the top due to their densities.

Extraction

Wells are drilled through impervious rock into reservoir rocks to extract petroleum and natural gas.

Refining of Petroleum

Petroleum is a mixture of various constituents such as petroleum gas, petrol, diesel, lubricating oil, paraffin wax, and bitumen. Refining is the process of separating these constituents by heating crude oil in a petroleum refinery using distillation towers.

Uses of Petroleum Constituents

- **Petroleum Gas (LPG):** Used as fuel for cooking and heating.
- **Petrol:** Fuel for motor vehicles and aviation.
- **Kerosene:** Fuel for stoves, lamps, and jet engines.
- **Diesel:** Fuel for heavy vehicles and generators.
- **Lubricating Oil:** Reduces friction in machines.
- **Paraffin Wax:** Used in ointments, candles, and vaseline.
- **Bitumen:** Used in road surfacing and paints.

Petrochemicals

Many useful substances like detergents, synthetic fibers, plastics, and fertilizers are made from petroleum and natural gas derivatives.

Petroleum Solved Examples

Example 1: Explain how petroleum is formed.

Solution: Dead marine organisms settled at the sea bottom and were buried under sand and clay. Heat and pressure over millions of years transformed them into petroleum.

Example 2: What is the purpose of refining petroleum?

Solution: Refining separates crude petroleum into useful constituents like petrol, diesel, kerosene, and lubricating oil by heating and distillation.

Petroleum Practice Set

- **Level 1:** Name two products obtained from petroleum.
- **Level 2:** Describe the layering of water, oil, and gas in petroleum reservoirs.
- **Level 3:** Discuss the importance of petroleum refining in daily life.

Petroleum Answer Key

- **Level 1:** Petrol and diesel.
- **Level 2:** Water is at the bottom due to highest density, oil is in the middle, and gas is at the top due to lowest density.
- **Level 3:** Refining produces various fuels and raw materials essential for transportation, industry, and manufacturing everyday products.

Natural Gas

What is Natural Gas?

Natural gas is a fossil fuel found underground, mainly composed of methane. It is stored under high pressure as compressed natural gas (CNG) and used for power generation and as a cleaner fuel for vehicles.

Advantages of Natural Gas

Natural gas burns cleaner than coal and petroleum, producing less pollution. It can be supplied through pipelines directly to homes and industries.

Uses of Natural Gas

Natural gas is used for cooking, heating, electricity generation, and as a raw material for producing chemicals and fertilizers.

Natural Gas Solved Examples

Example 1: Why is natural gas considered a cleaner fuel?

Solution: Natural gas produces fewer pollutants and greenhouse gases when burned compared to coal and petroleum.

Example 2: List two uses of natural gas.

Solution: Used for cooking and electricity generation.

Natural Gas Practice Set

- **Level 1:** What is CNG?
- **Level 2:** Explain why natural gas is preferred over coal in some applications.

- **Level 3:** Describe how natural gas is transported to homes and industries.

Natural Gas Answer Key

- **Level 1:** Compressed Natural Gas.
- **Level 2:** It burns cleaner, producing less pollution and greenhouse gases.
- **Level 3:** Through a network of pipelines supplying gas directly to consumers.

Limited Resources

Exhaustible Nature of Fossil Fuels

Coal, petroleum, and natural gas are fossil fuels formed over millions of years. Their known reserves are limited and will last only a few hundred years at current consumption rates.

Environmental Concerns

Burning fossil fuels contributes to air pollution and global warming. Therefore, it is important to use these fuels judiciously to protect the environment and conserve resources.

Conservation Measures

Organizations like the Petroleum Conservation Research Association (PCRA) promote fuel-saving practices such as driving at moderate speeds, switching off engines when idle, maintaining correct tyre pressure, and regular vehicle maintenance.

Limited Resources Solved Examples

Example 1: Why should fossil fuels be used judiciously?

Solution: Because they are limited and their use causes pollution and global warming.

Example 2: Name two fuel-saving tips recommended by PCRA.

Solution: Drive at moderate speed and switch off the engine when waiting.

Limited Resources Practice Set

- **Level 1:** What are fossil fuels?
- **Level 2:** Explain why fossil fuels are exhaustible.
- **Level 3:** Suggest ways to conserve fossil fuels in daily life.

Limited Resources Answer Key

- **Level 1:** Fuels formed from dead remains of living organisms over millions of years.
- **Level 2:** They take millions of years to form and are consumed faster than they are formed.
- **Level 3:** Use public transport, maintain vehicles, switch off engines when idle, and use alternative energy sources.

Quick Reference Table

Common Mistakes and Misconceptions

Glossary