Chapter Two

Assignment for Lecture (1)

Question 1: Choose the correct answer

1. **B) Nuclear energy**
2. **C) Mechanical energy**
3. **C) Damage to oil tankers**
4. **B) Carbon dioxide**
5. **B) Carbon monoxide**
6. **A) High temperatures**
7. **B) Coal**
8. **C) Natural gas**
9. **C) Sulfur trioxide**
10. **B) Fueling cars and plastic production**
11. **B) Use of fertilizers and pesticides**
12. **B) Forming acid rain**
13. **B) Supporting economic growth**
14. **B) Carbon dioxide**
15. **C) Creating jobs in the energy sector**
16. **B) The first law of thermodynamics**
17. **B) Electrical energy**
18. **C) Carbon dioxide**
19. **D) Solar energy**
20. **C) Turbines**
21. **A) Electrical energy**
22. **A) Causing acid rain**
23. **C) Carbon dioxide is released**
24. **A) Heat leakage**
25. **B) Emission of sulfur oxides**
26. **C) Combustion of fuel**
27. **C) Electrical energy**
28. **B) Coal**

29. **B) Electrical energy**
30. **B) Electrical energy**
31. **B) Carbon dioxide (CO2)**
32. **C) Sulfur dioxide (SO2)**
33. **C) Combustion at high temperatures**
34. **C) Forming acid rain**

Question 2: Explanations

1. **Coal is a polluting energy source** due to its high carbon content, which releases large amounts of carbon dioxide and sulfur oxides when burned.
2. **Sulfur dioxide reacts with water** in the atmosphere, forming sulfuric acid, which falls as acid rain, damaging ecosystems and structures.
3. **Carbon monoxide affects oxygen transport** by binding to hemoglobin more effectively than oxygen, reducing oxygen delivery to tissues.
4. **Nitrogen oxides irritate the respiratory system**, causing inflammation and exacerbating respiratory diseases.
5. **Oil is non-renewable** because it takes millions of years to form and cannot be replenished within a human lifetime.
6. **Sulfur and nitrogen oxides form acid rain**, leading to soil and water acidification, harming ecosystems.
7. **Fossil fuels increase greenhouse gases**, primarily carbon dioxide, leading to global warming.
8. **Thermal energy loss in power plants** reduces efficiency, as not all energy from fuel is converted into electricity.
9. **Power plants emit pollutants**, such as sulfur dioxide and nitrogen oxides, which contribute to smog and acid rain.
10. **Turbines convert mechanical energy** from steam, water, or wind into electrical energy, playing a critical role in power generation.

Question 3: Situations

1. **Oil spills** cause marine pollution, killing wildlife and damaging ecosystems.
2. **Inhaling carbon monoxide** reduces oxygen supply in the body, potentially leading to suffocation.
3. **Sulfur trioxide reacts with water**, forming sulfuric acid, a key component of acid rain.

4. **Acid rain damages stone buildings**, eroding them and reacting chemically with calcium carbonate in limestone.
5. **Burning nitrogen-impure fossil fuels** releases nitrogen oxides, which contribute to smog and acid rain.
6. **Acid rain acidifies soil and water**, harming plant and aquatic life.
7. **Large-scale fossil fuel burning** releases greenhouse gases and pollutants, contributing to global warming and air pollution.
8. **Thermal energy leaks reduce efficiency**, wasting energy that could generate electricity.
9. **High-pressure steam erodes turbines**, potentially damaging components and reducing efficiency.
10. **Sulfur and nitrogen oxides pollute the air**, leading to smog, respiratory issues, and acid rain.

Question 4: Additional Tasks

1. **Diagram**:

- A basic labeled diagram should include steps such as combustion, boiler (heat generation), steam production, turbine rotation, and electrical generation via a generator.

1. **Comparison of coal, oil, and natural gas**:

- Coal: High emissions, including sulfur oxides and particulates.
- Oil: Moderate emissions, easier transport, spills harm ecosystems.
- Natural gas: Least polluting but still releases carbon dioxide.

2. **Sustainable energy solutions**:

- Transition to renewable sources (solar, wind, hydroelectric).
- Increase energy efficiency in power plants.
- Carbon capture and storage.
- Investment in green technologies to reduce dependency on non-renewable resources.

Question 1: Multiple Choice Answers

1. **What is mining?**

   b) The process of extracting minerals from the Earth's surface

2. **Main effect of mining on soil?**

   b) Alters energy distribution and temperature

3. **Cause of land collapse during mining?**

   c) Voids created underground

4. **Effect of mining on groundwater?**
   b) Alters its pH level and mineral composition
5. **Effect of mining on natural habitats?**
   b) Destroys natural habitats
6. **Why is chemical analysis of ore conducted?**
   c) To determine its type, quantity, and mining feasibility
7. **Element used in aluminum extraction?**
   d) Cryolite
8. **Chemical process used to extract gold?**
   c) Using cyanide
9. **Ore used to extract iron?**
   b) Hematite
10. **Purpose of electrolysis in copper purification?**
    c) Purify it from impurities
11. **Effect of metal mining on soil temperature?**
    b) Increases temperature in dry soil
12. **Effect of mining chemicals on water?**
    b) Cause changes in chemical composition
13. **Main goal of chemical waste disposal?**
    a) Safe and efficient waste management
14. **Why classify chemical waste?**
    a) To separate hazardous materials
15. **Common method for chemical waste disposal?**
    b) Incineration in high-temperature furnaces
16. **Why store chemical waste in leak-resistant containers?**
    b) To prevent environmental contamination
17. **Negative effect of chemical waste leakage?**
    b) Soil and groundwater contamination
18. **NOT part of chemical waste disposal?**
    d) Sun heating
19. **Method to neutralize acids in chemical waste?**
    b) Adding basic materials
20. **Goal of metal purification?**
    b) Improve metal properties

21. **Process using activated carbon in gold mining?**
    c) Separating gold from solution
22. **Why monitor waste disposal sites?**
    a) To ensure no leakage occurs
23. **Benefit of recycling chemical waste?**
    b) Reduce environmental and industrial costs
24. **Technique for removing heavy metals from wastewater?**
    b) Chemical precipitation
25. **Purpose of filters in wastewater treatment?**
    a) To remove heavy metals
26. **Used to analyze bauxite?**
    c) Cryolite
27. **Process to separate gold from cyanide solution?**
    b) Activated carbon
28. **Benefit of burying waste in special landfills?**
    b) Protects groundwater from contamination
29. **Effect of chemical pollution on soil quality?**
    b) Degrades soil quality

Question 2: Explanations

1. **Mining processes degrade habitats:** Mining disrupts ecosystems by removing vegetation and altering landscapes.
2. **Soil temperature in wet soil:** Water retains heat, leading to higher temperatures in wet soil compared to dry soil.
3. **Ore analysis before mining:** Identifies ore type, quantity, and feasibility for cost-effective operations.
4. **Electrolysis in aluminum extraction:** Separates pure aluminum from bauxite using electric current.
5. **Chemical waste leakage:** Toxic substances pollute water, harming ecosystems and human health.
6. **Metal purification:** Removes impurities, enhancing metal properties for industrial use.
7. **Strict waste disposal standards:** Prevents environmental damage and health hazards.
8. **Land collapse in underground mining:** Caused by the removal of support structures.

9. **Heat distribution changes during mining:** Alters soil thermal properties due to removal of vegetation and soil layers.
10. **Filters in wastewater treatment:** Capture heavy metals, reducing water contamination.

Question 3: Outcomes of Various Scenarios

1. **Unclassified waste disposal:** Increases risks of hazardous reactions and environmental damage.
2. **Cyanide in gold extraction:** Cyanide binds with gold for easier separation but poses environmental risks.
3. **Topsoil removal:** Reduces fertility and increases erosion.
4. **Chemical leaks into groundwater:** Causes long-term contamination, affecting water usability.
5. **Untreated heavy metals in wastewater:** Accumulate in ecosystems, harming aquatic life.
6. **Cryolite in aluminum extraction:** Lowers melting point, reducing energy consumption.
7. **Unmonitored disposal sites:** Higher chances of leaks and environmental hazards.
8. **Thermal balance with vegetation removal:** Loss of vegetation increases soil temperature fluctuations.
9. **Improper waste disposal:** Leaches toxins into soil and water, causing widespread contamination.
10. **Heavy metal contamination in surface water:** Bioaccumulation and toxicity in aquatic ecosystems.

Question 4: Miscellaneous Questions

1. **Resource depletion effects:** Loss of habitat, food scarcity, and altered ecosystems.
2. **Long-term effects of deforestation/mining:** Soil erosion, water cycle disruption, and biodiversity loss.
3. **Reducing environmental damage:** Sustainable mining, reforestation, and using eco-friendly methods.
4. **Ecological balance and mining:** Mining alters soil, water, and air composition, disrupting natural cycles.
5. **Fossil fuel combustion reactions:** $C+O2 \rightarrow CO2$. $NO2$, $SO2$ these gases contribute to global warming and acid rain.
6. **Cumulative effects on biodiversity:** Habitat loss, pollution, and overexploitation reduce species survival.