Selecting Materials for Mechanical Components

Part 1: Roleplay Dialogue

Characters:

- **Ethan** – Mechanical Engineer
- **Sophia** – Senior Engineer

Ethan: Sophia, I'm evaluating materials for the new machine components. I'm considering **metallurgy** to understand how different metals will perform under stress.

Sophia: That's a good start. Have you thought about using **composite materials**? They could offer better strength-to-weight ratio compared to traditional metals.

Ethan: I have, but I'm concerned about **wear resistance**. Some composites degrade faster in high-friction environments.

Sophia: That's true. If friction is a concern, we should analyze **material fatigue** to see how long the materials can withstand repeated stress.

Ethan: Exactly. I also want to test the **alloy properties** of different metals to see which offers the best balance between strength and flexibility.

Sophia: That makes sense. We should also consider corrosion resistance, especially if the components will be exposed to moisture or chemicals.

Ethan: Agreed. I'll run some durability tests and compare the results before making a final decision.

Sophia: Good plan. Let's meet after the tests to review the data and finalize the selection.

Ethan: Sounds great. I'll keep you updated on my progress.

Part 2: Comprehension Questions

1. What aspect of material selection is Ethan analyzing first?
    - (A) Cost efficiency
    - (B) Metallurgy and stress performance
    - (C) Ease of manufacturing
    - (D) Aesthetic appeal
2. Why is Ethan concerned about composite materials?
    - (A) They are too expensive
    - (B) They may degrade in high-friction environments
    - (C) They are heavier than metals
    - (D) They are not strong enough for mechanical applications
3. What does Sophia suggest analyzing to assess repeated stress resistance?
    - (A) Corrosion testing
    - (B) Alloy flexibility
    - (C) Material fatigue
    - (D) Surface finish
4. What is the next step after Ethan runs durability tests?
    - (A) Immediately begin production
    - (B) Select the most affordable material
    - (C) Replace all metal components with composites
    - (D) Review the data and finalize the material choice

Part 3: Vocabulary List

- **Metallurgy (冶金学)** – The study of metals and their properties, including strength, hardness, and durability.
- **Composite materials (複合材料)** – Engineered materials made from two or more substances to enhance performance.
- **Wear resistance (耐摩耗性)** – The ability of a material to withstand surface damage from friction and use.
- **Material fatigue (材料疲労)** – The weakening of a material due to repeated stress or loading over time.
- **Alloy properties (合金特性)** – Characteristics of metal mixtures designed to improve strength, corrosion resistance, and flexibility.

Part 4: Answer Key

1. What aspect of material selection is Ethan analyzing first?
   ✅ (B) Metallurgy and stress performance
2. Why is Ethan concerned about **composite materials**?
   ✅ (B) They may degrade in high-friction environments
3. What does Sophia suggest analyzing to assess repeated stress resistance?
   ✅ (C) Material fatigue
4. What is the next step after Ethan runs durability tests?
   ✅ (D) Review the data and finalize the material choice