MSE-220 – Engineering Materials
Mid-Term Exam 2- Nov.,3rd , 2017

Student Name: Student Number:

1- Based on the spectrum of mechanical properties that apply to engineering materials, there are **five main groups** for mechanical properties. Name them. (Slide 8, Ch 4. Prt 1) **(10 score)**

Ans:

Strength
Formability
Stiffness
Toughness
Durability

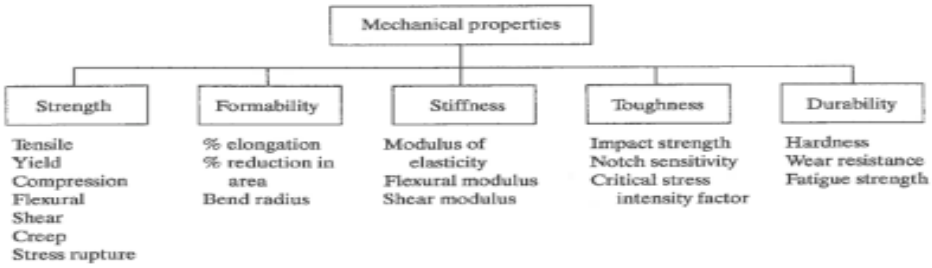


Figure 4-I The spectrum of mechanical properties that apply to engineering materials

2- What are the five basic type of stresses? . (Slide 10-11, Ch 4. Prt 1) **(5 score)**

Ans:

Tensile, Compression, Bending, Shear and Torsion

3- Name five important material properties that can be determined by a tensile test? (Slide 17 , Ch 4. Prt1) **(5 score)**

Ans:

- tensile strength
- yield strength
- modulus of elasticity
- % reduction in an area (RA)
- % elongation

4- What type of adhesive wear might be seen on an old working piston? (Q3-Ass#4) **(10 score)**

Ans:
Galling & Scoring/Scuffing

5- Name five main types of corrosion. (Slide 4 Ch6-prt 2) (Q9-Ass#5) **(5 score)**
Ans:
5 out of 7 types is needed.
Uniform, Pitting, Crevice, Galvanic, Stress corrosion cracking, Inter-granular attack, and Dealloying

6- What is the creep property of a material? (Slide 14 Ch4-prt 2) **(5 score)**
Ans:
This property is used to rate the resistance of a material to plastic deformation under sustained load.

7- **Fill in the blanks:**
Design stresses must be lower than …….. Strength of the material to ensure failure does not happen. (Slide 40 Ch4-prt 1) **(5 score)**
Ans:
Yield

8- Critical stress intensity factor (K_c) is a function of different parameters. Name four. (Slide 22 Ch4-prt 2) **(10 score)**
Ans:
It is a function of:

- the type of material
- the condition of heat treat,
- the microstructure,
- the residual stress conditions,

and on a more micro scale it can depend on:

- grain size,
- inclusion level,
- dislocation density,
- atomic bonds.

9- Name five factors that affect facture resistance. (Slide 25 Ch4-prt 2) **(10 score)**

Ans:

5 out of 7 types is needed.

Stress-strain curve
Impact strength
Fatigue strength
Notched tensile strength
Critical stress intensity factor
Stress rupture strength
Fracture toughness

10- What are the three types of polarization? (Slide 29 Ch6-prt 1) **(5 score)**

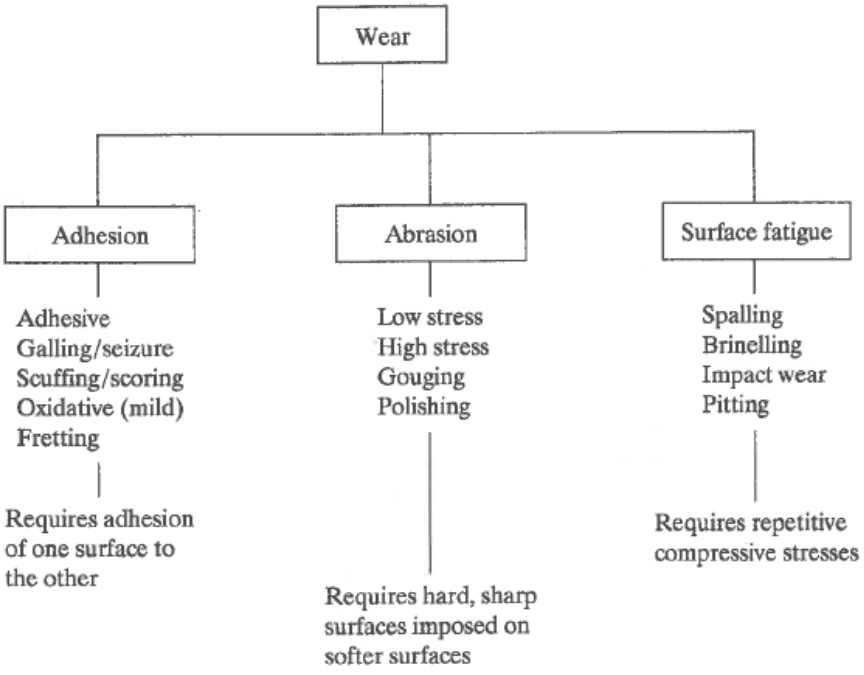
Ans:

Activation Polarization, Concentration Polarization, IR Drop

11- What are the main three types of wear? Just name them. (Slide 24 Ch5-prt 1) (10 score)

Ans:

Adhesion
Abrasion
Surface fatigue



12- Name 4 functions of lubricants. (Slide 5 -Ch5-prt 2) **(5 score)**

Ans:

Function of lubricants:
Friction reduction
Wear reduction during operation
Reduce operating temperatures
Minimizes corrosion of metal surfaces
Keep contaminants out of the system
Allow a machine to efficiently run at extreme temperatures

13- What are the metallurgical factors that can affect corrosion? (Slide 23 Ch6-prt 1) **(10 score)**

Ans:

Inclusion
Grain boundaries
Local cold work
Second phases
Local stresses
Precipitates

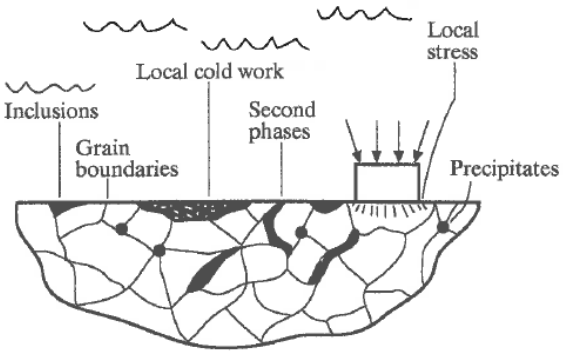


Figure 6–6
Metallurgical factors that can affect corrosion

14- What is pitting? (Q6, Ass#5) **(5 score)**

Ans:

Local corrosion damage characterized by surface cavities.