Eco-informed Materials Choice

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Scores: 1 point for a correct answer; 0 missing answer; -0.3 points wrong answer [Only one answer is correct!]

1. Which of the following indices should be used for selecting the most appropriate material for a 'beam' (also termed 'bar') subjected to *bending*, without failure, **minimizing the embodied energy**, with the same applied bending moment?
   A: $\sigma_f/(H_m \cdot \rho)$ B: $\sigma_f^{1/2}/(H_m \cdot \rho)$ C: $\sigma_f^{1/3}/(H_m \cdot \rho)$ D: $\sigma_f^{2/3}/(H_m \cdot \rho)$

2. Which of the following materials provides the **highest stiffness at minimum embodied energy**, for a panel subjected to bending?
   A: soda glass B: stone C: carbon steel D: CFRP

3. Which of the following materials provides the **highest strength at minimum carbon footprint**, for a bar?
   A: Ti alloy B: lead alloy C: carbon steel D: Al alloy

4. Consider the trade-off graph in Fig.10.7 (p. 286, "Materials and Environment", M.F.Ashby, Edition 2); find the **right** statement:
   A: With the given exchange constant, Frigidaire REL 1405 and Beko TLDA521 are equivalent
   B: Solutions near the trade-off line are generally the best
   C: AEG 72390 would be convenient for a low exchange constant
   D: AEG S72398 has the lowest penalty

5. Which of the following solutions has the highest potential in reducing the mass for supporting the same load, at the same overhang?
   A: Bar with square cross-section
   B: Bar with circular cross-section
   C: truss
   D: I-beam

6. Choose the material with the highest relative energy credit from recycling:
   A: PET B: Aluminum C: Glass D: Lead

7. Which of the following disposal route does not provide an EoL credit in terms of carbon emission?
   A: Reuse
   B: Re-engineering
   C: Recycle
   D: Combustion for heat recovery

8. Which of the following phases provides the highest contribution in carbon emissions for a washing machine?
   A: Manufacturing
   B: Transportation
   C: Material
   D: Use

9. Choose the right statement:
   A: Disposable cups are more energy efficient than reusable cups for a limited number of reuse cycles
   B: Reuse is energy efficient only if the transportation phase has a limited impact
   C: Materials with a nominal carbon footprint (per kg) are always preferrable
   D: Energy and carbon emissions for electrically powered appliances are affected by the choice of materials and manufacturing processes