Total No. of Printed Pages: 13

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CPG-EE-2018 (Physics)-(SET-Y)

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		Sr. No.	
Time: 11/2 Hours	Total Questions: 100		Max. Marks: 100
Roll No. (in figures)	(in words)		
Candidate's Name	Da	ate of Birth	
Father's Name —	Mother's Name		
Date of Exam :			

(Signature of the Candidate)

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- All questions are compulsory and carry equal marks. The candidates are required tattempt all questions.
- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
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- 5. Use only black or blue ball point pen of good quality in the OMR Answer-Sheet.
- 6. There will be negative marking. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

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- 1. Two particles of rest mass m_0 approach each other with equal and opposite velocity v, in the laboratory frame. The total energy of one particle as measured in the rest frame of other is:
 - (1) $E = m_0 c^2$

(2) $E = 2m_0c^2$

(3) $E = 3m_0c^2$

- (4) $E = 1/2m_0c^2$
- **2.** Two masses m_1 and m_2 connected by a spring of spring constant k rest on a frictionless surface. If the masses are pulled apart and let go, the time period of oscillation is:
 - (1) $T = 2\pi \sqrt{\frac{1}{k} \left(\frac{m_1 m_2}{m_1 + m_2} \right)}$
- (2) $T = 2\pi \sqrt{k \left(\frac{m_1 + m_2}{m_1 m_2}\right)}$

 $(3) \quad T = 2\pi \sqrt{\frac{m_1}{k}}$

- $(4) \quad T = 2\pi \sqrt{\frac{m_2}{k}}$
- **3.** A body moves a distance of 10 m along a straight line under the action of force of 5 Newton. If the work done is 25 J, the angle which the force makes with the direction of motion of the body is:
 - (1) 90°
- (2) 60°
- (3) 30°
- (4) 0°
- **4.** A body of mass m slide down an inclined plane making an angle of 45° with the horizontal. If the coefficient of friction between the body and the plane be 0.3, the acceleration of the body is approximately equal to:
 - (1) 0.49 g
- (2) 0.25 g
- (3) 1.5 g
- (4) 2.5 g
- **5.** An electron has mass of 9.11×10^{-31} kg. It revolves about the nucleus in a circular orbit of radius 5.29×10^{-11} m at a speed of 2.2×10^6 m/s. The linear momentum of the electron in this system will be :
 - (1) $1.1 \times 10^{34} \text{ kg-m/s}^2$

(2) $2.0 \times 10^{-24} \text{ kg-m/s}$

(3) $1.1 \times 10^{-24} \text{ kg-m/s}^2$

- (4) $4.1 \times 10^{-34} \text{ kg-m/s}^2$
- 6. The moment of inertia of the body does not depend upon:
 - (1) mass of the body
 - (2) the distribution of mass in the body
 - (3) angular velocity of the body
 - (4) the axis of the rotation of the body

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7.		uniform disc of ma rotating at 70 rpm?		s 50 cm. What is the kinet	ic
	(1) 241.8 J	(2) 300 J	(3) 134.6 J	(4) 34.56 J	
8.	A particle moved the work done?	from position $r_1 =$	3i + 2j – 6k to positi	ion $r_2 = 4i + j + 3k$ N. What	is
	(1) 1 J	(2) 0.01 J	(3) 10 J	(4) 100 J	
9.	If 0.5i + 0.8j + ck i	s a unit vector. The	n c is equal to:		
	$(1) \sqrt{0.89}$	(2) 0.2	(3) 0.3	(4) √0.11	
10.		an electric dipole at r bisector of dipole		f the dipole and at a point of	on
	(1) $E_1 = E_2$	(2) $E_1 = 2E_2$	(3) $2E_1 = E_2$	(4) $E_1 = 4E_2$	
11.			wo points 2 cm apa lese points will be a	art in an electric field of 20 round:	V,
	(1) 20 V/m	(2) 40 V/m	(3) 10 V/m	(4) 10 V/cm	
12.				n a point in a magnetic field B at that point W	
	(1) q	(2) v	(3) F	(4) $q, v, \text{ and } F$	
13.	The permeability	of para and ferrom	agnetic materials ar	e:	
	(1) greater than	unity	(2) less than ur	nity	
	(3) equal to unit	y	(4) negative		and the
14.	Poynting vector	is expressed as:			
	(1) $(H \times E)$	(2) $(E \times H)$	(3) $(E \times H).dS$	(4) $(H \times E).dS$	
15.	Young's modulu	s (Y), Modulus of ri	gidity (η) and Poiss	on ratio (σ) are related as:	

as:

$$(1) \quad Y = \frac{2\eta}{(1+\sigma)}$$

(2)
$$\sigma = \frac{2Y}{(1+\eta)}$$

(1)
$$Y = \frac{2\eta}{(1+\sigma)}$$
(3)
$$\frac{Y}{\eta} = 2(1+\sigma)$$

(4)
$$2Y = \eta(1 + \sigma)$$

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16.	The force required to stretch a s section is 1 sq.cm and Young mo	teel wire to double its length when its area of cross-dulus of $2 \times 10^{11} \text{N/m}^2$:
	(1) $2 \times 10^7 \mathrm{N}$	(2) $4.56 \times 10^9 \text{ N}$
	(3) $6.34 \times 10^5 \text{ N}$	(4) $1.5 \times 10^3 \text{ N}$
17.	The mean kinetic energy E per un	nit volume and the pressure P of a gas are related as :
	(1) P 0 (0 F	(0) D 0/0F

(1)
$$P = 2/3 E$$

(2) P = 3/2 E

(3)
$$P = 1/2 E$$

(4) $P = \sqrt{3}/2E$

18. The law of equipartition of energy was postulated by:

- (1) Maxwell
- (2) Boltzman
- (3) Stefan

(4) Weins

19. The viscosity of gas is directly proportional to:

(1) temperature

- (2) square root of temperature
- (3) characteristic gas constant
- (4) density of gas

20. A reference frame attached to the earth:

- (1) is an inertial frame by definition
- (2) cannot be an inertial frame because the earth is revolving round the sun
- (3) is an inertial frame because Newton's laws are applicable in this frame
- (4) cannot be an inertial frame because the earth is rotating about its own axis

21. An electron has a rest mass of 9.11×10^{-31} kg when its velocity of 0.9c the speed of light, its mass will be:

(1)
$$10.5 \times 10^{-31} \text{ kg}$$

(2)
$$64.4 \times 10^{-31} \text{ kg}$$

(3)
$$20.9 \times 10^{-31} \text{ kg}$$

(4)
$$6.37 \times 10^{-37} \text{ kg}$$

22. A rod of length 2 m moves with a velocity of 10^8 m/s relative to an observer at rest on the earth. What is the apparent length of the rod appearing to observer?

- (1) 11.78 m
- (2) 8.34 m
- (3) 55.4 m
- (4) 1.885 m

23. The fraction of electrons excited across the energy gap in Germanium (Eg = 0.7 eV) at room temperature (300 K) is :

- (1) 7×10^{-18}
- (2) 1.7×10^{-12}
- (3) 4×10^{-12}
- $(4) 1.3 \times 10^{-6}$

24.	The degeneracy of	the quantum states	with	$(n_x^2 + n_y^2 + n_z^2) = 0$	6 is:
	(1) 12	(2) 24	(3)	48	(4) 8
25.	At 0 K, the probab	ility of finding an el	ectror	at energy level	E is unity, when:
	(1) $E = E_F$	(2) $E > E_F$	(3)	$E < E_F$	(4) E >> E _F
26.	The reverse satura	tion current in a p-n	diod	e:	
	(1) increases		(2)	decreases	
	(3) remains const	ant	(4)	oscillates	
27.	The phase different in common emitte	기교 (프로스 시민은 시 그 전 시) 전환 및 (시) 중심	ut and	l output voltage	es of a transistor connected
	(1) 360°	(2) 180°	(3)	90°	(4) 270°
28.	The DC current and 10 mA. The base of		base	transistor is 0.9	56 and emitter current is
	(1) 0.66 mA	(2) 0.38 mA	(3)	0.25 mA	(4) 0.44 mA
29.	The electrical pow	ver output of a photo	diode	e is maximum w	hen a:
	(1) Small forward	d current flows throu	igh it,	irrespective of	the bias
	(2) Small forward	d bias exists across it		Alt algarded	called services (Gr
	(3) Large reverse	bias exists across it			
	(4) Small reverse	bias exists across it			or a last house or . it's
30.		er transistor has a t The emitter current		value of gain	(β) as 50 and the collector
	(1) 10.2 mA	(2) 45.8 mA	(3)	22.4 mA	(4) 12.5 mA
31.	The type of flip-fle	op is used to store th	e dat	a in registers :	and designation to a second
	(1) D flip-flop		(2)	RS flip-flop	
	(3) JK flip-flop		(4)	T flip-flop	and the
32.	The flash memori	es find application in	n:	ade brakes in	risk hammer Cutt. 89
	(1) super comput	ters	(2)	mainframe sys	stems
	(3) distributed sy	rstem	(4)	portable devic	es
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33.	3. With an amount of 110 J of heat is added to a increases by 40 J. Then the amount of external	
	(1) 120 J (2) 60 J (3) 7	70 J (4) 30 J
34.	1. In the Carnot engine when heat is taken from	the source its temperature :
	(1) remains constant (2) in	ncreases
	(3) decreases (4) fi	luctuate
35.	5. The entropy at absolute zero of system is:	in and a supply of the supply
	(1) tends to increase (2) z	ero
	(3) maximum (4) f	luctuate
36.	6. Maxwell's thermodynamic relations are valid	for:
	(1) closed system	A CONTRACTOR OF CA
	(2) open system	earliers and a system of the set.
	(3) a thermodynamic system in equilibrium	punta ip ir monaralio kinama sitar
	(4) only reversible process	
37.	7. The standard Gibbs energy change accompa property?	anying a spontaneous process has wha
	(1) is always larger than the internal energy of	change
	(2) is greater than zero	
	(3) is less than or equal to zero	and the control of the state of
	(4) it has no restrictions on its value	
38.	8. When the white light enters in a lens, it under	goes a change in :
	(1) frequency (2) v	wavelength
	(3) velocity (4) v	wavelength and velocity
39.	9. A double convex air bubble in water will act l	like a:

(2) convex lens

(4) concave mirror

(1) concave lens

(3) plane glass

6		
40.		tact and the focal length of the combination is 80 cm. If the enses be 20 cm, the power of the other lens is:
	(1) 1.89 diopters	(2) 6 diopters
	(3) -1.4 diopters	(4) -3.75 diopters
41.	Chromatic aberration is th	e product of :
	(1) dispersive power × fo	al length of red ray
	(2) dispersive power × m	an focal length
	(3) 1/ dispersive power >	mean focal length

42. The phenomenon of interference is used to prove that light is:

(1) longitudinal

(2) transverse

(3) stationary wave

(4) quantized

43. Two waves having the intensities in the ratio of 9:1 produce interference. The ratio of maximum to minimum intensity is equal to:

(1) 10:8

(2) 9:1

(4) dispersive power × 1/ mean focal length

(3) 4:1

(4) 2:1

44. Two straight and narrow parallel slits 1 mm apart are illuminated by monochromatic light. Fringes formed on the screen held at a distance of 100 cm from the slits are 0.5 mm apart. What is the wavelength of light?

(1) 100 Å

(2) 350 Å

(3) 500 Å

(4) 5000 Å

45. A microstate is a configuration of :

(1) distinguishable particles within a given state

(2) indistinguishable particles within a given state

(3) random distribution

(4) non-random distribution

46. In a micro canonical ensemble, a system A of fixed volume is in contact with a large reservoir B. Then:

(1) A can exchange only energy with B

(2) A can exchange only particles with B

(3) A can exchange neither energy not particle with B

(4) A can exchange both energy and particle with B

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47.	The entropy for ten particles in a st equal to:	tate with energy level occupations of (4, 3, 2, 1, 0) is
	(1) 7.8 J K ⁻¹ mol ⁻¹	(2) $2.45 \mathrm{J K^{-1} mol^{-1}}$
	(3) 1.45 J K ⁻¹ mol ⁻¹	(4) 4.34 J K ⁻¹ mol ⁻¹
48.	An object is at a temperature of 67 twice as fast?	73 K. At what temperature would it radiate energy
	(1) 400 K (2) 550 K	(3) 800 K (4) 1000 K
49.	The number of electron states per copper at 0 K is:	r electron volt at $E = E_F/2$ in a 1 g of sample of
	(1) $3.46 \times 10^{22} \text{ states/eV}$	(2) $5.46 \times 10^{23} \text{ states/eV}$
	(3) $1.43 \times 10^{21} \text{ states/eV}$	(4) $6.46 \times 10^{20} \text{ states/eV}$
50.	What is zero point energy?	
	(1) The irremovable energy of a pa	article, corresponding to an excited state
	(2) The irremovable energy of a pa	article, corresponding to the lowest energy state
	(3) The removable energy of a par	ticle, corresponding to and excited state
,	(4) The removable energy of a par	ticle, corresponding to the lowest energy state
51.	Bosons are particle with:	
	(1) integral spins	
	(2) half-integral spins	and the second s
	(3) does not obey the Fermi-Dirac	statistics
	(4) they possess conserved baryon	or lepton quantum number
52.	What is the limit of the molecular goes to zero?	vibrational partition function as the temperature
	(1) infinity (2) zero	(3) one (4) negative
53.	Newton's ring illustrates the pheno	omenon of :
	(1) interference	(2) diffraction
	(3) polarization	(4) circularly polarized light

(1) diffraction

55.	A transparent film of glass of refractive index 1.5 is introduced normally in the path of one of the interfering beams of Michelson's interferometer which is illuminated with light of wavelength 4800 Å. This causes 500 dark fringes to sweep across the field and the corresponding film thickness is:
	(1) 1 μm (2) 240 μm (3) 0.5 mm (4) 0.01 mm
56.	Maximum number of orders available with a grating is:
	(1) independent of grating element
	(2) directly proportional to grating element
	(3) inversely proportional to grating element
	(4) proportional to grating element
57.	The condition for observing Fraunfoher diffraction from a single slit is that the light wave front incident on the slit should be:
	(1) spherical (2) cylindrical (3) plane (4) elliptical
58.	Which phenomenon causes the polarization of light?
	(1) reflection (2) double reflection
	(3) double refraction (4) diffraction
59.	Light wave are transverse in nature, can be demonstrated by observing the phenomenon of:
	(1) dispersion (2) interference (3) polarization (4) diffraction
60.	The indices of refraction for the ordinary and extra-ordinary rays are 1.586 and 1.592. The thickness of the mica sheet required for making a quarter wave plate for λ = 5460 Å would be:
	(1) 0.02275 cm (2) 0.567 cm (3) 0.1 cm (4) 0.01 cm
61.	One of the allotropy of carbon is graphite whose crystal structure is hexagonal. Let the lattice parameters for graphite be a = 2.451 Å ; c = 6.701 Å and with density of 2.2589 g/cm^3 . An estimated number of atoms in their unit cell:
	(1) 4 (2) 6 (3) 8 (4) 12
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54. Which of the following phenomena produces the colours in the soap bubble?

(3) dispersion

(4) interference

(2) polarization

62.	The pack	ing efficien	ncy c	of diamond cubic	uni	it cell is:		
	(1) 0.34		(2)	0.52	(3)	0.68	(4)	0.74
63.	In ionic s	olid if the	radiı	us of anion is r_a a	nd o	of cation is rc, the	en bo	ond length is:
	(1) $(r_c +$	r_a)	(2)	$\sqrt{3}(r_c+r_a)$	(3)	$\sqrt{3}/2(r_c+r_a)$	(4)	(r_c-r_a)
64.	The num	ber of latti	ce po	oints in the rhom	boh	edral unit cell is	50	
	(1) 1		(2)	2	(3)	4	(4)	8
65.	The num	ber of unit	cell	s in 1 m ³ of FCC	nick	$(r_{Ni} = 1.243 \text{ Å})$:	
	(1) 2.3 ×	10 ²⁸	(2)	3.3×10^{25}	(3)	2.3×10^{38}	(4)	12.3×10^{28}
66.				om the FCC cry angle of θ of :	stal	has a Bragg ang	gle 6	of 21.5°, the second
	(1) 18.5°		(2)	8.5°	(3)	31.2°	(4)	36.8°
67.				ing obtained fro		he second reflec	ction	of a diamond cubic
	(1) 0.905	5 Å	(2)	2.56 Å	(3)	3.62 Å	(4)	5.12 Å
68.	The disci	rete values	of e	nergy the atomic	osc	illator can have		
	(1) nh/2	$2\pi\omega^2$	(2)	$n^2h/2\pi\omega$	(3)	$nh/2\pi\omega$	(4)	$2nh/2\pi\omega$
69.	If the De	bye's temp	erat	ure of metal is 45	50 K	, the Debye's free	quen	cy is:
	(1) 10 ¹³	Hz	(2)	10 ¹⁵ Hz	(3)	10 ²³ Hz	(4)	10 Hz
70.	The class	sical value	of m	olar specific hea	t is:			
	(1) $R_u/2$		(2)	3 R _u	(3)	3 R _u /2	(4)	R_{u}
71.				~				nated by light with a mitted photoelectrons
	(1) 1.9 e	V	(2)	6.2 eV	(3)	5.7 eV	(4)	0.58 keV
72.		e orbital o			= 3,	the magnetic qu	ianti	um number takes the
	(1) 6		(2)	10	(3)	7	(4)	14
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73.	The total energy of	f the	electron in hydr	oger	atom is:	10357	
	(1) -(13.6/n) eV	(2)	(13.6/n) eV	(3)	-(13.6/n²) eV	(4)	(13.6/n²) eV
74.	The maximum nur	mber	of electrons in a	sub	-shell with orbit	al qu	uantum number <i>l</i> is :
	(1) $2l + 1$	(2)	21-1	(3)	2(2l + 1)	(4)	2(2l-1)
75.	The position and its position is loomentum?	mom	entum of a 1 ke within 1 Å, v	eV e what	lectron are simulated is the percent	ıltan age	neously determined. I of uncertainty in it
	(1) 3.11	(2)	5.32	(3)	1.97	(4)	9.456
76.	The de Broglie way	velen	gth of a 10 eV el	ectro	on is:		
	(1) 3.88×10^{-9} m			(2)	$3.88 \times 10^{-10} \text{ m}$		
	(3) $6.88 \times 10^{-10} \text{ m}$			(4)	$1.55 \times 10^{-10} \text{ m}$		
77.	The work function equal to:	of p	hotoelectric mat	erial	is 3.3 eV. The th	resl	hold frequency will be
	(1) $8 \times 10^{14} \text{Hz}$	(2)	$8 \times 10^{10} \text{Hz}$	(3)	$5 \times 10^{20} \mathrm{Hz}$	(4)	$2 \times 10^{14} \text{Hz}$
78.	The energy levels of	of a p	article that is co	nfine	ed within the inf	inite	e potential well :
	$(1) \frac{h^2k^2}{8\pi^2m}$		12.2				$\frac{hk^2}{8\pi m^2}$
79.	The degeneracies confined to two directions	of the	ne lowest and t	he s ll :	econd lowest en	nerg	y levels of a particle
	(1) 0 and 1	(2)	0 and 2	(3)	1 and 4	(4)	1 and 2
80.	When an electron j			whei	re $n = 1$ to $n = 4$,	its	energy in terms of the
	(1) E ₁ /9	(2)	E ₁ /16	(3)	2 E ₁	(4)	16 E ₁
81.	According to Bohr equal to an integra			ang	ular momentum	of	electron in n th orbit is
	(1) $2h/\pi$	(2)	h/2π	(3)	h/π	(4)	nh/2π
	How does the mon	nenti	ım of a photon c	hang	ge if the waveler	ngth	is halved?
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83.	Consider the two- A ₂₁ = 6×10^8 S ⁻¹ . Th	level e fre	system with E quency of light	emit	-13.6 eV , $E_2 = -13.6 \text{ eV}$ et ansi	-3.4 e	eV and the coe from E ₂ and E ₁	efficient is:
	(1) $8.2 \times 10^{17} \text{ Hz}$							
84.	Which of the follobody radiator?	wing	g colours is asso	ociate	ed with the low	est te	emperature of	a black
	(1) Red	(2)	Blue	(3)	Green	(4)	Yellow	
85.	The $K\alpha$ line of melement?	ateri	al has energy o	of 66	keV. What is	the a	itomic number	of the
	(1) 45	(2)	55	(3)	81	(4)	23	
86.	When a spectrome field needed for wavelength:							
	(1) 1.34 T	(2)	3.64 T	(3)	12 T	(4)	2.456 T	
87.	The aluminium at shells. What is the					ectro	n outside fille	d inner
,	$(1)^{-3}P_1$	(2)	$2^{2}P_{5/2}$	(3)	² P _{1/2}	(4)	$^{2}P_{3/2}$	
88.	Which of the follow	wing	is used in atom	ic clo	cks?			
	(1) Laser	(2)	Quartz	(3)	Maser	(4)	Helium	
89.	A solid-state laser of Assume that the reemission is:							
	(1) $1.3 \times 10^{19} \mathrm{m/kg}$	3		(2)	$1.3\times10^{19}\mathrm{m/g}$			
	(3) $6.6 \times 10^{19} \mathrm{cm/k}$	g		(4)	$6.6 \times 10^{19} \mathrm{m/g}$			
90.	The following type	of la	aser can be used	for g	generation of las	er pı	ulse:	
	(1) Nd- YAG laser			(2)	Carbon dioxide	e lase	er	
	(3) Helium neon l	aser		(4)	Ruby laser			
91.	The atomic number	r of a	nucleus is equa	al to	the number of:			
	(1) electrons it cor	tains	3	(2)	protons it conta	ains		
	(3) neutrons it cor	tains		(4)	nucleons it con	tains	3	
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92.	The antiparticle of	electron is:	
	(1) positron	(2) proton	(3) alpha particle (4) beta particle
93.	The average life T	and the decay consta	tant λ of a radioactive nucleus are related
	(1) $T\lambda = 1$	(2) $T = 0.693/\lambda$	(3) $T/\lambda = 1$ (4) $T = c/\lambda$
94.	In nuclear reactions	s we have conservat	ition of:
	(1) mass only		(2) energy only
	(3) momentum on	ly	(4) all of the above
95.	Which theory expla	ains the attraction be	petween protons and neutrons?
	(1) Quantum Chro	omodynamics	(2) The Standard Model
4 (i) V	(3) String Theory		(4) The Grand Unified Theory
96.	The process in whi	ch two nuclei join to	ogether to form a new nucleus is called:
	(1) fission		(2) fusion
	(3) chain reaction		(4) nuclear transformation
97.	In a nuclear reactor	the moderator is:	
	(1) uranium-234	(2) uranium-238	(3) cadmium (4) heavy water
98.	For making an ator	n bomb we use the	process called :
	(1) fission	(2) fusion	(3) ionization (4) electrolysis
99.	The energy release	d per fission of a ₉₂ U	U ²³⁵ nucleus is nearly :
	(1) 200 eV	(2) 20 eV	(3) 200 MeV (4) 2000 eV
100.	The decay of artific	rial radioactive isoto	opes is accompanied by the emission of:
		(2) beta particle	

as:

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В		Sr. No
Time: 1½ Hours	Total Questions: 100	Max. Marks : 100
Roll No. (in figures)	(in words)	
Candidate's Name		Date of Birth
Father's Name	Mother's	s Name
Date of Exam :		
(Signature of the Candidate)		(Signature of the Invigilator)
CANDIDATES MUST READ TH	HE FOLLOWING INFOR	RMATION/INSTRUCTIONS BEFORE

STARTING THE QUESTION PAPER.

- 1. All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- 5. Use only black or blue ball point pen of good quality in the OMR Answer-Sheet.
- 6. There will be negative marking. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get 1/4 discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination. used for Jumsh chut

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		6	
1.	If the potential difference between two		c field of 20 V,
	(1) 20 V/m (2) 40 V/m	(3) 10 V/m (4) 10 V/	cm
2.	If a positive charge <i>q</i> moving with a experiences a deflecting force <i>F</i> , the depend upon:		
	(1) q (2) v	(3) F (4) q, v, a	nd F
3.	The permeability of para and ferromag	gnetic materials are :	
	(1) greater than unity	(2) less than unity	
	(3) equal to unity	(4) negative	
4.	Poynting vector is expressed as:		HER COLUMN
	(1) $(H \times E)$ (2) $(E \times H)$	(3) $(E \times H).dS$ (4) $(H \times E)$	E).dS
5.	Young's modulus (Y), Modulus of rigi	idity (η) and Poisson ratio (σ) are	related as:
	$(1) Y = \frac{2\eta}{(1+\sigma)}$		reigni eli
	$(3) \frac{Y}{\eta} = 2(1+\sigma)$	(4) $2Y = \eta(1 + \sigma)$	
6.	The force required to stretch a steel was section is 1 sq.cm and Young modulus		s area of cross-
	(1) $\cdot 2 \times 10^7 \mathrm{N}$	(2) $4.56 \times 10^9 \text{ N}$	
	(3) $6.34 \times 10^5 \text{ N}$	(4) $1.5 \times 10^3 \mathrm{N}$	iii0 (0
7.	The mean kinetic energy E per unit vo	olume and the pressure P of a gas	are related as:
	(1) $P = 2/3 E$	(2) $P = 3/2 E$	
	(3) $P = 1/2 E$	(4) $P = \sqrt{3}/2E$	

(3) Stefan

(1) Maxwell

8. The law of equipartition of energy was postulated by :

(2) Boltzman

(4) Weins

9.	The viscosity of gas is directly proporti	onal to:
	(1) temperature	(2) square root of temperature
	(3) characteristic gas constant	(4) density of gas
10.	A reference frame attached to the earth	
	(1) is an inertial frame by definition	
	(2) cannot be an inertial frame because	e the earth is revolving round the sun
	(3) is an inertial frame because Newton	n's laws are applicable in this frame
	(4) cannot be an inertial frame because	e the earth is rotating about its own axis
11.	The atomic number of a nucleus is equa	al to the number of :
	(1) electrons it contains	(2) protons it contains
	(3) neutrons it contains	(4) nucleons it contains
12.	The antiparticle of electron is:	and the state of t
	(1) positron (2) proton	(3) alpha particle (4) beta particle
13.	The average life T and the decay consta	ant λ of a radioactive nucleus are related a
	(1) $T\lambda = 1$ (2) $T = 0.693/\lambda$	(3) $T/\lambda = 1$ (4) $T = c/\lambda$
14.	In nuclear reactions we have conservat	ion of:
	(1) mass only	(2) energy only
	(3) momentum only	(4) all of the above
15.	Which theory explains the attraction be	etween protons and neutrons?
	(1) Quantum Chromodynamics	(2) The Standard Model
	(3) String Theory	(4) The Grand Unified Theory
16.	The process in which two nuclei join to	egether to form a new nucleus is called:
	(1) fission	(2) fusion
	(3) chain reaction	(4) nuclear transformation
17.	In a nuclear reactor the moderator is:	
	(1) uranium-234 (2), uranium-238	(3) cadmium (4) heavy water
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18	 For making an at 	om bomb we use th	ne process called:	re le e Nwei verene en la 1
	(1) fission	(2) fusion	(3) ionization	(4) electrolysis
19.	. The energy releas	sed per fission of a	₉₂ U ²³⁵ nucleus is nearl	y:
	(1) 200 eV	(2) 20 eV	(3) 200 MeV	(4) 2000 eV
20.	The decay of artif	icial radioactive isc	otopes is accompanied	by the emission of :
	(1) alpha particle		(2) beta particle	
	(3) positron		(4) neutron	
21.	A surface of zinc wavelength of 20 are:	having a work full nm. The maximum	unction of 4.3 eV is um kinetic energy of	illuminated by light with the emitted photoelectron
	(1) 1.9 eV	(2) 6.2 eV	(3) 5.7 eV	(4) 0.58 keV
22.	When the orbital following number	quantum number of values :	l = 3, the magnetic	quantum number takes the
	(1) 6	(2) 10	(3) 7	(4) 14
23.	The total energy o	f the electron in hy	drogen atom is:	i di Masal Labina a la Wasal
	(1) -(13.6/n) eV	(2) (13.6/n) eV	(3) $-(13.6/n^2)$ eV	(4) (13.6/n²) eV
24.	The maximum nur	mber of electrons ir	a sub-shell with orb	ital quantum number <i>l</i> is:
	(1) $2l + 1$	(2) $2l-1$	(3) $2(2l+1)$	(4) $2(2l-1)$
25.	The position and its position is loomentum?	momentum of a 1 rated within 1 Å,	keV electron are sim what is the percen	nultaneously determined. If tage of uncertainty in its
	(1) 3.11	(2) 5.32	(3) 1.97	(4) 9.456
26.	The de Broglie was	velength of a 10 eV	electron is:	
	(1) 3.88×10^{-9} m		(2) $3.88 \times 10^{-10} \mathrm{m}$	
	(3) $6.88 \times 10^{-10} \mathrm{m}$	Listerni 2, 7	(4) $1.55 \times 10^{-10} \text{ m}$	To third Promagnistic A. 188
27.	The work function equal to:	of photoelectric ma	aterial is 3.3 eV. The t	hreshold frequency will be
į	(1) $8 \times 10^{14} \text{Hz}$	(2) $8 \times 10^{10} \mathrm{Hz}$	(3) $5 \times 10^{20} \text{Hz}$	(4) $2 \times 10^{14} \mathrm{Hz}$
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28.	The energy levels of a particle that is confined within the infinite potential well:
	(1) $\frac{h^2k^2}{8\pi^2m}$ (2) $\frac{h^2k^2}{4\pi m}$ (3) $\frac{hk}{4\pi m}$ (4) $\frac{hk^2}{8\pi m^2}$
	$8\pi^2 m$ $4\pi m$ $4\pi m$ $8\pi m^2$
29.	The degeneracies of the lowest and the second lowest energy levels of a particle confined to two dimensional square well:
	(1) 0 and 1 (2) 0 and 2 (3) 1 and 4 (4) 1 and 2
30.	When an electron jumps from an orbit where $n=1$ to $n=4$, its energy in terms of the energy of the ground level (E ₁) is :
	(1) $E_1/9$ (2) $E_1/16$ (3) $2 E_1$ (4) $16 E_1$
31.	Bosons are particle with:
	(1) integral spins
	(2) half-integral spins
	(3) does not obey the Fermi-Dirac statistics
	(4) they possess conserved baryon or lepton quantum number
32.	What is the limit of the molecular vibrational partition function as the temperature goes to zero?
	(1) infinity (2) zero (3) one (4) negative
33.	Newton's ring illustrates the phenomenon of :
	(1) interference (2) diffraction
	(3) polarization (4) circularly polarized light
34.	Which of the following phenomena produces the colours in the soap bubble?
	(1) diffraction (2) polarization
	(3) dispersion (4) interference
35.	A transparent film of glass of refractive index 1.5 is introduced normally in the path of one of the interfering beams of Michelson's interferometer which is illuminated with light of wavelength 4800 Å. This causes 500 dark fringes to sweep across the field and the corresponding film thickness is:
	(1) 1 μm (2) 240 μm (3) 0.5 mm (4) 0.01 mm
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36.	Maximum number of orders available	with a grating is:
	(1) independent of grating element	Fire promoting of the
	(2) directly proportional to grating ele	ement
	(3) inversely proportional to grating e	element
	(4) proportional to grating element	
37.	The condition for observing Fraunfol wave front incident on the slit should	ner diffraction from a single slit is that the light be:
	(1) spherical (2) cylindrical	(3) plane (4) elliptical
38.	Which phenomenon causes the polaris	zation of light?
	(1) reflection	(2) double reflection
	(3) double refraction	(4) diffraction
39.	Light wave are transverse in natu phenomenon of:	are, can be demonstrated by observing the
	(1) dispersion	(2) interference
,	(3) polarization	(4) diffraction
40.		ary and extra-ordinary rays are 1.586 and 1.592. ed for making a quarter wave plate for $\lambda = 5460 \text{ Å}$
	(1) 0.02275 cm (2) 0.567 cm	(3) 0.1 cm (4) 0.01 cm
41.	The type of flip-flop is used to store th	ne data in registers :
	(1) D flip-flop	(2) RS flip-flop
	(3) JK flip-flop	(4) T flip-flop
42.	The flash memories find application in	n:
	(1) super computers	(2) mainframe systems
	(3) distributed system	(4) portable devices
43.	With an amount of 110 J of heat is ad increases by 40 J. Then the amount of	ded to a gaseous system, whose internal energy external work done is:
	(1) 120 J (2) 60 J	(3) 70 J (4) 30 J
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51.	An electron has a light, its mass will	rest mass of 9.11 × be:	10 ⁻³¹	kg when its v	elocity o	of 0.9c the spe	ed of
	(1) $10.5 \times 10^{-31} \text{ kg}$	3) 274 giA	(2)	$64.4 \times 10^{-31} \text{ kg}$		Ams Ok II)	
	(3) $20.9 \times 10^{-31} \text{ kg}$		(4)	$6.37 \times 10^{-37} \text{ kg}$	hollers		
52.		n moves with a velo					est on
	(1) 11.78 m	(2) 8.34 m	(3)	55.4 m	(4) 1.	885 m	
53.	The fraction of electroom temperature	ctrons excited across (300 K) is:	s the	energy gap in C	Germanii	um (Eg = 0.7ϵ	eV) at
	(1) 7×10^{-18}	(2) 1.7×10^{-12}	(3)	4×10^{-12}	(4) 1	3×10^{-6}	
54.	The degeneracy of	the quantum states	with	$(n_x^2 + n_y^2 + n_z^2) =$	6 is:		
	(1) 12	(2) 24			(4) 8	E-VENSKEL	
55.	At 0 K, the probabi	ility of finding an ele	ectror	n at energy leve	l E is un	ity, when:	
	(1) $E = E_F$	(2) $E > E_F$		$E < E_F$	(4) E		
56,	The reverse satura	tion current in a p-n	diod	e:			
	(1) increases		(2)	decreases			
	(3) remains consta	int	(4)	oscillates			
57.	The phase different in common emitter	ce between the inpu	it and	l output voltag	es of a tr	ansistor conn	ected
	(1) 360°	(2) 180°	(3)	90°	(4) 27	′0°	
58.	The DC current g	gain of a common-burrent value is:	oase t	transistor is 0.9	956 and	emitter curre	ent is
	(1) 0.66 mA	(2) 0.38 mA	(3)	0.25 mA	(4) 0.4	44 mA	
59.	The electrical power	er output of a photo	diode	is maximum w	when a:	I di au cura	
	(1) Small forward	current flows throu	gh it,	irrespective of	the bias		
	(2) Small forward	bias exists across it		NA CANTESCO VEG		Marke A (2)	
	(3) Large reverse b	pias exists across it				ive man in the	
	(4) Small reverse b	pias exists across it					
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	(2) dispersive power × mean focal length	
	(3) 1/ dispersive power × mean focal length	
	(4) dispersive power × 1/ mean focal length	
62.	The phenomenon of interference is used to prove that light is:	
	(1) longitudinal (2) transverse	
	(3) stationary wave (4) quantized	
63.	Two waves having the intensities in the ratio of 9:1 produce interference. The ratio of maximum to minimum intensity is equal to:	f
	(1) 10:8 (2) 9:1 (3) 4:1 (4) 2:1	
64.	Two straight and narrow parallel slits 1 mm apart are illuminated by monochromatilight. Fringes formed on the screen held at a distance of 100 cm from the slits are 0.5 mm apart. What is the wavelength of light?	
	(1) 100 Å (2) 350 Å (3) 500 Å (4) 5000 Å	
65.	A microstate is a configuration of :	
	(1) distinguishable particles within a given state	
	(2) indistinguishable particles within a given state	
	(3) random distribution	
	(4) non-random distribution	
66.	In a micro canonical ensemble, a system A of fixed volume is in contact with a larg reservoir B. Then:	e
	(1) A can exchange only energy with B	
	(2) A can exchange only particles with B	
	(3) A can exchange neither energy not particle with B	
	(4) A can exchange both energy and particle with B	
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60. A common-emitter transistor has a typical value of gain (β) as 50 and the collector

(3) 22.4 mA

(4) 12.5 mA

current is 10 mA. The emitter current is:

(1) dispersive power × focal length of red ray

61. Chromatic aberration is the product of:

(2) 45.8 mA

(1) 10.2 mA

	equal to.						
	(1) 7.8 J K ⁻¹ mol ⁻¹		(2)	2.45 J K ⁻¹ mol	1	No. of the last of	
	(3) 1.45 J K ⁻¹ mol	-1	(4)	4.34 J K ⁻¹ mol	1		15 779/
68.	An object is at a t twice as fast?	emperature of 6	573 K. At v	what temperatu	re wo	uld it radiate	e energy
	(1) 400 K	(2) 550 K	(3)	800 K	-(4)	1000 K	
69.	The number of e copper at 0 K is:	lectron states po	er electror	volt at E = E	_F /2 in	a 1 g of sa	mple of
	(1) 3.46×10^{22} sta	tes/eV	(2)	$5.46 \times 10^{23} \text{ stat}$	es/eV		
	(3) 1.43×10^{21} sta	tes/eV	(4)	$6.46 \times 10^{20} \text{ stat}$	es/eV		
70.	What is zero poin	t energy ?					
	(1) The irremova		oarticle, co	rresponding to	an exc	cited state	
		ble energy of a p					state
	(3) The removable	e energy of a pa	rticle, corr	esponding to a	nd exc	rited state	
,	(4) The removable	e energy of a pa	rticle, corr	esponding to the	ne low	est energy st	ate
71.	One of the allotro the lattice parame 2.2589 g/cm ³ . An	eters for graphi	te be a =	2.451 Å; c = 6.3	701 Å		
	(1) 4	(2) 6	(3)	8	(4)	12	
72.	The packing effici	ency of diamon	d cubic un	it cell is :			
	(1) 0.34	(2) 0.52	(3)	0.68	(4)	0.74	
73.	In ionic solid if th	e radius of anion	n is r _a and	of cation is r _c , t	nen bo	and length is	
	$(1) (r_c + r_a)$	$(2) \sqrt{3}(r_c + r_a)$	(3)	$\sqrt{3}/2(r_c+r_a)$	(4)	(r_c-r_a)	
74.	The number of lat	ttice points in th	e rhombol	nedral unit cell	is:		
	(1) 1	(2) 2	(3)	4	(4)	8	
75.	The number of ur	nit cells in 1 m³ c	of FCC nicl	kel (r _{Ni} = 1.243 A	: (Å		
	(1) 2.3×10^{28}	(2) 3.3×10^{25}	(3)	2.3×10^{38}	(4)	12.3×10^{28}	në satiralian
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67. The entropy for ten particles in a state with energy level occupations of (4, 3, 2, 1, 0) is

(4) $2nh/2\pi\omega$

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76.		ection from the FC ave an angle of θ of		g angle θ of 21.5°, the	second
	(1) 18.5°	(2) 8.5°	(3) 31.2°	(4) 36.8°	
77.		ar spacing obtaine, the lattice parame		reflection of a diamond	d cubic
	(1) 0.905 Å	(2) 2.56 Å	(3) 3.62 Å	(4) 5.12 Å	
78.	The discrete val	ues of energy the a	tomic oscillator can h	ave:	

(1) $nh/2\pi\omega^2$ (2) $n^2h/2\pi\omega$ (3) $nh/2\pi\omega$

- If the Debye's temperature of metal is 450 K, the Debye's frequency is: $(1) 10^{13} Hz$ $(2) 10^{15} Hz$ $(3) 10^{23} Hz$ (4) 10 Hz
- The classical value of molar specific heat is:
- (1) $R_u/2$ (2) 3 R_u (3) $3 R_u/2$ (4) R_u
- 81. Two particles of rest mass m₀ approach each other with equal and opposite velocity v, in the laboratory frame. The total energy of one particle as measured in the rest frame of other is:
 - (2) $E = 2m_0c^2$ (1) $E = m_0 c^2$ (4) $E = 1/2m_0c^2$ (3) $E = 3m_0c^2$
- Two masses m_1 and m_2 connected by a spring of spring constant k rest on a frictionless surface. If the masses are pulled apart and let go, the time period of oscillation is:

(1)
$$T = 2\pi \sqrt{\frac{1}{k} \left(\frac{m_1 m_2}{m_1 + m_2}\right)}$$
 (2) $T = 2\pi \sqrt{k \left(\frac{m_1 + m_2}{m_1 m_2}\right)}$ (3) $T = 2\pi \sqrt{\frac{m_1}{k}}$ (4) $T = 2\pi \sqrt{\frac{m_2}{k}}$

- A body moves a distance of 10 m along a straight line under the action of force of 5 Newton. If the work done is 25 J, the angle which the force makes with the direction of motion of the body is:
 - (1) 90° (2) 60° (3) 30° (4) 0°

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84.	horizontal. If t		ction between the b	king an angle of 45° ody and the plane be	
	(1) 0.49 g	(2) 0.25 g	(3) 1.5 g	(4) 2.5 g	
85.	of radius 5.29	s mass of 9.11×10^{-31} × 10^{-11} m at a speed system will be:	kg. It revolves about d of 2.2×10^6 m/s.	t the nucleus in a circu The linear momentu	ılar orbit m of the
	(1) $1.1 \times 10^{34} \mathrm{kg}$	g-m/s ²	(2) 2.0×10^{-24}]	kg-m/s	
	(3) $1.1 \times 10^{-24} \mathrm{k}$	kg-m/s ²	(4) 4.1×10^{-34}]	kg-m/s ²	
86.	The moment of	inertia of the body of	does not depend upo	n:	
	(1) mass of the				9/
		ition of mass in the b	oodv		
		ocity of the body	of the same of the same		V4 (4
		the rotation of the bo	ody		
87.		a uniform disc of m is rotating at 70 rpm		us 50 cm. What is the	e kinetic
	(1) 241.8 J	(2) 300 J	(3) 134.6 J	(4) 34.56 J	
88.	A particle move the work done		= 3i + 2j – 6k to posi	tion $r_2 = 4i + j + 3k N$.	What is
	(1) 1 J	(2) 0.01 J	(3) 10 J	(4) 100 J	
89.	If $0.5i + 0.8j + c$	k is a unit vector. The	en c is equal to:		4 45
	(1) $\sqrt{0.89}$	(2) 0.2	(3) 0.3	(4) √0.11	
90.		o an electric dipole a lar bisector of dipole		of the dipole and at a	point on
		(2) $E_1 = 2E_2$	(3) $^{\prime}2E_1 = E_2$	(4) $E_1 = 4E_2$	
91.	According to B	ohr's atomic model,	the angular momer	atum of electron in nti	orbit is

(3) h/π

(1) $2h/\pi$

equal to an integral multiple of:

(2) $h/2\pi$

(4) $nh/2\pi$

92.	How does the mom	nentum of a photon of	chang	ge if the wavelen	gth	is halved?
	(1) Doubles		(2)	Quadruples		
	(3) Stays the same		(4)	Is cut to one-ha	lf	
93.	0 4	level system with Enter frequency of light e				V and the coefficient from E_2 and E_1 is:
khun ka sa	(1) $8.2 \times 10^{17} \text{ Hz}$	(2) $4.5 \times 10^{16} \text{ Hz}$	(3)	$2.5\times10^{15}\mathrm{Hz}$	(4)	$6.5 \times 10^{14} \text{ Hz}$
94.	Which of the follow body radiator?	wing colours is asso	ciate	d with the lowe	est te	emperature of a black
	(1) Red	(2) Blue	(3)	Green	(4)	Yellow
95.	The Ka line of ma	aterial has energy o	f 66	keV. What is t	he a	tomic number of the
	(1) 45	(2) 55	(3)	81	(4)	23
96.	The second secon					e minimum magnetic ectral line of 400 nm
	(1) 1.34 T	(2) 3.64 T	(3)	12 T	(4)	2.456 T
97.		om has two 3s elect term symbol of its gr			ectro	n outside filled inner
	$(1)^{3}P_{1}$	(2) $2^2 P_{5/2}$	(3)	$^{2}P_{1/2}$	(4)	² P _{3/2}
98.	Which of the follow	wing is used in atomi	ic clo	ocks?		
	(1) Laser	(2) Quartz	(3)	Maser	(4)	Helium
99.						ne life time, $\tau_{sp} = 10^{-6}$ s. Defficient of stimulated
	(1) $1.3 \times 10^{19} \mathrm{m/kg}$	arthur and larg	(2)	$1.3 \times 10^{19} \mathrm{m/g}$		
	(3) $6.6 \times 10^{19} \mathrm{cm/k}$	g	(4)	$6.6 \times 10^{19} \mathrm{m/g}$		
100.	The following type	e of laser can be used	for	generation of las	er p	ulse:
	(1) Nd-YAG laser		(2)	Carbon dioxide	e las	er
	(3) Helium neon l	aser	(4)	Ruby laser		70/2 14
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	s	r. No
Time: 11/2 Hours	Total Questions: 100	Max. Marks: 100
Roll No. (in figures)	(in words)	
Candidate's Name —	Date o	f Birth———
Father's Name	Mother's Name	
Date of Exam :		
(Signature of the Candidate)	(Sign	ature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

- 1. All questions are *compulsory* and carry equal marks. The candidates are required to attempt all questions.
- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- 5. Use only black or blue ball point pen of good quality in the OMR Answer-Sheet.
- 6. There will be negative marking. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

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SEAL

1.	Chromatic aberration is the production	duct of:					
	(1) dispersive power × focal length of red ray						
	(2) dispersive power × mean fo						
	(3) 1/ dispersive power × mear						
	(4) dispersive power × 1/ mear						
2.	The phenomenon of interference is used to prove that light is:						
	(1) longitudinal	(2) transverse					
	(3) stationary wave	(4) quantized					
3.	Two waves having the intensiti maximum to minimum intensit		duce interference. Th	e ratio of			
	(1) 10:8 (2) 9:1	(3) 4:1	(4) 2:1				
4.	Two straight and narrow parallight. Fringes formed on the s 0.5 mm apart. What is the wave	creen held at a distance	luminated by monoc of 100 cm from the	hromatic slits are			
	(1) 100 Å (2) 350 Å	(3) 500 Å	(4) 5000 Å				
5.	A microstate is a configuration	of:					
	(1) distinguishable particles w	ithin a given state					
	(2) indistinguishable particles	within a given state					
	(3) random distribution		remark report to be				
	(4) non-random distribution						
6.	In a micro canonical ensemble reservoir B. Then:	, a system A of fixed vol	ume is in contact wi				
	(1) A can exchange only energy with B						
	(2) A can exchange only particles with B						
	(3) A can exchange neither energy not particle with B						
	(4) A can exchange both energ	gy and particle with B	n seed to assemble the	*			
7.	The entropy for ten particles ir equal to:	a state with energy leve	el occupations of (4, 3	, 2, 1, 0) is			
	(1) $7.8 \mathrm{J K^{-1} mol^{-1}}$	(2) $2.45 \text{ J K}^{-1} \text{ r}$	mol^{-1}				
	(3) $1.45 \mathrm{J} \mathrm{K}^{-1} \mathrm{mol}^{-1}$	(4) $4.34 \text{ J K}^{-1} \text{ r}$					
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twice as fast? (1) 400 K

- copper at 0 K is:
 - (3) 1.43×10^{21} states/eV (4) 6.46×10^{20} states/eV

10. What is zero point energy?

- (1) The irremovable energy of a particle, corresponding to an excited state
- (2) The irremovable energy of a particle, corresponding to the lowest energy state
- (3) The removable energy of a particle, corresponding to and excited state
- (4) The removable energy of a particle, corresponding to the lowest energy state

11. An electron has a rest mass of 9.11×10^{-31} kg when its velocity of 0.9c the speed of light, its mass will be:

(1) $10.5 \times 10^{-31} \text{ kg}$

(2) $64.4 \times 10^{-31} \text{ kg}$

(3) $20.9 \times 10^{-31} \text{ kg}$

(4) $6.37 \times 10^{-37} \text{ kg}$

12. A rod of length 2 m moves with a velocity of 108 m/s relative to an observer at rest on the earth. What is the apparent length of the rod appearing to observer?

- (1) 11.78 m
- (2) 8.34 m
- (3) 55.4 m
- (4) 1.885 m

13. The fraction of electrons excited across the energy gap in Germanium (Eg = 0.7 eV) at room temperature (300 K) is:

- (1) 7×10^{-18}
- (2) 1.7×10^{-12} (3) 4×10^{-12} (4) 1.3×10^{-6}

14. The degeneracy of the quantum states with $(n_x^2 + n_y^2 + n_z^2) = 6$ is:

- (1) 12
- (2) 24
- (3) 48
- (4) 8

15. At 0 K, the probability of finding an electron at energy level E is unity, when:

- $(1) E = E_F$
- (2) E > E_F
- (3) $E < E_F$

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16.	The reverse saturation current in a p-n	diode:
	(1) increases	(2) decreases
	(3) remains constant	(4) oscillates
17.	The phase difference between the inpuin common emitter arrangement is:	at and output voltages of a transistor connected
	(1) 360° (2) 180°	(3) 90° (4) 270°
18.	The DC current gain of a common-late 10 mA. The base current value is:	pase transistor is 0.956 and emitter current is
	(1) 0.66 mA (2) 0.38 mA	(3) 0.25 mA (4) 0.44 mA
19.	The electrical power output of a photo	diode is maximum when a :
	(1) Small forward current flows throu	gh it, irrespective of the bias
	(2) Small forward bias exists across it	
	(3) Large reverse bias exists across it	are of the second secon
	(4) Small reverse bias exists across it	and the second second second second
20.	A common-emitter transistor has a ty current is 10 mA. The emitter current is	vpical value of gain (β) as 50 and the collector s :
	(1) 10.2 mA (2) 45.8 mA	(3) 22.4 mA (4) 12.5 mA
21.		ch each other with equal and opposite velocity energy of one particle as measured in the rest
	$(1) E = m_0 c^2$	$(2) E = 2m_0c^2$
	(3) $E = 3m_0c^2$	(4) $E = 1/2 m_0 c^2$
22.		by a spring of spring constant <i>k</i> rest on a pulled apart and let go, the time period of
	(1) $T = 2\pi \sqrt{\frac{1}{k} \left(\frac{m_1 m_2}{m_1 + m_2} \right)}$	(2) $T = 2\pi \sqrt{k \left(\frac{m_1 + m_2}{m_1 m_2}\right)}$
	$(3) T = 2\pi \sqrt{\frac{m_1}{k}}$	$(4) T = 2\pi \sqrt{\frac{m_2}{k}}$

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23.	A body moves a distance of 10 m along a straight line under the action of force of 5 Newton. If the work done is 25 J, the angle which the force makes with the direction of motion of the body is:							
	(1) 90°	(2)	60°	(3)	30°	(4) 0°	
24.	A body of m horizontal. If acceleration of	the coeffic	dent of iri	ction be	tween the	naking an body and	angle of d the plan	45° with the e be 0.3, the
	(1) 0.49 g	(2)	0.25 g	(3)	1.5 g	(4	2.5 g	
25.	An electron h of radius 5.29 electron in the	$9 \times 10^{-6} \text{ m}$	at a spee	kg. It red of 2.2	evolves above × 10 ⁶ m/	out the nu	cleus in a cear mome	circular orbit ntum of the
	(1) 1.1×10^{34}	kg-m/s ²		(2)	2.0×10^{-2}	24 kg-m/s	ord in many	
	(3) 1.1×10^{-24}	kg-m/s ²				34 kg-m/s ²		
26.	The moment	of inertia of	the body	does not	depend u	pon:		
	(1) mass of th				Calculation			
	(2) the distrib	oution of m	ass in the l	oody				
9	(3) angular v							
	(4) the axis of	f the rotatio	n of the bo	ody				
27.	A flywheel is energy when i	a uniform	disc of m	nass 72 k	g and rac	dius 50 cn	n. What is	the kinetic
	(1) 241.8 J	(2) 3			134.6 J	(4)	34.56 J	
28.	A particle morthe work done	ved from p	osition r ₁ =	= 3i + 2j -	- 6k to pos			N. What is
	(1) 1 J	(2) 0	.01 J	(3)	10 J	(4)	100 J	
29.	If $0.5i + 0.8j + 0.8j$	ck is a unit	vector. The	en c is eq	ual to:			of the fire
	(1) $\sqrt{0.89}$	(2) 0		(3)		(4)	√0.11	
30.	The field due the perpendicu	to an electri	ic dipole a	t an axia E2 are re	l point E ₁ ,			t a point on
	(1) $E_1 = E_2$		$_1 = 2E_2$	and the same	$2E_1 = E_2$	(4)	$E_1 = 4E_2$	
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31.	The atomic number of a nucleus is equal	to t	he number of:		
	(1) electrons it contains	(2)	protons it conta	ins	
	(3) neutrons it contains	(4)	nucleons it cont	ains	
32.	The antiparticle of electron is:				
	(1) positron (2) proton	(3)	alpha particle	(4)	beta particle
33.	The average life T and the decay constan	tλ	of a radioactive	nucle	eus are related as :
	(1) $T\lambda = 1$ (2) $T = 0.693/\lambda$	(3)	$T/\lambda = 1$	(4)	$T = c/\lambda$
34.	In nuclear reactions we have conservation	n o	f:		and the second second
	(1) mass only	(2)	energy only		
	(3) momentum only	(4)	all of the above		
35.	Which theory explains the attraction bet	wee	en protons and n	eutro	ons?
	(1) Quantum Chromodynamics	(2)	The Standard N	/lode	1
	(3) String Theory	(4)	The Grand Uni	fied	Theory
36.	The process in which two nuclei join tog	eth	er to form a new	nuc	leus is called:
	(1) fission	(2)	fusion		THE ARREST HAVE BEEN
	(3) chain reaction	(4)	nuclear transfo	rmat	tion
37.	In a nuclear reactor the moderator is:				
	(1) uranium-234 (2) uranium-238	(3)	cadmium	(4)	heavy water
38.	For making an atom bomb we use the pr	roce	ess called:		et 01 to
	(1) fission (2) fusion	(3)	ionization	(4)	electrolysis
39.	The energy released per fission of a 92U2	³⁵ n	ucleus is nearly		
	(1) 200 eV (2) 20 eV				2000 eV
40.	The decay of artificial radioactive isotop	es i	s accompanied b	y th	e emission of :
	(1) alpha particle (2) beta particle	(3)	positron	(4)	neutron
41.	One of the allotropy of carbon is graph the lattice parameters for graphite be a 2.2589 g/cm ³ . An estimated number of a	a =	2.451 Å; c = 6.7	701 Å	
	(1) 4 (2) 6	(3)	8	(4)	12
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	42.											
		(1) 0.34	(2) 0.52	(3) 0.68	(4) 0.74							
	43.	In ionic solid if the radius of anion is r_a and of cation is r_c , then bond length is:										
		$(1) (r_c + r_a)$	$(2) \sqrt{3}(r_c + r_a)$	(3) $\sqrt{3}/2(r_c + r_a)$	$(4) (r_c - r_a)$							
	44.	44. The number of lattice points in the rhombohedral unit cell is:										
		(1) 1	(2) 2	(3) 4	(4) 8							
	45.	The number of ur	nit cells in 1 m³ of FC	CC nickel ($r_{Ni} = 1.243$	Å):							
		(1) 2.3×10^{28}	(2) 3.3×10^{25}	(3) 2.3×10^{38}	(4) 12.3×10^{28}							
	46.	If the first reflect reflection will have	ion from the FCC α we an angle of θ of :	crystal has a Bragg a	angle θ of 21.5°, the secon	ıd						
		(1) 18.5°	(2) 8.5°	(3) 31.2°	(4) 36.8°							
	47.	If the interplanar spacing obtained from the second reflection of a diamond cubic crystal is 1.81 Å, the lattice parameter is:										
		(1) 0.905 Å	(2) 2.56 Å	(3) 3.62 Å	(4) 5.12 Å							
	48. The discrete values of energy the atomic oscillator can have :											
		(1) $nh/2\pi\omega^2$	(2) $n^2h/2\pi\omega$	(3). $nh/2\pi\omega$	(4) $2nh/2\pi\omega$							
	49.	If the Debye's tem	equency is:									
		(1) 10^{13} Hz	(2) 10^{15}Hz	(3) 10^{23} Hz	(4) 10 Hz							
	50.	The classical value	e of molar specific h	eat is:								
		(1) R _u /2	(2) 3 R _u	(3) 3 R _u /2	(4) R _u							
	51.	The type of flip-fl	op is used to store th	tore the data in registers :								
		(1) D flip-flop	a are a shrinkare about the	(2) RS flip-flop	Late 10 to the beginning							
	7 T	(3) JK flip-flop		(4) T flip-flop								
	52.	The flash memori	es find application in	n:								
		(1) super comput	ters	(2) mainframe sy	stems							
		(3) distributed sy	rstem	(4) portable device	ces							
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cubic

53.	With an amount of 110 J of heat is	s added to a gaseous system, whose internal energy	
	increases by 40 J. Then the amoun	t of external work done is:	
	(1) 120 J (2) 60 J	(3) 70 J (4) 30 J	
54.	In the Carnot engine when heat is	taken from the source its temperature :	
	(1) remains constant	(2) increases	
	(3) decreases	(4) fluctuate	
55.	The entropy at absolute zero of sy		
	(1) tends to increase	(2) zero	
	(3) maximum	(4) fluctuate	
56.	Maxwell's thermodynamic relatio	ns are valid for:	
	(1) closed system	value of the property of the p	
	(2) open system	(DO) - STORY THE THE STREET, IN CONTROL OF T	
	(3) a thermodynamic system in e	quilibrium	
	(4) only reversible process		
57.	The standard Gibbs energy chan property?	age accompanying a spontaneous process has what	
	(1) is always larger than the inter	nal energy change	
	(2) is greater than zero		
	(3) is less than or equal to zero	per pain Vanta le rimina van Stand Built 68	
	(4) it has no restrictions on its va	lue (C)	
58.	When the white light enters in a le	ens, it undergoes a change in :	
	(1) frequency	(2) wavelength	
	(3) velocity	(4) wavelength and velocity	
59.	A double convex air bubble in wa	iter will act like a:	
	(1) concave lens	(2) convex lens	
	(3) plane glass	(4) concave mirror	

60.	Two thin lenses are focal length of one of				mbination is 80 cm. If the her lens is :
	(1) 1.89 diopters		(2)	6 diopters	
	(3) -1.4 diopters		(4)	-3.75 diopters	
61.					minated by light with a e emitted photoelectrons
	(1) 1.9 eV	(2) 6.2 eV	(3)	5.7 eV	(4) 0.58 keV
62.	When the orbital qualifollowing number o		3,	the magnetic qua	antum number takes the
	(1) 6	(2) 10	(3)	7	(4) 14
63.	The total energy of	the electron in hydro	gen	atom is:	
	(1) -(13.6/n) eV		(2)	(13.6/n) eV	merca least (i)
	(3) -(13.6/n²) eV		(4)	$(13.6/n^2) \text{ eV}$	Small render 18 (See
64.	The maximum num	ber of electrons in a	sub	-shell with orbita	l quantum number <i>l</i> is :
	(1) $2l + 1$	(2) 2 <i>l</i> – 1	(3)	2(2l + 1)	(4) 2(2 <i>l</i> – 1)
65.					taneously determined. If ge of uncertainty in its
	(1) 3.11	(2) 5.32	(3)	1.97	(4) 9.456
66.	The de Broglie wave	elength of a 10 eV el	ectr	on is:	
	(1) 3.88×10^{-9} m		(2)	$3.88 \times 10^{-10} \text{ m}$	
	(3) $6.88 \times 10^{-10} \text{ m}$		(4)	$1.55 \times 10^{-10} \text{ m}$	
67.	equal to:				reshold frequency will be
	(1) $8 \times 10^{14} \text{Hz}$	(2) $8 \times 10^{10} \text{Hz}$	(3)	$5 \times 10^{20} \mathrm{Hz}$	(4) $2 \times 10^{14} \mathrm{Hz}$
68.	The energy levels of	f a particle that is con	nfin	ed within the infi	nite potential well:
	h^2k^2	h^2k^2	(2)	hk	hk^2
	$8\pi^2 m$	$(2) \frac{h^2k^2}{4\pi m}$	(3)	$4\pi m$	$(4) \frac{hk^2}{8\pi m^2}$
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69.		s of the lowest and dimensional square		t energy levels of a particle
	(1) 0 and 1	(2) 0 and 2	(3) 1 and 4	(4) 1 and 2
70.		n jumps from an orbound level (E_1) is:	it where n = 1 to n :	= 4, its energy in terms of the
	(1) E ₁ /9	(2) $E_1/16$	(3) 2 E ₁	(4) 16 E ₁
71.	According to Bo equal to an integ		he angular moment	tum of electron in nth orbit is
	(1) $2h/\pi$	(2) $h/2\pi$	(3) h/π	(4) $nh/2\pi$
72.	How does the m	omentum of a photo	n change if the wave	elength is halved?
	(1) Doubles	a grinsquitte u um	(2) Quadruples	eran languagen in it. Agr
	(3) Stays the sar	ne	(4) Is cut to one	e-half
73.				= -3.4 eV and the coefficient insition from E_2 and E_1 is:
	(1) $8.2 \times 10^{17} \text{ Hz}$		(2) $4.5 \times 10^{16} \text{ Hz}$	z
	(3) $2.5 \times 10^{15} \text{ Hz}$		(4) $6.5 \times 10^{14} \text{ Hz}$	Z
74.	Which of the followy body radiator?	llowing colours is as	ssociated with the le	owest temperature of a black
	(1) Red	(2) Blue	(3) Green	(4) Yellow
75.	The $K\alpha$ line of element?	material has energy	of 66 keV. What	is the atomic number of the
	(1) 45	(2) 55	(3) 81	(4) 23
76.				used, the minimum magnetic n a spectral line of 400 nm
	(1) 1.34 T	(2) 3.64 T	(3) 12 T	(4) 2.456 T
77.		atom has two 3s el ne term symbol of its		electron outside filled inner
	$(1)^{-3}P_1$	(2) $2^2 P_{5/2}$	$(3)^{-2}P_{1/2}$	$^{2}P_{3/2}$
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78.	3. Which of the following is used in atomic clocks?						
	(1) Laser	(2)	Quartz	(3)	Maser	(4) Helium	
79.						Å and the life time, t	
	(1) $1.3 \times 10^{19} \mathrm{m}/$	kg		(2)	$1.3 \times 10^{19} \mathrm{r}$	n/g	
	(3) $6.6 \times 10^{19} \mathrm{cm}$	/kg		(4)	$6.6 \times 10^{19} \mathrm{r}$	n/g	
80.	The following ty	pe of la	ser can be u	ised for g	generation of	of laser pulse :	
	(1) Nd-YAG las	ser		(2)	Carbon di	oxide laser	
	(3) Helium neor	laser		(4)	Ruby laser		
81.	If the potential of the electric field					part in an electric fiel around :	d of 20 V,
	(1) 20 V/m	(2)	40 V/m	(3)	10 V/m	(4) 10 V/cm	
82.		And the second second				gh a point in a magnification <i>B</i> at that	
4.7	(1) q	(2)	v	(3)	F	(4) q , v , and F	
83.	The permeability	of par	a and ferror	magnetic	materials a	are:	
	(1) greater than	unity		(2)	less than u	inity	
	(3) equal to unit	y	ne w yva	(4)	negative		
84.	Poynting vector	is expr	essed as:			The Control	
	(1) $(H \times E)$			(2)	$(E \times H)$		
	(3) $(E \times H).dS$			(4)	$(H \times E).dS$	A MAGELAN I	

85. Young's modulus (Y), Modulus of rigidity (η) and Poisson ratio (σ) are related as :

$$(1) \quad Y = \frac{2\eta}{(1+\sigma)}$$

$$(2) \quad \sigma = \frac{2Y}{(1+\eta)}$$

$$(3) \quad \frac{Y}{\eta} = 2(1+\sigma)$$

(4)
$$2Y = \eta(1+\sigma)$$

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00	section is 1 sq.cm and Young modul	l wire to double its length when its area of cross- us of $2 \times 10^{11} \text{ N/m}^2$.			
	(1) $2 \times 10^7 \mathrm{N}$	(2) $4.56 \times 10^9 \text{ N}$			
	(3) $6.34 \times 10^5 \mathrm{N}$	(4) $1.5 \times 10^3 \mathrm{N}$			
87	. The mean kinetic energy E per unit s	volume and the pressure P of a gas are related as :			
	(1) $P = 2/3 E$ (2) $P = 3/2 E$	HEAT (1)			
00		(3) $P = 1/2 E$ (4) $P = \sqrt{3}/2 E$			
88	or equipartition of energy w	as postulated by :			
	(1) Maxwell (2) Boltzman	(3) Stefan (4) Weins			
89.	. The viscosity of gas is directly propo	rtional to:			
	(1) temperature	(2) square root of temperature			
	(3) characteristic gas constant	(4) density of gas			
90.	A reference frame attached to the ear	th:			
	(1) is an inertial frame by definition	and this office the transport mentions and the second			
		se the earth is revolving round the sun			
	(3) is an inertial frame because Newt	on's laws are applicable in the sun			
	(4) cannot be an inertial frame because	se the earth is rotating about its own axis			
91.	Bosons are particle with:	se the earth is rotating about its own axis			
	(1) integral spins				
	(2) half-integral spins				
	(3) does not obey the Fermi-Dirac sta				
	(4) they possess conserved baryon or lepton quantum number				
92.	What is the limit of the molecular vi goes to zero?	brational partition function as the temperature			
	(1) infinity (2) zero	(3) one (4) negative			
93.	Newton's ring illustrates the phenome	non of:			
	(1) interference	(2) diffraction			
	(3) polarization	(4) circularly polarized light			
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	H. (2017) :	1.1.0.			

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94.	94. Which of the following phenomena produces the colours in the soap b	oubble?			
	(1) diffraction (2) polarization (3) dispersion (4) inter-	ference			
95.	95. A transparent film of glass of refractive index 1.5 is introduced norm of one of the interfering beams of Michelson's interferometer which with light of wavelength 4800 Å. This causes 500 dark fringes to safield and the corresponding film thickness is:	h is illuminated			
	(1) $1 \mu m$ (2) $240 \mu m$ (3) $0.5 mm$ (4) 0.01	mm			
96.	96. Maximum number of orders available with a grating is:				
	(1) independent of grating element	Alaska Ali			
	(2) directly proportional to grating element				
	(3) inversely proportional to grating element				
	(4) proportional to grating element	inteloy (C), tolon			
97.	97. The condition for observing Fraunfoher diffraction from a single slit wave front incident on the slit should be:	is that the light			
	(1) spherical (2) cylindrical (3) plane (4) ellip	tical			
98.	98. Which phenomenon causes the polarization of light?				
	(1) reflection (2) double reflection	anna (b)			
	(3) double refraction (4) diffraction				
99.	99. Light wave are transverse in nature, can be demonstrated by phenomenon of :	observing the			
	(1) dispersion (2) interference				
	(3) polarization (4) diffraction				
100.					
	(1) 0.02275 cm (2) 0.567 cm				
	(3) 0.1 cm (4) 0.01 cm				
	notational action (Cr. 1977)	then it is			

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CPG-EE-2018 (Physics)-(SET-Y)

10416

D		Sr. No.	
Time: 11/2 Hours	Total Questions : 100		Max. Marks: 100
Roll No. (in figures)	(in words)		
Candidate's Name		Date of Birth	
Father's Name —	Mother's Name		
Date of Exam :			
(Signature of the Candidate)	-	(Signature of	the Invigilator)

STARTING THE QUESTION PAPER.

- 1. All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- 5. Use only black or blue ball point pen of good quality in the OMR Answer-Sheet.
- 6. There will be negative marking. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get 1/4 discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

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1.	A surface of zinc having a work function of 4.3 eV is illuminated by light with a wavelength of 200 nm. The maximum kinetic energy of the emitted photoelectrons are:						
	(1) 1.9 eV	(2) 6.2 eV	(3) 5.7 eV	(4) 0.58 keV			
2.	When the orbital following number	quantum number <i>l</i> of values :	= 3, the magnetic q	uantum number takes the			
	(1) 6	(2) 10	(3) 7	(4) 14			
3.	The total energy o	of the electron in hyd	rogen atom is:	Comment of			
	(1) -(13.6/n) eV	(2) (13.6/n) eV	(3) $-(13.6/n^2)$ eV	(4) (13.6/n²) eV			
4.	The maximum nu	mber of electrons in	a sub-shell with orbi	tal quantum number l is:			
	(1) $2l + 1$	(2) 21-1	(3) $2(2l+1)$	$(4) \ \ 2(2l-1)$			
5.	The position and its position is loomomentum?	momentum of a 1 k cated within 1 Å,	keV electron are sim- what is the percen	ultaneously determined. If tage of uncertainty in its			
	(1) 3.11	(2) 5.32	(3) 1.97	(4) 9.456			
6.	The de Broglie wa	velength of a 10 eV e	electron is:				
			(3) $6.88 \times 10^{-10} \text{ m}$	(4) $1.55 \times 10^{-10} \mathrm{m}$			
7.	The work function equal to:	of photoelectric ma	terial is 3.3 eV. The t	hreshold frequency will be			
	(1) $8 \times 10^{14} \text{Hz}$	(2) $8 \times 10^{10} \mathrm{Hz}$	(3) $5 \times 10^{20} \mathrm{Hz}$	(4) $2 \times 10^{14} \text{Hz}$			
8.	The energy levels	of a particle that is co	onfined within the in	finite potential well:			
			$(3) \frac{hk}{4\pi m}$				
9.	The degeneracies confined to two di	of the lowest and mensional square w	the second lowest e	nergy levels of a particle			
	(1) 0 and 1	(2) 0 and 2	(3) 1 and 4	(4) 1 and 2			
10.	When an electron energy of the grou	jumps from an orbit (E_1) is:	where $n = 1$ to $n = 4$, its energy in terms of the			

(3) 2 E₁

(4) 16 E₁

(1) $E_1/9$

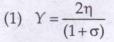
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(2) $E_1/16$

11.	Bosons are particle with:						
	(1) integral spins						
	(2) half-integral spins						
	(3) does not obey the Fermi-Dirac stati	stics					
	(4) they possess conserved baryon or l	epton quantum number					
12.	What is the limit of the molecular vib goes to zero?	prational partition function as the temperature					
	(1) infinity (2) zero	(3) one (4) negative					
13.	Newton's ring illustrates the phenomer	non of:					
	(1) interference	(2) diffraction					
	(3) polarization	(4) circularly polarized light					
14.	Which of the following phenomena pro	oduces the colours in the soap bubble?					
	(1) diffraction (2) polarization	(3) dispersion (4) interference					
15.	of one of the interfering beams of M	ve index 1.5 is introduced normally in the path ichelson's interferometer which is illuminated is causes 500 dark fringes to sweep across the ness is:					
	(1) 1 μm (2) 240 μm	(3) 0.5 mm (4) 0.01 mm .					
16.	Maximum number of orders available	with a grating is:					
	(1) independent of grating element						
	(2) directly proportional to grating element						
	(3) inversely proportional to grating element						
	(4) proportional to grating element	At his work Laft Lawrencing back A.					
17.	The condition for observing Fraunfohowave front incident on the slit should be	er diffraction from a single slit is that the light					
	(1) spherical	(2) cylindrical					
	(3) plane	(4) elliptical					
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18.	8. Which phenomenon causes the polarization of light?	
	(1) reflection (2) double re	eflection
	(3) double refraction (4) diffraction	n - Larens and Marie (I).
19.	phenomenon of:	emonstrated by observing the ion (4) diffraction
20.		dinary rays are 1.586 and 1.592.
	(1) 0.02275 cm (2) 0.567 cm (3) 0.1 cm	(4) 0.01 cm
21.	1. The type of flip-flop is used to store the data in registe	rs:
	(1) D flip-flop (2) RS flip-flop (3) JK flip-flo	op (4) T flip-flop
22.	2. The flash memories find application in :	
	(1) super computers (2) mainfran	ne systems
	(3) distributed system (4) portable	devices
23.	3. With an amount of 110 J of heat is added to a gaseou increases by 40 J. Then the amount of external work decreases by 40 J.	
	(1) 120 J (2) 60 J (3) 70 J	(4) 30 J
24.	4. In the Carnot engine when heat is taken from the sour	ce its temperature :
	(1) remains constant (2) increases	
	(3) decreases (4) fluctuate	
25.	5. The entropy at absolute zero of system is:	
	(1) tends to increase (2) zero	
	(3) maximum (4) fluctuate	
26.	6. Maxwell's thermodynamic relations are valid for :	The state of the s
	(1) closed system	on the second second second
	(2) open system	
	(3) a thermodynamic system in equilibrium	
	(4) only reversible process	
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27.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	companying a spontaneous process has what
	property?	
	(1) is always larger than the internal er	ergy change
	(2) is greater than zero	
	(3) is less than or equal to zero	
	(4) it has no restrictions on its value	
28.	When the white light enters in a lens, it	undergoes a change in :
	(1) frequency	(2) wavelength
	(3) velocity	(4) wavelength and velocity
29.	A double convex air bubble in water w	ill act like a :
	(1) concave lens	(2) convex lens
	(3) plane glass	(4) concave mirror
30.		focal length of the combination is 80 cm. If the m, the power of the other lens is:
	(1) 1.89 diopters	(2) 6 diopters
	(3) -1.4 diopters	(4) -3.75 diopters
31.	If the potential difference between two the electric field intensity between thes	points 2 cm apart in an electric field of 20 V, e points will be around :
	(1) 20 V/m (2) 40 V/m	(3) 10 V/m (4) 10 V/cm
32.		elocity, v through a point in a magnetic field the magnetic induction B at that point will
	(1) q (2) v	(3) F (4) $q, v, \text{ and } F$
33.	The permeability of para and ferromage (1) greater than unity (3) equal to unity	(2) less than unity (4) negative
34.	Poynting vector is expressed as:	150 7 1190 (4)
54.	(1) $(H \times E)$ (2) $(E \times H)$	(3) $(E \times H).dS$ (4) $(H \times E).dS$
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(2)
$$\sigma = \frac{2Y}{(1+\eta)}$$

(3)
$$\frac{\gamma}{\eta} = 2(1+\sigma)$$

(4)
$$2Y = \eta(1 + \sigma)$$

The force required to stretch a steel wire to double its length when its area of crosssection is 1 sq.cm and Young modulus of $2 \times 10^{11} \text{ N/m}^2$:

(1)
$$2 \times 10^7 \, \text{N}$$

(2)
$$4.56 \times 10^9 \text{ N}$$

(3)
$$6.34 \times 10^5 \text{ N}$$

(4)
$$1.5 \times 10^3 \,\mathrm{N}$$

37. The mean kinetic energy E per unit volume and the pressure P of a gas are related as:

(1)
$$P = 2/3 E$$

(2)
$$P = 3/2 E$$

(3)
$$P = 1/2E$$

(4)
$$P = \sqrt{3}/2E$$

The law of equipartition of energy was postulated by:

- (1) Maxwell
- (2) Boltzman
- (3) Stefan
- (4) Weins

The viscosity of gas is directly proportional to:

(1) temperature

- (2) square root of temperature
- (3) characteristic gas constant
- (4) density of gas

40. A reference frame attached to the earth:

- (1) is an inertial frame by definition
- (2) cannot be an inertial frame because the earth is revolving round the sun
- (3) is an inertial frame because Newton's laws are applicable in this frame
- (4) cannot be an inertial frame because the earth is rotating about its own axis

41. The atomic number of a nucleus is equal to the number of:

- (1) electrons it contains
- (2) protons it contains
- (3) neutrons it contains
- (4) nucleons it contains

42. The antiparticle of electron is :

- (2) proton (3) alpha particle (4) beta particle

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43.	The average life T and the decay const	ant λ of a radioactive nucleus are related as:			
	(1) $T\lambda = 1$ (2) $T = 0.693/\lambda$	(3) $T/\lambda = 1$ (4) $T = c/\lambda$			
44.	In nuclear reactions we have conserva-	tion of:			
	(1) mass only	(2) energy only			
	(3) momentum only	(4) all of the above			
45.	Which theory explains the attraction b	etween protons and neutrons?			
	(1) Quantum Chromodynamics	(2) The Standard Model			
	(3) String Theory	(4) The Grand Unified Theory			
46.	The process in which two nuclei join to	ogether to form a new nucleus is called:			
	(1) fission	(2) fusion			
	(3) chain reaction	(4) nuclear transformation			
47.	In a nuclear reactor the moderator is:				
	(1) uranium-234 (2) uranium-238	(3) cadmium (4) heavy water			
48.	For making an atom bomb we use the	process called:			
	(1) fission (2) fusion	(3) ionization (4) electrolysis			
49.	The energy released per fission of a 92	U ²³⁵ nucleus is nearly:			
	(1) 200 eV (2) 20 eV	(3) 200 MeV (4) 2000 eV .			
50.	The decay of artificial radioactive isotopes is accompanied by the emission of :				
	(1). alpha particle	(2) beta particle			
	(3) positron	(4) neutron			
51.	One of the allotropy of carbon is graphite whose crystal structure is hexagonal. Let the lattice parameters for graphite be a = 2.451 Å ; c = 6.701 Å and with density of 2.2589 g/cm^3 . An estimated number of atoms in their unit cell:				
	(1) 4 (2) 6	(3) 8 (4) 12			
52.	The packing efficiency of diamond cul	bic unit cell is:			
	(1) 0.34 (2) 0.52	(3) 0.68 (4) 0.74			
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53.	In ionic solid if the	e radius of anion is ra	and of cation is rc, th	en bond length is:
	$(1) (r_c + r_a)$	$(2) \sqrt{3}(r_c + r_a)$	(3) $\sqrt{3}/2(r_c + r_a)$	$(4) (r_c - r_a)$
54.	The number of lat	tice points in the rho	mbohedral unit cell is	siste to see the late is:
	(1) 1	(2) 2	(3) 4	(4) 8
55.	The number of un	it cells in 1 m³ of FCC	C nickel (r _{Ni} = 1.243 Å):
	(1) 2.3×10^{28}	(2) 3.3×10^{25}	(3) 2.3×10^{38}	(4) 12.3×10^{28}
56.		ion from the FCC cree an angle of θ of :	ystal has a Bragg an	gle θ of 21.5°, the second
	(1) 18.5°	(2) 8.5°	(3) 31.2°	(4) 36.8°
57.	If the interplanar crystal is 1.81 Å, the	spacing obtained fr he lattice parameter i	om the second refle	ction of a diamond cubic
	(1) 0.905 Å	(2) 2.56 Å	(3) 3.62 Å	(4) 5.12 Å
58.	The discrete value	es of energy the atom	ic oscillator can have	TACHOLSAN IS HIS TON
	(1) $nh/2\pi\omega^2$	(2) $n^2h/2\pi\omega$	(3) $nh/2\pi\omega$	(4) $2nh/2\pi\omega$
59.	If the Debye's tem	perature of metal is 4	50 K, the Debye's fre	quency is :
	(1) 10 ¹³ Hz	(2) 10^{15}Hz	(3) 10^{23} Hz	(4) 10 Hz
60.	The classical value	e of molar specific he	at is:	18 (M. 17 × 1. × 6)
	(1) R _u /2	(2) 3 R _u	(3) 3 R _u /2	(4) R _u
61.	According to Boh equal to an integra		e angular momentum	n of electron in n th orbit is
	(1) $2h/\pi$	(2) $h/2\pi$	(3) h/π	(4) $nh/2\pi$
62.	How does the mor	mentum of a photon	change if the waveler	ngth is halved?
	(1) Doubles	(2) Quadruples	(3) Stays the same	(4) Is cut to one-half
63.	Consider the two $A_{21}=6 \times 10^8 \text{S}^{-1}$. The	-level system with E ne frequency of light	$E_1 = -13.6 \text{ eV}, E_2 = -10.6 \text{ eV}$ emitted due to transi	3.4 eV and the coefficient tion from E_2 and E_1 is:
	(1) $8.2 \times 10^{17} \mathrm{Hz}$	(2) $4.5 \times 10^{16} \mathrm{Hz}$	(3) $2.5 \times 10^{15} \mathrm{Hz}$	(4) $6.5 \times 10^{14} \text{ Hz}$
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	body radiator?					
	(1) Red	(2) Blue	(3)	Green	(4) Yellow	
65.	The Ka line of n element?	naterial has energy o	of 66	keV. What is t	he atomic number of the	
	(1) 45	(2) 55	(3)	81	(4) 23	
66.					d, the minimum magnetic spectral line of 400 nm	
	(1) 1.34 T	(2) 3.64 T	(3)	12 T	(4) 2.456 T	
67.		atom has two 3s electer term symbol of its g			ectron outside filled inner	
	(1) ³ P ₁	(2) $2^2 P_{5/2}$	(3)	² P _{1/2}	$^{2}P_{3/2}$	
68.	Which of the following is used in atomic clocks?					
	(1) Laser	(2) Quartz	(3)	Maser	(4) Helium	
69.	A solid-state laser emits radiation of wavelength of 6000 Å and the life time, $\tau_{sp} = 10^{-6}$ s. Assume that the refractive index of the medium is one and the coefficient of stimulated emission is :					
	(1) $1.3 \times 10^{19} \mathrm{m/l}$	kg .	(2)	$1.3 \times 10^{19} \mathrm{m/g}$		
	(3) $6.6 \times 10^{19} \mathrm{cm}$	'kg	(4)	$6.6 \times 10^{19} \mathrm{m/g}$	TO THE REAL PROPERTY OF THE PARTY OF THE PAR	
70.	The following type of laser can be used for generation of laser pulse :					
	(1) Nd- YAG lase	er	(2)	Carbon dioxid	e laser	
	(3) Helium neon	laser		Ruby laser		
71.	Chromatic aberra	ation is the product of	f:			
	(1) dispersive po	ower × focal length of	red r	ay		
	(2) dispersive po	ower × mean focal len	gth			
	(3) 1/ dispersive	e power × mean focal	lengt	h		
	(4) dispersive po	ower × 1/ mean focal	lengt	h		
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64. Which of the following colours is associated with the lowest temperature of a black

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72.	The phenomenon of interference is used to prove that light is:						
	(1) longitudinal	(2) transverse					
	(3) stationary wave	(4) quantized					
73.	Two waves having the intensities in the ratio of 9:1 produce interference. The ratio of maximum to minimum intensity is equal to:						
	(1) 10:8 (2) 9:1	(3) 4:1	(4) 2:1				
74.	Two straight and narrow parallel slits 1 mm apart are illuminated by monochromatic light. Fringes formed on the screen held at a distance of 100 cm from the slits are 0.5 mm apart. What is the wavelength of light?						
	(1) 100 Å (2) 350 Å	(3) 500 Å	(4) 5000 Å				
75.	A microstate is a configuration of:						
	(1) distinguishable particles within a given state						
	(2) indistinguishable particles within a given state						
	(3) random distribution						
18.4	(4) non-random distribution						
76.	In a micro canonical ensemble, a system A of fixed volume is in contact with a large reservoir B. Then:						
	(1) A can exchange only energy with B						
	(2) A can exchange only particles with B						
	(3) A can exchange neither energy not particle with B						
	(4) A can exchange both energy and particle with B						
77.	The entropy for ten particles in a state with energy level occupations of (4, 3, 2, 1, 0) is equal to:						
	(1) 7.8 J K ⁻¹ mol ⁻¹	(2) 2.45 J K ⁻¹ mo	pl^{-1}				
	(3) $1.45 \text{J K}^{-1} \text{mol}^{-1}$	(4) 4.34 J K ⁻¹ mo	bl^{-1}				
78.	An object is at a temperature of 673 K. At what temperature would it radiate energy twice as fast?						
	(1) 400 K (2) 550 K	(3) 800 K	(4) 1000 K				
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79.	The number of electron states per electron states per electron at 0 K is:	ctro	n volt at $E = E_F$	/2 in a 1 g of sample of
	(1) $3.46 \times 10^{22} \text{ states/eV}$	(2)	$5.46 \times 10^{23} \text{ state}$	s/eV
	(3) $1.43 \times 10^{21} \text{ states/eV}$	(4)	$6.46 \times 10^{20} \text{ state}$	s/eV
80.	What is zero point energy?		Fail Constant of	
	(1) The irremovable energy of a particle	e, co	rresponding to a	n excited state
	(2) The irremovable energy of a particle	e, co	rresponding to the	he lowest energy state
	(3) The removable energy of a particle,	cor	responding to an	d excited state
	(4) The removable energy of a particle,	cor	responding to the	e lowest energy state
81.	An electron has a rest mass of 9.11×10^{-10} light, its mass will be :	10 ⁻³¹	kg when its vel	ocity of 0.9c the speed of
	(1) $10.5 \times 10^{-31} \text{ kg}$	(2)	$64.4 \times 10^{-31} \text{ kg}$	
	(3) $20.9 \times 10^{-31} \text{ kg}$	(4)	$6.37 \times 10^{-37} \mathrm{kg}$	
82.	A rod of length 2 m moves with a velocithe earth. What is the apparent length of	200		
	(1) 11.78 m (2) 8.34 m	(3)	55.4 m	(4) 1.885 m
83.	The fraction of electrons excited across room temperature (300 K) is :	the	energy gap in Ge	ermanium (Eg = 0.7 eV) at
	(1) 7×10^{-18}	(2)	1.7×10^{-12}	
	(3) 4×10^{-12}	(4)	1.3×10^{-6}	
84.	The degeneracy of the quantum states v	with	$(n_x^2 + n_y^2 + n_z^2) = 6$	5 is:
	(1) 12 (2) 24	(3)	48	(4) 8
85.	At 0 K, the probability of finding an ele	n at energy level	E is unity, when:	
	(1) $E = E_F$ (2) $E > E_F$	(3)	$E < E_F$	(4) $E >> E_F$
86.	The reverse saturation current in a p-n	dioc	le:	
	(1) increases	(2)	decreases	Company Colon
	(3) remains constant	(4)	oscillates	

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87.	The phase difference between the input and output voltages of a transistor connected						
	in common emitter arrangement is:				and the southern the		
	(1) 360°	(2)	180°	(3) 90°	(4) 270°		

- **88.** The DC current gain of a common-base transistor is 0.956 and emitter current is 10 mA. The base current value is :
 - (1) 0.66 mA (2) 0.38 mA (3) 0.25 mA (4) 0.44 mA
- 89. The electrical power output of a photodiode is maximum when a:
 - (1) Small forward current flows through it, irrespective of the bias
 - (2) Small forward bias exists across it
 - (3) Large reverse bias exists across it
 - (4) Small reverse bias exists across it
- **90.** A common-emitter transistor has a typical value of gain (β) as 50 and the collector current is 10 mA. The emitter current is:
 - (1) 10.2 mA (2) 45.8 mA (3) 22.4 mA (4) 12.5 mA
- **91.** Two particles of rest mass m₀ approach each other with equal and opposite velocity *v*, in the laboratory frame. The total energy of one particle as measured in the rest frame of other is:
 - (1) $E = m_0 c^2$ (2) $E = 2m_0 c^2$ (3) $E = 3m_0 c^2$ (4) $E = 1/2m_0 c^2$
- **92.** Two masses m_1 and m_2 connected by a spring of spring constant k rest on a frictionless surface. If the masses are pulled apart and let go, the time period of oscillation is:

(1)
$$T = 2\pi \sqrt{\frac{1}{k} \left(\frac{m_1 m_2}{m_1 + m_2}\right)}$$
 (2) $T = 2\pi \sqrt{k \left(\frac{m_1 + m_2}{m_1 m_2}\right)}$ (3) $T = 2\pi \sqrt{\frac{m_1}{k}}$ (4) $T = 2\pi \sqrt{\frac{m_2}{k}}$

- **93.** A body moves a distance of 10 m along a straight line under the action of force of 5 Newton. If the work done is 25 J, the angle which the force makes with the direction of motion of the body is :
 - (1) 90° (2) 60° (3) 30° (4) 0°

- 94. A body of mass m slide down an inclined plane making an angle of 45° with the horizontal. If the coefficient of friction between the body and the plane be 0.3, the acceleration of the body is approximately equal to:
 - (1) 0.49 g
- (2) 0.25 g
- (3) 1.5 g
- (4) 2.5 g
- An electron has mass of 9.11×10^{-31} kg. It revolves about the nucleus in a circular orbit of radius 5.29×10^{-11} m at a speed of 2.2×10^6 m/s. The linear momentum of the electron in this system will be:
 - (1) $1.1 \times 10^{34} \text{ kg-m/s}^2$

(2) $2.0 \times 10^{-24} \text{ kg-m/s}$

(3) $1.1 \times 10^{-24} \text{ kg-m/s}^2$

- (4) $4.1 \times 10^{-34} \text{ kg-m/s}^2$
- The moment of inertia of the body does not depend upon: 96.
 - (1) mass of the body
 - (2) the distribution of mass in the body
 - (3) angular velocity of the body
 - (4) the axis of the rotation of the body
- 97. A flywheel is a uniform disc of mass 72 kg and radius 50 cm. What is the kinetic energy when it is rotating at 70 rpm?
 - (1) 241.8 J (2) 300 J
- (3) 134.6 J
- (4) 34.56 J
- **98.** A particle moved from position $r_1 = 3i + 2j 6k$ to position $r_2 = 4i + j + 3k$ N. What is the work done?
 - (1) 1 J
- (2) 0.01 J
- (3) 10 J
- (4) 100 J
- 99. If 0.5i + 0.8j + ck is a unit vector. Then c is equal to:
 - $(1) \sqrt{0.89}$
- (2) 0.2
- (3) 0.3
- $(4) \ \sqrt{0.11}$
- The field due to an electric dipole at an axial point E1, of the dipole and at a point on the perpendicular bisector of dipole E2 are related as:
 - (1) $E_1 = E_2$
- (2) $E_1 = 2E_2$
- (4) $E_1 = 4E_2$

ANSWER KEY OF PHYSICS MDUCEE 2018

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Q. No.	А	В	С	D
1	3	4	2	1
2	1	4	4	3 4
3	2	1	3	3 -
4	1	2	4	3.
5	2	3	1	1 .
6	3	1	3	2 -
7	1	1	1	1.
8	4	1	3	1
9	3	2	3	4.
10	2	1	2	4 .
11	4	2	1	1 .
12	4	1	1	2
13	1	1	4	1
14	2	4	2	4
15	3	1	3	2
16	1	2	3	2
17	1	4	2	3
18	1	1	4	.3 -
19	2	3	2	3
20	1	3	1	1
21	1	1	3	1 '
22	1	3	1	4
				3
23 24	2	3	2	1
25		1	2	2
26		2	3	3 -
27	2	1	1	3
28	<u> </u>	1	4	. 4
29		4	3	2
30		4	2	.4 -
31	1	1	2	4
32		2	1	4 .
33		1	1	1
34		4	4	2
35		2	1	3
36		2 .	2	1 1
37		3	4	1
38		3	1	1

ANSWER KEY OF PHYSICS MDUCEE 2018

71113	VVLIVICEI	71 11113103	IVIDUCEL ZO	710
Q. No.	Α	В	С	D
39	2	3	3	2
40	4	1	3	1.
41	2	1	4	2.
42	4	4	1	1
43	3	3	1	1
44	4	1	1	4
45	1	2 .	1	1
46	3	3	3	2
47	1	3	4	4
48	3	4	3	1
49	3	2	1	3
50	2	4	2	3 -
51	1	1	1	4 ·
52	2	1	4	1 -
53	1	4	3	1 .
54	4	2	1	1 .
55	2	3	2	1
56	2	3	3	3
57	3	2 .	3	4 ·
58	3	4	4	3
59	3	2	2	1 -
60	1	1	4	2
61	4	2	1	2.
62	1	4	3	1
63	1	3	3	3
64	1	4	3	1
65	1	1	1	3 ·
66	3	3	2	1 .
67	4	1	1	3
68	3	3	1	3 ·
69	1	3	4	1.
70	2	2	4	4
71	1	4	2	2
72	3	1	1	4
73	3	1	3	3
74	3 .	1	1	. 4
75	1	1	3	1
76	2	3	1	3

ANSWER KEY OF PHYSICS MDUCEE 2018

Q. No.	Α	В	С	D
77	1	4	3	1.
78	1	3 .	3	3 ·
79	4	1	1	3 ·
80	4	2	4	2
81	2	3	4	1
82	1	1	4	1.
83	3	2	1	4 -
84	1	1	2	2
85	3	2	3	3 .
86	1	3	1	3
87	3	1	1	2 -
88	3	4	1	4
89	1	3	2	2 -
90	4	2 .	1	1 ·
91	2	2	1	3.
92	1	1	2	1
93	1	3	1	2.
94	4	1	4	1.
95	1	3	2	2 3
96	2	1	2	3
97	4	3	3	1
98	1	3	3	4 ·
99	3	1	3	3
100	3	4	1	2 ·