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Roll Number : n140103
Branch : MM
College : RGUKT-Nuzvid
Exam : MM-High Temperature Materials (HTM) (14.10.2020)

Score : Under Review

1	In Ni-based super alloys, strengthening from Î³â€™ phase can be achieved by _____ ?
(A)	Increasing coherent strains
(B)	All options are correct
(C)	Increasing Anti Phase Boundary energy
(D)	Decreasing interparticle spacing
User Response	B correct
Marks Awarded	1

2	Not a major contributor of engineering ceramics.
(A)	ZrO2
(B)	SiC
(C)	SiO2
(D)	UO2
User Response	C correct
Marks Awarded	1

3	Which of the following deposition process has very less deposition on substrate?
(A)	PVD
(B)	Plasma assisted CVD
(C)	All options are correct
(D)	CVD

User Response	A correct
Marks Awarded	1

4	The significance of interphase in Ceramic matrix composites(CMCs)
(A)	To distinguish/ act as a boundary between the primary and secondary phases
(B)	To lower down the melting point of reinforcement phase
(C)	None of the remaining
(D)	To achieve bonding of primary and secondary phases
User Response	C *incorrect*
Marks Awarded	0

5	Strength of an alloy increases with
(A)	All options are correct
(B)	increase in misfit
(C)	decrease in misfit
(D)	zero misfit
User Response	B *incorrect*
Marks Awarded	0

6	_____ are used for applications at high temperature in oxidizing conditions?
(A)	Platinum-Rhodium alloys
(B)	Platinum-Iridium alloys
(C)	Platinum-Palladium alloys
(D)	Platinum-Ruthenium alloys
User Response	B *incorrect*
Marks Awarded	0

7	Intrusions & Extrusions are caused by _____?
(A)	None of the remaining
(B)	Random slip
(C)	Cyclic slip
(D)	Uni-directional slip
User Response	C correct
Marks Awarded	1

8	Which of the relationship is true?
(A)	Higher the melting temperature smaller is the elastic modulus
(B)	There is no relationship between the melting temperature and elastic modulus
(C)	Higher the melting temperature greater is the elastic modulus
(D)	Lower the melting temperature greater is the elastic modulus
User Response	C correct
Marks Awarded	1

9	Good combination of strength, ductility & toughness in Ti-alloys can be achieved when the microstructure consists of?
(A)	spherical precipitates of Î± in Î² matrix
(B)	spherical & acicular precipitates of Î² in Î± matrix
(C)	spherical precipitates of Î² in Î± matrix
(D)	spherical & acicular precipitates of Î± in Î² matrix
User Response	B *incorrect*
Marks Awarded	0

10	Which shape of precipitates results in high toughness?
(A)	Spherical
(B)	Plate
(C)	Acicular

(D)	Cubodial
User Response	C correct
Marks Awarded	1

11	Unit of thermal diffusivity is ?
(A)	kcal/m.hr^{o}C
(B)	m^{2}/hr
(C)	m^{2}/hr^{o}C
(D)	kcal/m^{2}hr
User Response	B correct
Marks Awarded	1

12	Which process offers longer tool life?
(A)	CVD
(B)	Both, PVD & CVD
(C)	None of the remaining
(D)	PVD
User Response	A correct
Marks Awarded	1

13	One of the characteristic properties of polymer material?
(A)	High elongation
(B)	Low hardness
(C)	High temperature stability
(D)	High mechanical strength
User Response	B *incorrect*
Marks Awarded	0

14	Which of the following plays a crucial role in the quality of coating?
(A)	Exposure time
(B)	Velocity of particles
(C)	All options are correct
(D)	Temperature
User Response	C correct
Marks Awarded	1

15	Which of the following doesnâ€™t have high resistance to creep?
(A)	Stainless steel
(B)	Refractory metals
(C)	Superalloys
(D)	Magnesium
User Response	C *incorrect*
Marks Awarded	0

16	Why High stresses are required for dislocations to overcome the obstacles?
User Response	dislocations often pileup on slip plains acts barriers that is grain boundaries. high stress concentration on the leading dislocations in the pileup if the pileup stress increases theoritical stress also increases
Marks Awarded	0

17	Which property can resist the crack propagation?
User Response	-
Marks Awarded	0

18	Which type of phases are advantageous in Ni-based super-alloys?

User Response	phases in Ni base alloys: gamma, gamma prime, gamma double prime, TCP. GAMMA: pure Ni matrix gamma prime: NI3AI gamma double prime: intermetallics, precipitates. gamma prime and gamma double prime are more advantageous because. Ni3Al increases strengthening of the alloys and gamma double prime improves solid solution strengthening and precipitates and secondary particles assists grain boundary segirigation.
Marks Awarded	0

19	The effect of oxygen dissolution is mainly on Ti and its alloys and not present on other metals/alloys?Why?
User Response	The effect of oxygen dissolution is mainly on Ti and its alloys not on other metals because of when O2 dissolves in TI and its alloys it forms TiO2 which is more stable oxide. so it acts as a barrier and not allowed any other impurities to diffuse into the metal. TiO2 is rutile structure. from 330 degree C to 885 degree C 30% of oxygen is dissolved into the metal. below 330 degree C oxide layer forms with no oxygen dissolution. in alpha phase more oxygen dissolution takes place among all phases.
Marks Awarded	0

20	Write a short note on the kinetics of Chromium?
User Response	kinetics of Chromium: Cr and p-type element and it has the properties nearer to super alloys. it has high strength and corrosion resistance. Cr is only using as alloying elements not as base metal. Cr2o3 is a stable oxide. when Cr3+ ions heated at 900 degree C it forms Cr6+ ions which are very volatile in nature and evoparate from the alloy. Cr is defect free structure in nature so diffusion only takes place at grain boundaries rather than lattice diffusion. so oxide formation is very less. Cr operated at atmosphere, it reacts with C,N it firstly forms nitride and then oxide. so Cr2O3 acts as a barrier to protect the metal from diffusion. Cr satisfies parabolic law up to 900 degree C
Marks Awarded	0

21	Does the beta Ti alloys used at high temperature applications and why?
User Response	the beta Ti alloys are not used at high temperature application because beta phase has low strength and at high temperature applications phase transformation is not favorable. above 885 degree C Ti changes from alpha to beta phase. then materials will leads to catastropic failure. that's why beta phase Ti alloys are not used at high temperature applications.
Marks Awarded	0

22	What happens when an oxide layer is formed on a material at high temperature?
User Response	when an oxide layer is formed on metal surface at high temperatures it acts as a barrier only when it iis a stable oxide. if it is not a stable oxide diffusion rate is increases material gets degraded and failure takes place ex: stables oxides like TiO2, NiO, Cr2O3 are protects the surface from both inward and outward diffusion. 2, oxide layers like FeO are more dangerous.
Marks Awarded	0

23	Write in brief how DBTT can be studied by toughness vs temperature curve?
User Response	-
Marks Awarded	0

24	Write in brief how the fatigue life shortened at high temperatures?
User Response	-
Marks Awarded	0

25	What is grain boundary allotriomorph?
User Response	-
Marks Awarded	0

26	Which of the following is the stable oxide in Ti at high temperatures
(A)	Ti_2O
(B)	TiO_2
(C)	Ti_3O_5
(D)	TiO
User Response	B correct
Marks Awarded	1

27	Which of the following are prone to sulphidation
(A)	Gas turbines
(B)	Power plants
(C)	Refineries
(D)	Incinerators
User Response	B correct
Marks Awarded	1

28	Which of the following factors contribute to a brittle â€“ cleavage type of fracture?
(A)	All options are correct
(B)	High temperature
(C)	Low strain rate
(D)	Rapid rate of loading
User Response	A *incorrect*
Marks Awarded	0

29	In Ni base upper alloys which of the following elements will cause Grain boundary segregation?
(A)	Cr, Y, Th
(B)	Al, Ti, Nb
(C)	B, C, Zr

(D)	Cr, Al, Nb
User Response	C correct
Marks Awarded	1

30	Which of the following elements when added to Ni can resist creep
(A)	Cr
(B)	Ti
(C)	Zr
(D)	Co
User Response	B correct
Marks Awarded	1

31	In short circuit diffusion, short circuit path is through
(A)	Grains and cracks
(B)	Grain boundaries and cracks
(C)	All options are correct
(D)	Grain boundaries and grains
User Response	B correct
Marks Awarded	1

32	The condition where failure occurs by one application/half cycle of thermal stress is called
(A)	None of the remaining
(B)	Thermal fatigue
(C)	Thermal shock
(D)	Corrosion fatigue
User Response	B *incorrect*
Marks Awarded	0

33	Upto the critical radius of insulation_____?
(A)	Convective heat loss will be less than conductive heat loss
(B)	Heat flux will decrease
(C)	Added insulation will increase heat loss
(D)	Added insulation will decrease heat loss
User Response	B *incorrect*
Marks Awarded	0

34	Good combination of strength, ductility & toughness in Ti-alloys can be achieved when the microstructure consists of?
(A)	spherical precipitates of Î± in Î² matrix
(B)	spherical & acicular precipitates of Î² in Î± matrix
(C)	spherical precipitates of Î² in Î± matrix
(D)	spherical & acicular precipitates of Î± in Î² matrix
User Response	B *incorrect*
Marks Awarded	0

35	Stress-corrosion occurs due to
(A)	tensile stress
(B)	compressive stress
(C)	combined action of tensile stress and corrosive environment
(D)	shear stress
User Response	C correct
Marks Awarded	1

36	Unit of thermal diffusivity is ?
(A)	kcal/m.hr^{o}C
(B)	m^2/hr
(C)	m^2/hr^{o}C

(D)	kcal/m^2hr
User Response	B correct
Marks Awarded	1

37	Which phase in Ti alloys is preferable at elevated temperatures
(A)	beta
(B)	alpha
(C)	All options are correct
(D)	gamma
User Response	B correct
Marks Awarded	1

38	In which of the alloys melting point is higher?
(A)	Ni base
(B)	Al base
(C)	Fe base
(D)	Co base
User Response	C *incorrect*
Marks Awarded	0

39	Which of the following is a slow rise of plastic deformation under the action of shear stresses when it is below the yield strength of the material?
(A)	Fatigue
(B)	Brittle fracture
(C)	Ductile fracture
(D)	Creep
User Response	C *incorrect*
Marks Awarded	0

40	Yield point in metallic materials under normal circumstances occurs due to
(A)	Interaction of dislocation with inclusions
(B)	Interaction of dislocation with interstitials
(C)	Interaction of dislocation with substitutionals
(D)	Cross slipping
User Response	B correct
Marks Awarded	1

41	During oxidation, the ratio of parabolic rate constant of Ni at 500 Â°C and 1000 Â°C is
(A)	1:1
(B)	1:2
(C)	1:3
(D)	1:4
User Response	B correct
Marks Awarded	1

42	Which of the following creep mechanism comes under power-law break down region?
(A)	Nabarro-Herring creep
(B)	Coble creep
(C)	Dislocation glide

(D)	Dislocation creep
User Response	B *incorrect*
Marks Awarded	0

43	Strain hardening occurs because of ?
(A)	Grain boundary strengthening
(B)	Solid solution strengthening
(C)	Dislocation interaction
(D)	Yield point phenomena
User Response	C correct
Marks Awarded	1

44	Logarithmic kinetics are followed by every metal at
(A)	High temperature and high rate of reaction
(B)	Low temperature and high rate of reaction
(C)	Low temperature and high pressure
(D)	High temperature and high pressure
User Response	C correct
Marks Awarded	1

45	If a process is chemical reaction controlled, it means?
(A)	external mass transfer is slow
(B)	diffusion is fast
(C)	chemical reaction is fast
(D)	chemical reaction is slow
User Response	A *incorrect*
Marks Awarded	0

46	If applied stress is less than CRSS which one will be true?
(A)	There will be slipping
(B)	There will no slipping but can have plastic deformation
(C)	Both, There will be slipping & There will no slipping but can have plastic deformation
(D)	None of the remaining
User Response	B correct
Marks Awarded	1

47	Young modulus of elasticity is the _____?
(A)	Slope of initial linear portion of stress strain curve
(B)	Slope of plastic region in stress strain curve
(C)	Ratio of strain to stress
(D)	Ratio of strain to elasticity
User Response	C *incorrect*
Marks Awarded	0

48	In Ti-Alloys, DO19 type of crystals forms when _____?
(A)	Î±-equivalent = 9
(B)	Doesnâ€™t depend on Î±-equivalent
(C)	Î±-equivalent > 9
(D)	Î±-equivalent < 9
User Response	B *incorrect*
Marks Awarded	0

49	Which of the following Al-alloy have good fluidity?
(A)	Al-Zn
(B)	Al-Si
(C)	Al-Li

(D)	Al-Cu
User Response	B correct
Marks Awarded	1

50	Which of the following is dislocation movement creep
(A)	Secondary creep
(B)	Tertiary creep
(C)	Initial creep
(D)	Primary creep
User Response	A correct
Marks Awarded	1

51	Molybdenum help increase creep resistance of steels at elevated temps by forming _____?
(A)	Molybdenum Nitrides
(B)	Mo-precipitates at grain boundaries
(C)	Molybdenum carbides
(D)	All options are correct
User Response	D *incorrect*
Marks Awarded	0

52	Diffusion coefficient depends on
(A)	All options are correct
(B)	Atomic weight
(C)	Atomic distances
(D)	Atomic fraction
User Response	C correct
Marks Awarded	1

53	Which of the following is measured in terms of s-1?
(A)	Strain rate
(B)	Both, Creep rate & Strain rate
(C)	None of the remaining
(D)	Creep rate
User Response	D *incorrect*
Marks Awarded	0

54	Ternary stage of creep is associated with _____.
(A)	None of the remaining
(B)	Strain hardening
(C)	Recovery
(D)	Necking
User Response	D correct
Marks Awarded	1

55	Which super alloys are preferred (load controlled and strain controlled) for high temperature testing at 600^0C ?
(A)	Ti based super alloys
(B)	Ni based super alloys
(C)	Fe based super alloys
(D)	Co based super alloys
User Response	B correct
Marks Awarded	1

56	Higher stresses required for dislocations to overcome the obstacles depends on
(A)	antiphase boundary
(B)	All options are correct
(C)	particle size

(D)	volume fraction
User Response	A *incorrect*
Marks Awarded	0

57	The strength of the polymer increases with _____ in molecular weight ?
(A)	Increase
(B)	Decreases
(C)	No change
(D)	Slightly decrease
User Response	A correct
Marks Awarded	1

58	Which of the following is the difficult mechanism in diffusion of solids?
(A)	Vacancy mechanism
(B)	Ring mechanism
(C)	Interstitial mechanism
(D)	All options are correct
User Response	B correct
Marks Awarded	1

59	The equilibrium phase in Al-Ti alloy is _____?
(A)	AlTi with BCC structure
(B)	$AlTi_3$ with HCP structure
(C)	Al3Ti with D022 structure
(D)	Al_3Ti with L12 structure
User Response	B *incorrect*
Marks Awarded	0

60	Thermally activated or assisted processes are the reason behind which of the following phenomena?
(A)	Creep
(B)	Fatigue (in isothermal condition at room temperature)
(C)	Corrosion
(D)	Strain hardening at room temperature
User Response	B *incorrect*
Marks Awarded	0

61	The fatigue strength of mild steel is ?
(A)	More than its tensile strength
(B)	Equal to its yield strength
(C)	Lower than its yield strength
(D)	Equal to its tensile strength
User Response	C correct
Marks Awarded	1

62	Fatigue life a material depends on?
(A)	Grain size
(B)	Surface finish
(C)	Oxidation
(D)	All options are correct
User Response	D correct
Marks Awarded	1

63	Which of the following process is used in corrosion resistance applications?
(A)	Plasma spray
(B)	Cold spray
(C)	Detonation spray

(D)	Arc spray
User Response	D correct
Marks Awarded	1

64	Which of the following creep mechanism describes the creep process which involves atomic diffusion along the grain boundaries?
(A)	Dislocation glide
(B)	Dislocation creep
(C)	Nobarro-Herring creep
(D)	Coble creep
User Response	D correct
Marks Awarded	1

65	Ellingham diagram gives us the information about
(A)	Partial pressure of oxygen
(B)	Free energy
(C)	Temperature
(D)	All options are correct
User Response	D correct
Marks Awarded	1

66	Ti_3Al compound is having _____.
(A)	Poor formability
(B)	Good formability
(C)	Good castability
(D)	Poor castability
User Response	A correct
Marks Awarded	1

67	The ability of a material to resist softening at high temperature is known as
(A)	Fatigue
(B)	Creep
(C)	Hot tempering
(D)	Hot hardness
User Response	D correct
Marks Awarded	1

68	Which of the following deposition process has very less deposition on substrate?
(A)	PVD
(B)	Plasma assisted CVD
(C)	All options are correct
(D)	CVD
User Response	A correct
Marks Awarded	1

69	For low carbon steels, skin-pass rolling will be carried out?
(A)	To increase yield strength
(B)	To increase ductility
(C)	To avoid yield point phenomenon

(D)	All options are correct
User Response	D *incorrect*
Marks Awarded	0

70	Gold and Nickel plates are placed together and heat treated. Suppose gold diffuses faster than nickel, the boundary shift towards
(A)	Gold
(B)	Both gold & nickel Rhombus
(C)	No shift in the boundary
(D)	Nickel
User Response	A correct
Marks Awarded	1

71	What is the nature of the curve of a viscous creep?
(A)	Straight line passing through an origin
(B)	Circle
(C)	Parabola
(D)	Hyperbola
User Response	A correct
Marks Awarded	1

72	The structures of CoO and Co_3O_4 are
(A)	NaCl type and Spinel structure
(B)	Spinel and NaCl type structure
(C)	NaCl type and hexagonal structure
(D)	Hexagonal and NaCl type structure
User Response	A correct
Marks Awarded	1

73	The negative sign in Fickâ€™s first law represents
(A)	Change in jump frequency
(B)	Change in concentration
(C)	Change in flux
(D)	Change in distance
User Response	B correct
Marks Awarded	1