 Surname Name Group

Comprehension Quiz: Unit 9 - Material Selection

Part 1: True or False (15 points)

Read each statement below. Write (T) for True or (F) for False in the blank provided.

1. Material selection is based only on the cost of the material.
2. A material that is "stiff" resists bending.
3. Aluminum bicycle frames are generally heavier than steel frames.
4. Carbon fiber is a popular material for high-performance bicycles because it is very light and stiff.
5. The first step in the material selection process is to choose a synthesis method.
6. "Toughness" refers to a material's resistance to cracking.
7. Titanium is a cheap and commonly used material for low-cost consumer products.
8. Simulation software helps engineers test materials virtually, saving time and money.
9. A "brittle" material can bend significantly without breaking.
10. Environmental factors, like humidity and temperature, are not important in material selection.
11. The Weighted-Properties Method gives equal importance to all selection criteria.
12. Steel is an alloy composed primarily of iron and carbon.
13. According to the case study, PET is used for beverage bottles because it is heavy and non-recyclable.
14. Concrete's versatility makes it unsuitable for a wide range of bridge designs.
15. Researching past projects is considered a best practice in material selection.

Part 2: Multiple Choice (A/B/C) (15 points)

Circle the best answer for each question.

1. What are the three main factors material selection is based on?
   a) Color, shape, and size
   b) Application, required properties, and budget
   c) Engineer's preference, availability, and brand

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2. Which material property describes a material's ability to withstand a force without breaking?
   a) Flexibility
   b) Strength
   c) Brittleness
3. Which tool is described as a "large digital library containing information on thousands of materials"?
   a) Ashby Chart
   b) Decision Matrix
   c) Material Database
4. For a cheap commuter bike, which frame material is most suitable?
   a) Titanium
   b) Carbon Fiber
   c) Steel

5. What is the main advantage of using a Decision Matrix in material selection?
   a) It creates a 3D model of the final product.
   b) It provides a fair and clear way to compare materials using scores.
   c) It changes the chemical properties of the materials.
6. According to the lesson, what is one key disadvantage of using carbon fiber for a bicycle frame?
   a) It is too flexible.
   b) It is very heavy.
   c) It is expensive.
7. If an engineer needs to find a material that is both strong and lightweight for an airplane part, which tool would be best for an initial visual comparison?
   a) A Material Database
   b) An Ashby Chart
   c) Simulation Software
8. The process of "Selecting a suitable synthesis method" refers to:
   a) Choosing how the material will be manufactured into a shape.
   b) Deciding what color to paint the final product.
   c) Selecting the application for the material.
9. Why is steel a good choice for a cargo bike frame?
   a) Because it is the most lightweight material available.
   b) Because it is very strong and relatively cheap.
   c) Because it is the most comfortable material.
10. Thinking about environmental factors in material selection means considering:
    a) How the material will perform in different weather conditions.
    b) How popular the material is with customers.
    c) The brand name of the material.
11. A mountain bike frame must withstand impacts without cracking. This requirement is best described by which mechanical property?
    a) Stiffness

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b) Toughness
c) Malleability

12. What is a major advantage of using a Decision Matrix?
    a) It makes material comparisons fair and clear by using scores.
    b) It creates virtual prototypes of the final product.
    c) It changes the chemical composition of materials.
13. Which material is known for its excellent biocompatibility, making it ideal for medical implants?
    a) Aluminum
    b) Plastic
    c) Titanium
14. Thinking about sustainability in material selection involves:
    a) Choosing the fastest material to produce.
    b) Selecting materials that are recyclable or have a low environmental impact.
    c) Using only the newest materials available.
15. What is the primary purpose of Performance Indices?
    a) To calculate the salary of engineers.
    b) To rank materials based on how well they perform a specific job.
    c) To design the shape of the final product.

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