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NPTEL

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Courses » Surface Engineering for Corrosion and Wear Resistance Application

Announcements **Course** Ask a Question Progress FAQ

Unit 3 - Week 1 :

Register for
Certification exam

Course outline

How to access
the portal

Week 0 :

Week 1 :

- Lecture 01 :
Structure of
Solids
- Lecture 02 :
Microstructure
of Solids
- Lecture 03 :
Defects in
Crystalline
Solids
- Lecture 04 :
Surface and
Surface Energy
- Lecture 05 :
Surface
Properties-due
to mechanical
activation
- Lecture 06 :
Surface
dependent
physical and
chemical
property
- Lecture
Materials

Assignment 1

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2019-02-13, 23:59 IST.**

1) Crystalline and amorphous solids differ in **1 point**

- a. Number of atoms, ions and molecules
- b. Shape and size of units cells
- c. Periodicity of atoms, ions or molecules
- d. High and low melting temperatures

No, the answer is incorrect.

Score: 0

Accepted Answers:

c. Periodicity of atoms, ions or molecules

2) Metallic and ceramic materials differ because: **1 point**

- a. Metals are always elemental and ceramics are compounds
- b. Metals can conduct electricity but ceramics cannot
- c. Metals are always softer and ceramics are tougher
- d. Metals possess free electrons among cations but ceramics usually transfer or share electrons between neighbors

No, the answer is incorrect.

Score: 0

Accepted Answers:

d. Metals possess free electrons among cations but ceramics usually transfer or share electrons between neighbors

3) Polymers and metals differ in: **1 point**

- a. Type of bonding
- b. Melting temperature

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Week 3 :	4) Polymeric materials are attractive for engineering applications for the following combination of properties: 1 point
Week 4 :	<input type="radio"/> a. High creep and fatigue strength with low melting point
Week 5 :	<input type="radio"/> b. High strength with low density but high formability
Week 6 :	<input type="radio"/> c. High formability with very high corrosion and oxidation resistance
Week 7 :	<input type="radio"/> d. High electrical and thermal conductivity with good formability
Week 8 :	No, the answer is incorrect. Score: 0
Week 9 :	Accepted Answers: <i>b. High strength with low density but high formability</i>
Week 10 :	5) Ceramic compounds are attractive for engineering applications for the following combination of properties: 1 point
Week 11 :	<input type="radio"/> a. High tensile strength with good impact and fatigue toughness at room temperature
Week 12 :	<input type="radio"/> b. High magnetic permeability with very low coercivity and low melting point
Supplementary Lecture Slides	<input type="radio"/> c. High melting/liquidus temperature with high oxidation and corrosion resistance at elevated temperature
DOWNLOAD VIDEOS	<input type="radio"/> d. High electrical and thermal conductivity with high density
Solution	No, the answer is incorrect. Score: 0
Interaction Session	Accepted Answers: <i>c. High melting/liquidus temperature with high oxidation and corrosion resistance at elevated temperatur</i>
	6) Identify the only one incorrect statement from below: 1 point
	<input type="radio"/> a. Metals usually have fixed melting temperature and are crystalline
	<input type="radio"/> b. Semiconductors have small band gap which can be altered by doping
	<input type="radio"/> c. Ceramic compounds possess higher strength under compression than in tension
	<input type="radio"/> d. Polymeric materials possess low density, high formability and good electrical conductivity
	No, the answer is incorrect. Score: 0
	Accepted Answers: <i>d. Polymeric materials possess low density, high formability and good electrical conductivity</i>
	7) Non-primitive unit cells are characterized by: 1 point
	<input type="radio"/> a. More number of atoms/ions/molecules per unit cell
	<input type="radio"/> b. More than one lattice site and atom/ion/molecule per unit cell
	<input type="radio"/> c. Face centered cubic lattice
	<input type="radio"/> d. Greater lattice parameters
	No, the answer is incorrect. Score: 0
	Accepted Answers: <i>b. More than one lattice site and atom/ion/molecule per unit cell</i>
	8) 14 is the maximum possible number of: 1 point
	<input type="radio"/> a. Crystal systems
	<input type="radio"/> b. Crystal structure
	<input type="radio"/> c. Crystal lattices

d. Crystal defects

No, the answer is incorrect.

Score: 0

Accepted Answers:

c. Crystal lattices

9) Difference between hexagonal and hexagonal close packed structure lies in:

1 point

- a. Amorphous and crystallinity
- b. Shape and size of the unit cells
- c. Elemental and compound crystals
- d. Bravais lattice and crystal structure



No, the answer is incorrect.

Score: 0

Accepted Answers:

d. Bravais lattice and crystal structure

10) Atomic packing density of sodium chloride (FCC, B1) unit cell is:

1 point

- a. 74%
- b. 68%
- c. 52%
- d. None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

d. None of the above

11) Difference between interstitial and substitutional solutes arise from:

1 point

- a. Size ratio of solute to solvent atoms
- b. Number of solute atoms per unit cell
- c. Valence of atoms
- d. Electronegativity of atoms

No, the answer is incorrect.

Score: 0

Accepted Answers:

a. Size ratio of solute to solvent atoms

12) Which of the following consists of at least one dissimilar property in the group:

1 point

- a. Yield strength, resilience, impact toughness, scratch resistance.
- b. Permeability, coercivity, permeation, remanence
- c. Wavelength, amplitude, pitch, interference
- d. Oxidation corrosion, pitting, tarnishing

No, the answer is incorrect.

Score: 0

Accepted Answers:

b. Permeability, coercivity, permeation, remanence

13) A critical concentration of vacancy in a perfect crystal at a given temperature stabilizes the solid because: **1 point**

- a. Entropy increases
- b. Entropy decreases
- c. Enthalpy increases
- d. Diffusivity increases

No, the answer is incorrect.

Score: 0

Accepted Answers:

a. Entropy increases

14) A screw dislocation need not climb like an edge dislocation because when needed, it can: **1 point**

- a. Slide or glide
- b. Form a dislocation loop
- c. Get annihilated at a barrier
- d. Cross slip

No, the answer is incorrect.

Score: 0

Accepted Answers:

d. Cross slip

15) Annealing twins are likely to occur in metals with: **1 point**

- a. Low yield strength with high ductility
- b. High yield strength with low ductility
- c. High stacking fault energy
- d. Low stacking fault energy

No, the answer is incorrect.

Score: 0

Accepted Answers:

d. Low stacking fault energy

16) Identify the right combination of property and its unit: **1 point**

- a. Current – Volt
- b. Impact strength – MPa
- c. Permeability – Gauss
- d. Lattice parameter – nm

No, the answer is incorrect.

Score: 0

Accepted Answers:

d. Lattice parameter – nm

17) Surface energy arises due to: **1 point**

- a. Impurity segregation
- b. Crystallographic orientation
- c. Unsaturated bonds
- d. Higher coordination number

No, the answer is incorrect.

Score: 0

Accepted Answers:

c. Unsaturated bonds

18) Among the following, surface energy is highest for:

1 point

- a. Coherent precipitate-matrix interface
- b. Incoherent low angle boundary of a semiconductor
- c. Faceted [111] face of an ionic single crystal
- d. Solid-liquid interface of a metallic melt



No, the answer is incorrect.

Score: 0



Accepted Answers:

d. Solid-liquid interface of a metallic melt



19) High surface energy corresponds to

1 point

- a. Low wetting angle
- b. High wetting angle
- c. Good wettability
- d. High surface hardness



No, the answer is incorrect.

Score: 0

Accepted Answers:

a. Low wetting angle

20) Atomic force microscope is useful for determining

1 point

- a. Surface hardness
- b. Surface energy
- c. Surface topography
- d. Surface charge

No, the answer is incorrect.

Score: 0

Accepted Answers:

c. Surface topography

21) Grain boundaries in a polycrystalline microstructure appear relatively darker because

1 point

- a. Grain boundaries are stronger than grain body
- b. Grain boundaries possess higher energy than grain body
- c. Grain boundaries possess lower energy than grain body
- d. Grain boundaries possess higher diffusivity than grain body

No, the answer is incorrect.

Score: 0

Accepted Answers:

b. Grain boundaries possess higher energy than grain body

22) Frenkel defect refers to a:

1 point

- a. Point defects in ionic crystals
- b. Point defects in metallic crystals
- c. Point defects in covalent crystals
- d. Point defects in intermetallic compounds

No, the answer is incorrect.

Score: 0

Accepted Answers:

a. Point defects in ionic crystals

23) Number of phases that should coexist at the eutectic point of a ternary alloy is: **1 point**

- a. 4
- b. 3
- c. 1
- d. 2



No, the answer is incorrect.

Score: 0

Accepted Answers:

a. 4



24) Tungsten is routinely used as the filament material in electron microscope because it can easily emit electrons: **1 point**

- a. when irradiated with electrons
- b. when optical rays shine on it
- c. when electrical potential difference is applied
- d. when heated

No, the answer is incorrect.

Score: 0

Accepted Answers:

d. when heated

25) Corrosion of metals like iron at ambient condition is a spontaneous activity because: **1 point**

- a. Air contains oxygen and moisture
- b. Iron oxides/hydroxides possess lower Gibbs energy than pure iron
- c. Metals are inherently reactive
- d. Surface energy of metals is higher than ceramics

No, the answer is incorrect.

Score: 0

Accepted Answers:

b. Iron oxides/hydroxides possess lower Gibbs energy than pure iron

26) An oxide scale is likely to be adherent when Pilling-Bedworth ratio is: **1 point**

- a. < 1
- b. $= 0$
- c. ≥ 1
- d. $\gg 1$

No, the answer is incorrect.

Score: 0

Accepted Answers:

d. $\gg 1$

27) Identify the wrong (unrelated) combination of property and its cause: **1 point**

- a. Fatigue – alternating loading

- b. Conductivity – heating
- c. Diffraction – interference
- d. Corrosion – Galvanic action

No, the answer is incorrect.

Score: 0

Accepted Answers:

b. Conductivity – heating



28) Which of the following is not a surface dependent property:

1 point

- a. Hardness
- b. Roughness
- c. Toughness
- d. Tackiness



No, the answer is incorrect.

Score: 0

Accepted Answers:

c. Toughness

29) Select the odd set of surface dependent properties from the following:

1 point

- a. Color, adsorption, fatigue, adhesion
- b. Corrosion, catalysis, oxidation, reactivity
- c. Pitting/crevice/galvanic/stress-corrosion
- d. Wear, friction, hardness, erosion

No, the answer is incorrect.

Score: 0

Accepted Answers:

a. Color, adsorption, fatigue, adhesion

30) Which of the following properties cannot be derived from a stress-strain curve?

1 point

- a. Elastic modulus
- b. Fracture stress
- c. Creep strength
- d. Ductility

No, the answer is incorrect.

Score: 0

Accepted Answers:

c. Creep strength

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