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No.	

Total No. of Pages: 20

P.G. Entrance Examination, May - 2023 M.Sc. PHYSICS Sub. Code: 58718

			Sub. Co	ode: 587]	18
•			nday, 08 - 05 - 2023 o 05.00 p.m.		Total Marks: 100
Inst	ructions:	1)	All questions are com	ipulsory.	
		2)	Each question carrie	s 1 mark.	
		3)	Answers should be darkening the approp		the given OMR answer sheet by
		4)	Follow the instruction	ons given on	OMR sheet.
		5)	Rough work shall be paper.	done on the	sheet provided at the end of question
Sel	ect corre	ect alt	ernative for the fol	lowing:	
1)		;	are the factors which	affect the	moment of inertia of a rotating
	system'	?			_
	A) M	ass an	d velocity	B)	Density and temperature
	C) Sh	ape ai	nd size	D)	Friction and air resistance
2)		_	Newton's First Law	, an object	at rest will remain at rest unless
	A) a f	force		B)	an acceleration
	C) aı	nass		D)	torque
3)			ntal force which ho		anets in their orbits around the
	A) ele	ectrom	agnetic	B)	electrostatic
	C) nu	clear		D)	gravitational

4)	A stretched wire is said to be	under torsion, if it is
	A) heavily loaded	B) twisted
	C) bent into an arc of a circ	e D) shortened
5)	The motion of a torsional pe	ndulum is
	A) uniform linear motion	B) accelerated linear motion
	C) angular S.H.M	D) linear S.H.M
6)	Del operator is a	differential operator.
	A) scalar	B) vector
	C) Scalar or vector	D) integral
7)	A force which can be express as	ed as gradient of a scalar potential are known
	A) scalar fields	B) vector fields
	C) lamellar fields	D) conservative fields
8)	Capacitance of a capacitor is is 50 volts then charge stored	$00 \mu F$ and potential difference between plates on each plate is
	A) 10 mC	B) 5mC
	C) 4mC	D) 15mC
9)	The point at which two or mo	ere than two branches meet is called
	A) node	B) mesh
	C) branch	D) loop

10)		ove temperature, the imagnetic.	ferr	omagnetic materials become
	A)	Curie	B)	Debye
	C)	Room	D)	Faraday
11)	An	adiabatic process occurs at constan	t	
	A)	temperature	B)	pressure
	C)	heat	D)	volume
12)	Whi	ich of the following is reversible pr	ocess	?
	A)	Carnot's heat engine	B)	Free expansion of gas
	C)	Heat conduction	D)	Rubbing of stones
13)		water, the coefficient of viscosity are at 10°C.	is o	ne third at °C of its
	A)	35	B)	50
	C)	60	D)	80
14)	In a	normal mode of oscillation the osc	cillati	ng parts have
	A)	same frequency	B)	same amplitude
	C)	same phase	D)	all the given
15)		average kinetic energy of electron argy of electron in metal at 0 °K.	at 0°	K is 6 eV, then calculate fermi
	A)	5eV	B)	10eV
	C)	15eV	D)	20eV

- **16**) The Clausius- Clapeyron equation gives _____.
 - A) change in melting or boiling point due to change in pressure
 - B) change in melting or boiling point due to change in volume
 - C) change in volume due to change in melting or boiling point
 - D) change in volume due to change in pressure
- 17) For a coaxial lens system, the relation between linear (m), axial (m_L) and angular (α) magnifications are given by _____.
 - A) $a\alpha.m=m_{L}$

B) $\alpha/m_{I}=m$

C) $\alpha.m_{L}=m$

- D) $\alpha/m = m_{T}$
- **18**) For an optical system the relation between focal length and refractive indices is given by _____.
 - A) $f_1 / f_2 = \mu_1 / \mu_2$

B) $f_1 / f_2 = -(\mu_1 / \mu_2)$

C) $f_2 / f_1 = \mu_1 / \mu_2$

- D) $f_1 f_2 = \mu_1 \mu_2$
- **19**) Mechanical equilibrium of thermodynamic system refers to the uniformity of _____.
 - A) pressure

B) volume

C) temperature

- D) entropy
- **20**) Poiseuille's equation for the coefficient of viscosity of liquid is _____.
 - A) $\eta = \frac{\pi V a^4}{8lP}$

B) $\eta = \frac{\pi P a^4}{8lV}$

C) $\eta = \frac{\pi VP}{8la^4}$

D) $\eta = \frac{8la^4}{\pi VP}$

- 21) In partial differential equation there exists _____ independent variables.
 - A) one

B) two

C) two or more

- D) four
- 22) The of power highest order derivative in the differential equation is called _____ of the differential equation.
 - A) order

B) degree

C) integer

- D) solution
- 23) Singular points are _____.
 - A) regular

B) irregular

C) both A) & B)

- D) rational
- 24) If both the functions P(x) and Q(x) of the differential equation $\frac{d^2y}{dx^2} + P(x)\frac{dy}{dx} + Q(x)y = 0$, are finite, then the point $x = x_0$ is said to be
 - A) ordinary point

- B) singular point
- C) regular singularity point
- D) irregular singularity point
- 25) Which of the following is called Laplace equation?

A)
$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 y}{\partial x^2} = \frac{\partial u}{\partial t}$$

B)
$$\frac{\partial^2 u}{\partial x^2} = C^2 \frac{\partial u}{\partial t}$$

C)
$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

D)
$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 v}{\partial x^2} = 0$$

26)	For	the differential equation $x^2(1-x)y$ " -	+ <i>xy</i> ′	+ y = 0, x = 1 is		
	A)	an ordinary point	B)	a regular singular point		
	C)	an irregular singular point	D)	both B & C		
27)	<i>x</i> +	<i>iy</i> is a				
	A)	cartesian form of complex number	•			
	B) polar form of complex number					
	C)	exponential form of complex num	ber			
	D)	linear form of complex number				
28)	If Z	$_{1} = 2 + i$ and $Z_{2} = 3 + 2i$, then $Z_{1}Z_{2}$	_ = _	·		
	A)	6+3i	B)	5+3i		
	C)	4+7i	D)	7+3i		
29)	The	value of $\beta(1, 2)$ is				
	A)	1	B)	2		
	C)	1/2	D)	1/4		
30)	erf(») =				
	A)	1	B)	0		
	C)	∞	D)	-1		
31)	The	total probability of the system		·		
	A)	changing	B)	increasing		
	C)	decreasing	D)	remains constant		

32)	A w	vide wave group clearly defines		·
	A)	energy	B)	position
	C)	wavelength	D)	none of these
33)		Eigen function sin 4x operated with en value of an operator	_	rator d ² /dx ² , then corresponding
	A)	-16	B)	64
	C)	16	D)	-64
34)	As j	per de Broglie hypothesis, linear m	omei	ntum (p) is
	A)	<i>ħ/</i> k	B)	$\hbar \mathrm{w}$
	C)	hk	D)	$\hbar \mathbf{k}$
35)	The	quantity $ \psi(x) ^2$ is called	•	
	A)	probability current	B)	probability current density
	C)	probability density	D)	entropy
36)	Ref	lection coefficient (R) and transmi	ssion	coefficient (T) are related by
	A)	R+T=0	B)	R=1/T
	C)	R+T=1	D)	R-T=1
37)	The	Eigen values of parity operator are	e	
	A)	0, +1	B)	0, - 1
	C)	+ 1, -1	D)	+ 1, + 2

38)		Which of the following are degenerate energy levels characterized by $n_x n_y n_z$) for a particle in a rigid box.		
	A)	(121)	B)	(113)
	C)	(221)	D)	all of these
39)	Iden	atify symmetric wave function from	opti	ons given below.
	A)	sin x	B)	4x
	C)	x	D)	\mathbf{X}^3
40)		o operators said to commute each o	other,	if their commutator bracket is
	A)	infinite	B)	one
	C)	zero	D)	two
41)	A co	onservative force is the one	•	
	A)	which never do work		
	B)	work done in a close path is zero		
	C)	work done is independent of the p	ath	
	D)	both B) and C)		
42)		ording to the principle of virtual wo	ork th	ne system will be equilibrium if
	A)	work done by force of constraints	is ze	ro
	B)	work done by an external force is	zero	
	C)	both A and B		
	D)	work done by an external force is	max	imum

43)		minimum distance between two pone earth (assuming the earth is sphere)		
	A)	straight line	B)	circular arc
	C)	parabola	D)	pyperbola
44)		iatomic molecule in a space can laber of coordinates.	be co	ompletely specified
	A)	three	B)	five
	C)	six	D)	3N
45)	As a	an object approaches the speed of l	ight,	its mass becomes
	A)	zero	B)	double
	C)	remains same	D)	infinite
46)		ording to the principle of invariance ald be exactly the same in all		
	A)	inertial	B)	non-inertial
	C)	rotating	D)	accelerated
47)	If a	n object reaches the speed of light,	its le	ength changes to
	A)	infinite	B)	double of the value
	C)	half of the value	D)	zero
48)		od of length 5m is moving at a spoendicular to the direction of motion		_
	A)	5 m	B)	4m
	C)	3m	D)	2m

49) Poisson's and Laplace's equations can be easily derived from ______. A) Coulomb's law B) Gauss law C) Ampere's law Faraday's law D) **50**) In free space, if $\rho = 0$, Poisson's equation becomes _____. A) Laplacian equation $\nabla^2 V = 0$ Kirchoff's voltage equation $\Sigma V = 0$ B) Maxwell's convergence equation $\nabla \cdot \overline{B} = 0$ C) D) Gauss law ∇ . $V = \rho v$ 51) Full adder is a logic circuit that can add _____ bits at a time. A) 2 B) 3 C) 4 D) 1 52) Which of the following is the statement of De-Morgan's first theorem? B) $\overline{A+B} = \overline{A} \cdot \overline{B}$ A) $\overline{A \cdot B} = \overline{A} + \overline{B}$ D) $\overline{\overline{A \cdot B}} = \overline{\overline{A}} - \overline{\overline{B}}$ C) $\overline{A-B} = \overline{A} \cdot \overline{B}$ 53) Boolean equation for two inputs (A and B) XNOR gate is _____. A) B)

 $A \oplus B \\$

D)

 $A \oplus B$

C) $\overline{A \cdot B}$

54)	In w	which configuration the transistor ar	nplifi	er give highest power gain?
	A)	СВ	B)	CE
	C)	CC	D)	both CE & CB
55)	Tan	k circuit produces oscill	ation	S.
	A)	damped	B)	undamped
	C)	sinusoidal	D)	square
56)	The	gain of the vertical amplifier in CI	RO ca	an be controlled by the
	A)	electron gun	B)	attenuator
	C)	aquadag	D)	phosphor
57)		ne wavelength is 8 divisions and c, then frequency of the wave will		
57)		c, then frequency of the wave will		
57)	mse A)	c, then frequency of the wave will	be _ B)	Hz.
	mse A) C)	c, then frequency of the wave will 20	be _ B)	Hz.
	mse A) C)	c, then frequency of the wave will 20 12.5	be _ B)	Hz.
	mse A) C) The	c, then frequency of the wave will 20 12.5 CRO is used to measure	be _ B) D)	Hz. 10 16.5
	mse A) C) The A) C)	c, then frequency of the wave will 20 12.5 CRO is used to measure voltage	be _ B) D)	Hz. 10 16.5 frequency
58)	mse A) C) The A) C)	c, then frequency of the wave will 20 12.5 CRO is used to measure voltage phase	be _ B) D)	Hz. 10 16.5 frequency

60)	In I	C 555, trigger is applied at termina	ıl nur	mber
	A)	3	B)	5
	C)	4	D)	2
61)	If r_0	= 1.2×10^{-15} m, then radius of Pt	o^{208} is	·
	A)	7.11×10^{-15} m	B)	$1.71 \times 10^{-15} \text{m}$
	C)	$7.11 \times 10^{-10} \text{m}$	D)	$1.71 \times 10^{-10} \text{m}$
62)	Qua	rks have electronic char	ges.	
	A)	zero	B)	one unit of negative
	C)	one unit of positive	D)	fractional
63)	Prot	ons and neutrons have Intrinsic sp	in eq	ual to
	A)	\hbar	B)	$2\hbar$
	C)	\hbar	D)	$\frac{\hbar}{2\pi}$
	C)	$\overline{2}$	D)	$\overline{2\pi}$
64)	Cyc	lotron is suitable to accelerate		<u>-</u>
	A)	neutrons	B)	protons
	C)	electrons	D)	positrons
65)		is based on the concept of elerating force.	f elec	ctromagnetic induction as the
	A)	cyclotron	B)	synchrocyclotron
	C)	betatron	D)	synchrotron

66)	In V	Vilson cloud chamber, a charged par	rticle	passing through a gas
	A)	produces positrons	B)	produces nuclear reactions
	C)	makes the gas radioactive	D)	ionizes the gas
67)	The	counting speed of semiconductor	detec	etor is
	A)	neglisible	B)	low
	C)	high	D)	very high
68)	The	two classes of hadrons are		
	A)	leptons and mesons	B)	leptons and baryons
	C)	mesons and baryons	D)	leptons and bosons
69)	Eler	nentary particles with zero spin and	d neg	ative parity are called
	A)	Baryon	B)	Pions
	C)	Kaons	D)	Both B) and C)
70)	Hea	rt of scintillation counter is	•	
	A)	light guide	B)	photomultiplier tube
	C)	MgO-coating	D)	phosphor
71)		is worthless energy not usef	ful fo	r doing work.
	A)	Exergy	B)	Power
	C)	Anergy	D)	Work done
72)	Froi	m physics point of view, energy is	noth	ning but
	A)	capacity to do work	B)	energy to work
	C)	power to do work	D)	force to do the work

73)) Which of the following is not renewable source of energy?			arce of energy?
	A)	wind	B)	solar
	C)	nuclear	D)	ocean
74)	The	value of solar constant is	·	
	A)	1367 W/m ²	B)	1357 W/m ²
	C)	1347 W/m ²	D)	1377 W/m ²
75)		is the cause of origin of b	ioma	ss energy.
	A)	Photosynthesis	B)	fermentation
	C)	oxidation	D)	deoxidation
76)	Criti	ical temperature of mercury is		•
	A)	233 °K	B)	4.2 °K
	C)	34 °K	D)	90 °K
77)	1 nr	m= m.		
	A)	10^{2}	B)	10-9
	C)	1010	D)	10^{-10}
78)		omaterials are the materials with at	least	one dimension measuring less
	A)	I nm	B)	10 nm
	C)	100 nm	D)	1000 nm

79)	Surface to volume ratio of sphere of radius 'r' is						
	A)	3/r	B)	2/r			
	C)	$3/r^2$	D)	$2/r^2$			
80)	For incoming wind with velocity 'v', maximum power obtained from wind turbine is proportional to						
	A)	v	B)	V^2			
	C)	v^3	D)	$1/v^3$			
81)	Right vertical axis of the H-R diagram represents						
	A) luminosity against surface temperature of stars						
	B) surface temperature against Luminosity of stars						
	C)	C) luminosity against surface temperature of stars on logarithmic scale					
	D)	none of these					
82)	According to anomalous Zeeman effect the longer wavelength line D1 is sodium spectrum splits into lines.						
	A)	3	B)	4			
	C)	5	D)	6			
83)	Raman shift is for Stokes lines.						
	A)	positive	B)	negative			
	C)	zero	D)	infinity			

84) The total energy of a diatomic molecule is

- A) $E_{\text{Total}} = E_{\text{vibrational}} + E_{\text{rotational}}$
- $B) \quad E_{\text{Total}} = E_{\text{vibrational}} E_{\text{rotational}}$
- C) $E_{\text{Total}} = E_{\text{vibrational}} \times E_{\text{rotational}}$
- D) $E_{\text{Total}} = E_{\text{vibrational}} / E_{\text{rotational}}$

85)	The original	unscattered	lines in	Raman	effect are calle	h	lines
00)	The original	unscallered	111162 111	IXalliali	cricci are carre	5 u	111105

A) Stark

B) Stokes

C) Antistokes

D) Rayleigh

A) $\Delta J = 1$

B) $\Delta J = -1$

C) $\Delta J = 0$

D) $\Delta J = \pm 1$

A) refracting

B) reflecting

C) transmitting

D) scattering

A) 20

B) 100

C) 5000

D) 2000

89)	The Doublet separation increases with							
	A) atomic number (Z)							
	B)	principle quantum number (n)						
C) orbital angular momentum quantum number (I)								
	D)	all the above						
90)	20) of the following is not a spectral series.							
	A)	Fundamental	B)	Diffuse				
	C)	Principal	D)	Elementary				
91) The packing fraction of BCC crystal structure is								
	A)	0.52	B)	0.64				
	C)	0.68	D)	0.74				
92)	The	number of atoms per unit cell in F	FCC (crystal structure is				
	A)	2	B)	4				
	C)	6	D)	8				
93)	The	lattice parameters, a=b=c for	(crystal system.				
	A)	Cubic						
	B)	Rhombohedral						
	C)	Triclinic						
	D)	Both Cubic and Rhombohedral						
94)	The	example of hexagonal crystal stru	cture	is				
	A)	Albite	B)	Borax				
	C)	Celestine	D)	Zinc oxide				

				ENI-U2		
95)	Rec	iprocal lattice to BCC lattice is		lattice.		
	A)	SC	B)	FCC		
	C)	BCC	D)	НСР		
96)	Brag	gg's law in reciprocal lattice is		→		
	A)	$2K.G + G^2 = 0$	B)	$K.G + G^2 = 0$		
	C)	K.G + G = 0	D)	2K.G + G = 0		
97)	Susc	ceptibility of the materia	l is iı	ndependent of the temperature.		
,		paramagnetic		ferromagnetic		
		diamagnetic		none of these		
98)	The	Curie- Weiss Law for ferromagnetic	ic ma	terials is		
	A)	$\chi = C / (T - \theta)$	B)	$\chi = C / (T - \theta)$		
	C)	$\chi = CT$	D)	$\chi = CT$		
99)	The first Brillouin zone lies between the values of k =					
	A)	$-\pi/a$ to $+\pi/a$	B)	$0 \text{ to } + \pi/a$		
	C)	$-\pi/a$ to 0	D)	$-\pi/2a$ to $+\pi/2a$		
100) The conduction band of insulator is						
100,						
	A)	completely empty	B)	completely filled		
	C)	partially filled	D)	arbitrarily filled		

Rough Work

Rough Work