

PART-A

Questions 1-10: Choose the most grammatically correct and meaningful option from those provided at the end of each sentence :

1.	1. One who is incapable of committing a mistake is called						
	A) sure	B) certain	C) definite	D) infallible			
2.	The opposite of 'curi	ous' is					
	A) calm	B) indifferent	C) undemanding	D) provoked			
3.	Their entire future	on the re	esult of this examina	ation.			
	A) depends	B) depending	C) resolved	D) revolving			
4.	We haven't had	rest all	of this week.				
	A) many	B) some	C) any	D) no			
5.	This seems to be the	ques	stion to answer right	now.			
	A) hardly	B) hardest	C) very hard	D) harder			
6.	If I	the decision-maker, th	nings would have be	en much easier.			
	A) had been	B) were	C) was	D) am			
7.	Everyone was in time	e for the show,	?				
	A) wasn't he	B) isn't it	C) weren't they	D) were they			
8.	He has	all that he had in	this gamble.				
	A) lossed	B) loosed	C) losed	D) lost			
9.	We should refrain	overea	ting.				
	A) from	B) to	C) in doing	D) over			
10.	ar	e we waiting for ?					
	A) W/by	R) When	C) What	D) How			



11.	The highest rank in Ir	ndian Air Force is			
	A) Air Chief Marsha	ıl	B)	Air Marshal	
	C) Air Vice-Marshal	l	D)	Air Commande	r
12.	Who was the first wor	men to win the Jnanpith	Awa	ard?	
	A) Mahadevi Varma		B)	Subhadra Kuma	nr Chouhan
	C) Amrita Pritam		D)	Ashapurna Devi	i
13.	Yuri Gagarin was a				
	A) Nuclear Scientist	i.	B)	Musician	
	C) Playcont		D)	Cosmonaut	
14.	'People's Daily' is an	important newspaper o	f		
	A) China	B) Russia	C)	Egypt	D) Indonesia
15.	Find the next term of	the series POQ, SRT, V	'UW	7	
	A) XYX	B) XZY	C)	ZYX	D) YXZ
16.	Which of the following	ng States has banned the	e sla	ughter of camels	s ?
	A) Gujarat	B) Punjab	C)	Haryana	D) Rajasthan
17.	The first woman Judg	ge of the Supreme Court	of I	ndia was	
	A) Leela Seth		B)	Cornelia Sorab	jee
	C) Omna Kunjamma	ı	D)	M. Fathima Bee	evi
18.	and covered 8 km; the	to the West and turned ren she turned back and to far is she from the starti	ave	lled 11 km, finall	
	A) 2 km	B) 6 km		10 km	D) 15 km
19.	The is	an instrument used to r	neas	sure distance trav	velled on foot.
	A) Phorometer			Pedometer	
	C) Micrometer		D)	Pachymeter	



20.	D. In a row of 21 girls, when Monika was shifted by four places towards the right, she became 12 th from the left end. What was her earlier position from the right end of the row?							
	A) 9 th		B) 10 th					
			,	.1				
	C) 12 th		D) None of	these				
21.	Micheal Corleone is a	a character from the bo	ok					
	A) For Whom the Be	ells Toll	B) Lord of t	he Rings				
	C) Love Story		D) Godfathe	er				
22.	Who amongst the foll	owing are associated w	th communis	m ?				
	(i) Karl Marx							
	(ii) Ayn Sue-Khi							
	(iii) Ayn Rend							
	(iv) MaoTseTung							
	The correct answer is							
	A) only (i)		B) (i) and (i	ii)				
	C) (i) and (iv)		D) only (iv)					
23.	In covering a distance	of 30 km, Abhay takes 2	hours more th	an Sameer. If Abhay doubles				
	his speed, then he wou	uld take 1 hour less that	n Sameer. Abh	ay's speed is				
	A) 5 kmph		B) 6 kmph					
	C) 6.25 kmph		D) 7.5 kmpł	ı				
24.	The dog breed "Pug"	is associated with the a	dvertisement o	of				
	A) Airtel	B) Vodafone	C) Aircel	D) BSNL				
25.	"Anokhi" is a brand as	ssociated with						
	A) Hand Block Prin	ts	B) Pottery					
	C) Antique Furniture	,	D) Organic	Food				



PART-B

26.	6. The atomic radius of an atom in a BCC crystal (if a is lattice parameter) is							
	A) a	B) a/	2			C)	$a/(4/\sqrt{3})$	D) $a/(4/\sqrt{2})$
27.	Schottky-defect in ce	ramic 1	mate	erial is				
	A) Interstitial impuri	ty				B)	Vacancy- inters	stitial pair of cations
	C) Pair of nearby cation	on and	anio	n vacanci	ies	D)	Substitutional i	mpurity
28.	Electron sea exists in							
	A) Polar bond	B) Io	nic	bond		C)	Covalent bond	D) Metallic bond
29.	Particles that mostly	affect t	he 1	naterials	prop	ert	ies	
	A) Protons	B) V	alen	ce electro	ons	C)	Neutrons	D) Electrons
30.	A metal crystallizes with The diameter of the m				ubic	latti	ice. The edge of	the unit cell is 408 pm.
	A) 144 pm	B) 28	88 p	m		C)	204 pm	D) 408 pm
31.	Solvents of covalent of	ompou	ınds	include a	all bu	ıt		
	A) Water					B)	Alcohol	
	C) Tetra chlorometha	ane				D)	Petrol	
32.	Which of the following	ng state	eme	nt is inco	rrect	t ?		
	A) The coordination						•	
	B) A metal that cryst							-
	C) A unit cell of an i		•					
	D) The length of unit							
33.	If A > B means the rad comparisons is INCO			greater tha	an th	e ra	dius of B, then v	vhich of the following
	A) $C > C^+$	B) K	+>C	21-		C)	As > S	D) S > O
34.	Use the information b	elow t	o ca	lculate th	ne lat	ttice	e energy for CsC	Cl
	$Cs(g) \rightarrow Cs^{+}(g) + e^{-}$		H=	386 kJ				
	$Cs(s) \rightarrow Cs(g)$		H=	72 k J				
	$Cl_2(g) \rightarrow 2Cl(g)$		H=	236 k J				
	$Cl(g) + e^{-} \rightarrow Cl^{-}(g)$		H=	-342 k J				
	$Cs(s)+1/2Cl_2(g) \rightarrow Cs(g)$	Cl(s)	H=	-426 k J				

A) $\Delta H = +680 \text{kJ}$ B) $\Delta H = +660 \text{kJ}$ C) $\Delta H = -660 \text{kJ}$ D) $\Delta H = -680 \text{kJ}$



35.	The lattice energy is i	nversely proportional t	o sum of the radii of	fthe
	A) Cation	B) Anion	C) Both A) and B)	D) None of these
36.	Not a Hume-Ruthery	condition		
	A) Crystal structure	of each element of soli	d solution must be t	he same
	B) Size of atoms of e	each two elements mus	t not differ by more	than 15%
	C) Elements should to	form compounds with e	each other	
	D) Elements should h	nave the same valence		
37.	In phase diagram studi	ies the overall phase trai	nsformation rate char	nges with temperature
	A) Monotonically de	ecreases with temperatu	ire	
	B) First increases, th	en decreases		
	C) Initially it is slow,	and then picks-up		
	D) Monotonically in	creases with temperatu	re	
38.	During homogeneous in rate of under-coolin	s nucleation, critical siz ng.	e of a particle	with increase
	A) Increases	B) Decreases	C) Won't Change	D) Not related
39.	Not a typical site for r	nucleation during solid	state transformation	1
	A) Container wall		B) Grain boundari	es
	C) Stacking faults		D) Dislocations	
40.	The boundary line bet	ween (liquid+solid) an	d (solid) regions mu	st be part of
	A) Solvus	B) Solidus	C) Liquidus	D) Tie-line
41.	Which atomic orbital	is described by the qua	ntum numbers n = 4	$l, l = 1, m_l = 0$?
	A) 4s	B) 4p	C) 4d	D) 4f
42.	The Wt.% of carbon i	n mild steels		
	A) <0.008	B) 0.008 – 0.3	C) $0.3 - 0.8$	D) 0.8 – 2.11
43.	Both nucleation and g	rowth require change i	n free energy to be	
	A) Negative	B) Zero	C) Positive	D) Any
44.	In crystal lattice ions	are arranged in		
	A) One dimensions		B) Two dimension	S
	C) Three dimensions	S	D) Four dimension	ns



45. The plane (1–11)	is parallel to		
A) (-11-1)	B) (-1-11)	C) (111)	D) (1–11)

- 46. The Bragg formulation of X-ray scattering is defined in terms of scattering from ______, whereas the Von Laue formulation is defined in terms of scattering from
 - A) Planes of lattice; Points of the lattice
 - B) Points of lattice; Planes of the lattice
 - C) Points of lattice; Planes of the reciprocal lattice
 - D) Points of reciprocal lattice; Planes of the lattice
- 47. The geometrical structure factor
 - A) Expresses the extent to which waves scattered from different types of ions within the basis interfere destructively
 - B) Expresses the extent to which waves scattered from different types of ions within the basis interfere constructively
 - C) Expresses the extent to which waves scattered from identical ions within the basis affects the Braggs peak intensity
 - D) Has nothing to do with Braggs peak intensity
- 48. Bloch's theorem
 - A) Cannot be proven conclusively
 - B) Says that the eigenstates of the Hamiltonian in the case of periodic potential can be written as a product of a plane wave and a function with the periodicity of the reciprocal lattice
 - C) Says that the eigenstates of the Hamiltonian in the case of periodic potential can be written as a product of a plane wave and a function with the periodicity of the Bravias lattice
 - D) Introduces a wave vector k which is proportional to the electronic momentum
- 49. In tight binding method,
 - A) The periodic-wave function solutions are not Bloch wave-functions
 - B) Energy bandwidth is not proportional to an overlap integral
 - C) The eigen energy solutions are independent of k
 - D) The starting point for the periodic wave function solutions are localized atomic orbital wave functions

50. Nose of a isothermal transformation diagram (C-curve) represents

A) Shortest time required for specified fraction of transformation



	B) Longest time required for specified fraction of transformation.								
	C) Average time required for specified fraction of transformation.								
	D) No information regarding time required for specified fraction of transformation.								
51.	If the Miller indices of t	wo planes are (211)	and (422), then they	are					
A) Parallel B) Perpendicular									
	C) At an angle of 45°		D) None of these						
52.	Which of the following	is the adiabatic proc	ess?						
	A) $\Delta U = 0$	$\mathbf{W} = 0$	C) $Q = 0$	D) $\Delta V = 0$					
53.	3. According to kinetic theory of gases, the absolute zero temperature is attained when A) Volume of gas is Zero B) Pressure of gas is Zero C) Kinetic energy of the molecule is Zero D) Specific heat of the gas is Zero								
54.	Intensive property of a s	ystem is whose valu	e						
	A) Depends on the mas	ss of the system, like	volume						
	B) Does not depend on	the mass of the syst	em, like temperatur	e, pressure etc.					
	C) Does not dependent	on the path followe	d but on the state						
	D) Depends on the path	n followed and not or	n the state						
55.	Work done is zero for the	ne following process	i.						
	A) Constant Volume		B) Free expansion	l					
	C) Throttling		D) All the above						
56.	The process of heat tran		t to another because	of molecular motion					
	A) Convection		B) Conduction						
	C) Radiation		D) Induction						
57.	A container with rigid w of the gas is doubled. W			absolute temperature					
	A) Doubles		B) Quadruples						
	C) Triples		D) Decreased to o	ne-half					

58.	In a single-component of phases that can co-	condensed system, if de exist	gree of freedom is ze	ero, maximum number				
	A) 0	B) 1	C) 2	D) 3				
59.	An invariant reaction	that produces a solid up	on cooling two liqu	uids				
	A) Eutectic	B) Peritectic	C) Monotectic	D) Syntectic				
60.	Phase formed of diffu	ision-less reaction						
	A) Pearlite	B) Lower Bainite	C) Upper bainite	D) Martensite				
61.	 Sum of these is unity A) Reflectivity + Transmitivity B) Reflectivity + Refractivity C) Reflectivity + Refractivity + Transmitivity 							
62	D) Refractivity +Tra	se the sun light is subject	etad to					
02.	A) Rayleigh scatterinC) Both		B) Compton scattering D) None					
63.	Detrimental property	of a material for shock	load applications					
	A) High density		B) Low toughness					
	C) High strength		D) Low hardness					
64.	 A) Photons emitted while excited electrons drops down B) Knocking out of electrons by photons C) Photons stimulated by photons D) All 							
65.	Pyrometer works base	ed on						
	A) Laser technology		B) Photo-conduct	ion				
	C) Thermal emission	l	D) Tyndall effect					
66.	 6. Refractive index of materials is approximately equal to square root of A) electrical permittivity B) magnetic permeability C) electrical permittivity x magnetic permeability 							
	D) none							

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67. Magnetic susceptibility of para-magnetic materials in the order of



	A) $+10^{-5}$	B) -10^{-5}	C) 10^5	D) 10^{-5} to 10^{-2}			
68.	Typical size of magne	etic domains	_ (mm).				
	A) 1–10	B) 0.1–1	C) 0.05	D) 0.001			
69.	Typical thickness of E	Bloch walls	(nm).				
	A) 0.1–1	B) 1–10	C) 10–50	D) 100			
70.	Example for magnetic	e material used in data s	storage devices				
	A) 45 Permalloy	B) CrO ₂	C) Cunife	D) Alnico			
	 In a magnetic materials hysteresis loss takes place primarily due to A) Rapid reversal of its magnetism B) Flux density lagging behinds its magnetizing force C) Molecular friction D) Its high retentivity Hard steel is suitable for making permanent magnets because A) It has good residual magnetism B) Its hysteresis loss has large area 						
	D) Its mechanical stre	ength is low					
73.	Reciprocal of reluctar	nce is					
	A) Reluctivity		B) Permeance				
	C) Permeability		D) Susceptibility				
74.	Relative Magnetic Per	rmeability (μ_r) =					
	A) 1 – χ	B) χ-1	C) χ-H	D) 1 + χ			
75.	The quantity of magnetizing force is c A) Leftover magnetis		nagnetic material aft B) Hysteresis	ter withdrawal of the			
	C) Residual magnetis		D) Coercivity				



76. Bauschinger effect can be considered as

	A) Hysteresis loss during loading and unloading							
	B) Anelastic deformation							
	C) Dependence of yield stress on path and direction							
	D)	None of these						
77.	Sha	pe of true stress-str	rain curve for a materia	al dep	ends on			
	A)	Strain	B) Strain rate	C) 1	Temperature -	D)	All	
78.	Acc	cording to distortion	n-energy criterion, yiel	lding	occurs when			
	A)	Distortion energy	reaches a critical value	e				
	B)	Second invariant of	of the stress deviator ex	ceed	ed some critica	l val	lue	
	C)	Octahedral shear s	stress reaches a critical	value	e			
	D)	All the above						
79.	Eng	gineering stress-stra	ain curve and true stres	ss-stra	in curve are eq	ualı	up to	
	A)	Proportional limit		B) E	Elastic limit			
	C)	Yield point		D) 1	Tensile strength	ı poi	nt	
80.	Wh	at is the effect to al	uminum with copper a	ıs allo	ying element?	1		
	A)	Increase strength u	ıp to about 12%					
	B)	Reduces shrinkage	2					
	C)	Improves machina	bility					
	D)	Increases fluidity i	in casting					
81.	Nar	noscience can be st	udied with the help of					
	A)	Quantum mechani	cs	B) Newtonian mechanics				
	C)	Macro-dynamics		D) (Geophysics			
82.	Wh	ich of the following	g is monosaccharides ?	?				
	A)	Glucose	B) Lactose	C) (Cellulose	D)	Maltose	
83.	Hal	l-petch equation is	relation of yield streng	gth to				
	A)	Grain Size	B) Volume	C) F	Fatigue	D)	Surface area	
84.	Cre	vice corrosion occ	urs due to					
	A)	Oxygen deficiency	<i>I</i>	B) F	Residual stress			
	C)	Low Melting point	t	D) A	Alloy formation	1		



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os.	Burger ³	0	VCC LO	L U	narac	ICIIZCS
	. 0					

A) Dislocation lines

B) Space

C) Fracture

D) Hardness

86. Why is potential energy of electron is taken as zero in free electron theory?

A) e is free

B) e is independent

C) neither A) nor B)

D) there is no e-e and e-ion interaction

87. Pitting is related to

A) Fabrication of device

B) Form of corrosion

C) Swelling in polymer

D) Thin film formation

88. Time dependent elastic behavior is known as

- A) Plasticity
- B) Super- elasticity
- C) Anelasticity
- D) Super plasticity

89. Czochralski model is a

- A) Crystal growth technique
- B) Welding technique

C) Forging technique

D) X-ray analysis technique

90. The electronic polarizability αe of a mono atomic gas atom where R is the radius of circular orbit is

- A) $4\pi \in 0$
- B) $4\pi \in {}_{0}R$
- C) $4\pi \in {}_{0}R^{3}$ D) $4\pi \in {}_{0}R^{2}$

91. The half cell reaction, with its standard reduction potentials are

i)
$$Pb^{2+} + 2e^- \rightarrow Pb (E^\circ = -0.13 \text{ V})$$

ii)
$$Ag^+ + e^- \rightarrow Ag (E^\circ = +0.80 \text{ V})$$

Which of the following reactions will occur?

- A) $Pb^{2+} + 2Ag \rightarrow 2Ag^{+} + Pb$
- C) $2H^+ + 2Ag \rightarrow 2Ag^+ + H_2$
- B) $Pb^{2+} + H_2 \rightarrow 2H^+ + Pb$ D) $2Ag^+ + Pb \rightarrow Pb^+ + 2Ag$

92. Which one of the followings forms micelles in aqueous solution above certain concentration?

- A) Dodecyl trimethyl ammonium chloride
- B) Glucose
- C) Urea
- D) Pyridinium chloride

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93.	For silicon doped with	n trivalent impurity			
	A) $n_e >> n_h$	B) $n_e > n_h$	C)	$n_h >> n_e$	D) $n_h > n_e$
94.	Metallic bond is not c	haracterized by			
	A) Ductility	B) High conductivity	C)	Directionality	D) Opacity
95.	Which of these is at the	ne nanoscale (between	1 -10	00 nm) ?	
	A) The head of a pin		B)	DNA	
	C) A red blood cell		D)	A hydrogen ato	m
96.	Which one of these st	atements is not true?			
	A) Silicon at the nan-	oscale is an insulator			
	B) Gold at the nanos	cale is red			
	C) Copper at the nan	oscale is transparent			
	D) Band gap increase	es with decrease in part	icle s	size	
97.	In how many dimension	on are quantum dot exc	itons	confined?	
	A) One	B) Two	C)	Three	D) Zero
98.	Fermi energy level fo	r p-type extrinsic semi	cond	uctors lies	
	A) At middle of the b	and gap	B)	Close to conduc	ction band
	C) Close to valence b	oand	D)	None	
99.	What does the effective	ve mass of a photon des	scrib	e ?	
	A) Photons only hav	e a rest mass of zero			
	B) It has mass-like p	roperties because photo	ons n	nove at the spee	ed of light
	C) Effective mass oc	curs because photons v	warp	the space-time	continuum
	D) Photons have no e	effective mass as they a	are m	assless	
100.	Which one of these for	orces dominate at the de	eep N	Nano scale level	? (10 nm or less)?
	A) Gravitational force	ee			
	B) Nuclear force				
	C) Van der Waals for	rce			
	D) Electromagnetic	force			



SPACE FOR ROUGH WORK