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## (DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU

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## PHD-EE-2023-24

SET-Y

Physics 10029

		Sr. No
Time: 11/4 Hours	Max. Marks : 100	Total Questions: 100
Roll No. (in figures)	(in words)	
Name	Date of Birth	
Father's Name	Mother's Name	
Date of Examination		
	() _	
(Signature of the Candidate)		(Signature of the Invigilator)

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

1. All questions are compulsory.

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 unfairmeans / mis-behaviour 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. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to

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- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

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- 1. The directional derivative of  $\varphi = x^2 yz + 2xz^3$  at (1, 1, -1) in the direction  $2\hat{i} 2\hat{j} + \hat{k}$ 
  - (1)  $\frac{2}{3}$

(2)  $-\frac{2}{3}$ (4)  $\frac{1}{3}$ 

(3)  $\frac{5}{3}$ 

- The angle between the surfaces  $x^2 + y^2 + z^2 = 1$  and  $z = x^2 + y^2 1$  at the point
  - (1) 15.76° surgeon as also any one in (2) 1.75° of T count graters in (2)

(3) 2.53°

- (4) 25.23°
- 3. A G.M. counter records 4,900 background counts in 100 min. with a radioactive source in position, the same total number of counts are recorded in 20 min. The percentage of S.D. with net counts due to the source is:
  - (1) 5.5% (2) 1.8%
  - (3) 0.5% (4) 2.5%
- The alpha ray activity of a material is measured after equal successive intervals (hours), in terms of its initial activity as unity to the 0.835; 0.695; 0.580; 0.485; 0.405 and 0.335. Assuming that the activity obeys an exponential decay law, the half-life is:

  - (1) 5.63 h (2) 8.05 h
  - (3) 2.15 h (4) 3.82 h
- A thin uniform annular disc of mass M has outer radius 4R and inner radius 3R. The work required to take a unit mass from point P on its axis to infinity is:

  - (1)  $\frac{2GM}{7R} \left(4\sqrt{2}-5\right)$  (2)  $-\frac{2GM}{7R} \left(4\sqrt{2}-5\right)$
- $\frac{100 \times 10^{-1} (5)}{100 \times 10^{-1} (4)} (4) \frac{2GM}{5R} (\sqrt{2} 1)$

Two masses m<sub>1</sub> and m<sub>2</sub> 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) 
$$T = 2\pi \sqrt{k \left(\frac{m_1 + m_2}{m_1 m_2}\right)}$$

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

$$(4) \quad T = 2\pi \sqrt{\frac{m_2}{k}}$$

Two particles of rest mass  $m_0$  approach each other with equal and opposite velocity  $\nu$ , in the laboratory frame. The total energy of one particle as measured in the rest frame of other is:

$$(1) \quad E = m_o c^2$$

(2) 
$$E = 2m_o c^2$$

(3) 
$$E = 3m_o c^2$$

(2) 
$$E = 2m_o c^2$$
  
(4)  $E = 1/2m_o c^2$ 

A thermal neutron has a speed  $\nu$  at temperature T = 300K and kinetic energy  $m_n v^2 / 2 = 3kT / 2$ . The de-Broglie wavelength of thermal neutron is :

(1) 
$$0.27 \text{ Å}$$

(2) 
$$1.37 \,\mathring{A}$$

(4) 
$$3.17 \mathring{A}$$

Using the uncertainty principle, the ground state energy of a linear oscillator is expressed by:

(1) 
$$\frac{1}{2}\hbar\omega$$

(3) 
$$\frac{3}{2}\hbar\omega$$

- An electron is trapped in an infinitely deep potential well of width  $L=106 \, fm$ . The wavelength of photon emitted from the transition  $E_4 \rightarrow E_3$  is:
  - (1) 3.453 nm

(3) 1.435 nm

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11.	A particle of mass $m_e$ trapped in an infinite depth well of width $L=1$ nm. Consider the
	transition from the excited state $n = 2$ to the ground state $n = 1$ . The wavelength of light
	emitted is:

- (1) 1234 nm
- (2) 8864 nm
- (3) 4321 nm (4) 8790 nm
- 12. A particle of mass m and charge q oscillating with frequency  $\omega$  is subjected to a uniform electric field E parallel to the direction of oscillation. The stationary energy levels is:

- (1)  $\left(n + \frac{1}{2}\right)\hbar\omega$  (2)  $\frac{1}{2}\hbar\omega$  (3)  $\left(n^2 + \frac{1}{2}\right)\hbar\omega$  (4)  $\hbar\omega$
- The rms velocity of hydrogen molecules at NTP and at 127° C is: 13.
  - $(1) 148 \, m/s$
- (2) 2134 m/s

- The fraction of the oxygen molecule with velocities between 199 m/s and 201 m/s at 27°C:
  - (1)  $1.29 \times 10^{-3}$

- (3)  $2.29 \times 10^{-3}$  moderate (4)  $5.29 \times 10^{-2}$  mass and the value of the value
- If 1 g of water freezes into ice, the change in its specific volume is 0.091 cc. The pressure required to be applied to freeze 10 g of water at -1°C.
  - (1) 3.345 atm
- (2) 0.254 atm (3) 2.24 atm
- (4) 2.587 atm
- 16. A 50  $\Omega$  resistor carrying a constant current of 1A is kept at a constant temperature of 300 K by a stream of cooling water. In a time interval of 1 sec, the change in entropy of the resistor is:
- (1) Zero (2)  $10 JK^{-1}$  (3)  $1000 JK^{-1}$
- (4) Infinity

				f a molecule, then $\overline{v}_x^2$ is:
	$(1) \ 2 \in /5m$	(2) 5∈/2 <i>m</i>	(3) 2 <i>m</i> /5∈	$(4) 5m/2 \in$
19.	The temperature a of 1 eV is:	at which an ideal gas		nave an average kinetic energy
	(1) 10345 K		(2) 11594 K	
	(3) 1234 K		(4) 4532 K	
20.	The classical valu	e of molar specific h	neat is:	
o Alm	(1) $R_{\rm u}/2$	national component	$(2) 3R_{\rm u}$	
	$(3) R_{\rm u}$	01 × 32 × 10	(4) $3R_{\rm u}/2$	
21.	melting point = 80	0°C, latent heat = 35	5.5 cal/g, density of s	eric change of pressure, given solid = 1.145 g/cc and density
	(1) 100 K	or the noneway to the	(2) 300 K	than beautiful and may
	(3) 273 K	(a) 7.24 atm. (a)	(4) 273.0346 K	
22.				n at 27°C for the number of
	(1) 0.477 eV		(2) 1.235 eV	
	(3) 1.874 eV		(4) 2.365 eV	

17. Consider six distinguishable particles are distributed over three nondegenerate energy

levels. Level 1 is at zero energy; level 2 has an energy ∈; and level 3 has energy 2∈.

(3) 555

(4) 729

The total number of microstates for the system is:

(2) 1168

(1) 10

23.	A wire of length 1m and radius 1mm is heated via an electric current to produce 1 kW of
	radiant power. Treating the wire as a perfect blackbody and ignoring any end effects, the
	temperature of the wire is:

- (1) 1358 K
- (2) 1294 K
- (3) 273 K
- (4) 8569 K

A blackbody has its cavity of cubical shape. The number of modes of vibration per unit volume in the wavelength region 4,990-5,010 Å is:

- (1)  $1.038 \times 10^{19} / m^3$
- (2)  $5.038 \times 10^{11} / m^3$
- (3)  $8.038 \times 10^{17} / m^3$

(4)  $0.038 \times 10^{19} / m^3$ 

25. 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

Tealmon't supplied to the consistency and thousand the contemporary to the A transistor has a collector current of 5 mA, when the emitter voltage is 20 mV. At 26. 30 mV. At 30 mV, the current is 30 mA. At 50 mV, it is:

(1)  $80 \, mA$ 

(2) 280 mA

(3) 480 mA

(4) 1080 mA

The operating frequency of a Wien-bridge oscillator is given by: 27.

(1)  $\frac{1}{2\pi\sqrt{LC}}$ 

 $(2) \frac{1}{4\pi\sqrt{LC}}$ 

(3)  $\frac{1}{2\pi RC}$ 

 $(4) \ \frac{1}{2\pi\sqrt{RC}}$ 

The reverse saturation current in a p-n diode: 28.

- (1) Increases
- (2) Decreases
- (3) Remains constant (4) Oscillates

A. James	and output voltages of a transfer connected in
The phase difference between the inpu	the age until out will all comment the man
(1) 360° (2) 180°	(3) 90° (4) 27°
(3) 273 K (4) 8569 K (	ter is 0.956 and emitter current is 10 mA
The DC current gain of a common-base	e transistor is 0.250 and vicine and vicine and vicine
The base current value is ! Th	strong to mineralization of the original strains
E N. BERNELLE SE SELECTION DE LE CONTRACTOR DE LE CONTRACTOR DE LE CONTRACTOR DE LA CONTRAC	(2) 0.38 mA (1) 10 × 860.1 (1)
BY Salves Continue Report (1)	(4) 0.44 mA
The state of the s	$(3) 8 038 \times 10^{-7}$
T it and to region the L - Ves charac	cteristics of a MOSFET are:
The state of the same of the s	(1)(2) Linear
	(4) Exponential
(3) 224 md 841 12 shall	- 「
The output of operational amplifier inc	reases 5 V in 15 µs. The slew rate is.
mA. When the confider voltage of	(2) 0.333 V/us
(1) 90 V/μs : εξη Μαξίζει/	TEATH SENIOUS CONTRACTOR
(3) 30 V/μs	(4) 5 V/μs
	S.
	[42] [18] [18] [18] [18] [18] [18] [18] [18
(1) Same as half-wave rectifier	(2) Double the half-wave rectifier
(3) One-half of half-wave rectifier	(4) One-third of half-wave rectifier
(E)	
The most unique property of laser:	24v
(1) speed	(2) directional
(3) coherence	(4) wavelength
260 207,140	
Which of the following is an example	of optical pumping?
(1) Ruby laser	(2) Helium-Neon laser
(3) Semiconductor laser	
	(4) Dye laser
EE-2023-24/(Physics)(SET-Y)/(A)	A STATE OF THE STA
	<ul> <li>(3) 0.25 mA</li> <li>In the triode region, the I<sub>D</sub> – V<sub>DS</sub> characters (1) Hyperbolic (2) may be added as a contract (3) Quadratice. The output of operational amplifier incomplete (1) 90 V/μs</li> <li>(3) 30 V/μs</li> <li>(4) Same as half-wave rectifier (1) Same as half-wave rectifier. (2) One-half of half-wave rectifier. (3) One-half of half-wave rectifier. (1) speed. (3) coherence.</li> <li>(4) Which of the following is an example (1) Ruby laser. (3) Semiconductor laser.</li> </ul>

without the
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of tamputa
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rahisani) Ah
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um
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and the dopant silicon is 12 and

(3) -13.595 eV

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43.	A half-wave rectifier is supplied with an AC supply of 120 vertex down transformer having a turn ratio of 10:1. By assuming an ideal diode is used, the				
	output DC voltage of diode is:	Tackle in the superior and			
	Consistential to	9) 8.5 V (4) 3.3 V (5) Refugor synthesis of betas orbits (42.425) 77.			
44.	<ol> <li>Consider an ideal op-amplifier with infinite of independent voltage sources connected respectively, and let V<sub>0</sub> be the output voltage</li> </ol>	to the positive and negative input terminals, ge. If $V_1 \neq V_2$ , then $V_0$ will be:			
	(1) Zero	) Infinite to satisfact souther of (4)			
	(3) Finite	Unpredictable  in nichan ar animalish and to a ACC 560			
45.	. A differential amplifier has an open-circui	t voltage again of 100. This amplifier has a an air results in an output signal of 26			
37	mV, the CMRR is:	der die Land en Augenstein.			
		3) 23.4 dB (4) 36.7 dB			
46.	The laser action is mainly characterized by				
特	(1) Spontaneous emission process (2)	2) Stimulated emission process			
	(3) Thermionic emission process (4)	4) Plasmonic process			
47.	. The number of photons, from green light of				
	(1) $4524.2 \times 10^{18} / m^3$	2) $2.4961 \times 10^{18}/m^3$			
grant.	(3) 2.4961/m <sup>3</sup> (1) × L to deliver learner (4)	4) 2.4961/m			
48.	. The binding energy of the electron for the	owest energy level of the hydrogen atom is			
	(1) -3.399 eV	2) 3.399 meV			

(4) -13595 meV

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43. A half-wave rectifier is supplied with an AC supply of 120 V at 60 Hz through a step-

	500 nm in a depth of 10 m. The c wavelength is:	comp	elex refractive dielectric constant at this
	(1) $1.77 + i 9.2 \times 10^{-8}$	(2)	$3.37 + i \cdot 4.1 \times 10^{-5}$
	(3) $i 9.2 \times 10^{-8}$	(4)	$2.23 + i \cdot 1.2 \times 10^{-6}$
50.	The Doppler broadening of the emission	ı wa	velength takes place in:
	(1) He-Ne laser (3) Nd:glass laser	5	Nd:YAG laser Ruby laser
51.	The wavelength of radiation emitted by with band gap energy $2.8 \ eV$ :	an I	ED made up of a semiconducting material
TEST.	(1) 2.8 $\mathring{A}$ and the same of the same o	(2)	4.3308 Å https://www.aversta.com/
ie).	(3) 5548.4 Å	(4)	4430.8 Å illist tars Vo 4-7 to 7-1
52.	Goldilocks Zone means:		The factor of the confirmation of the confirma
	(1) Habitable Zone		Porridge Zone
ME S	(3) Ursa Major Zone		Just right distance from Jupiter
53.	Hubble's Law enables astronomers to determine the galaxy's:	estir	nate the distance to a galaxy if they can
	(1) Spectral type	(2)	Mass
of n	(3) Velocity of recession	(4)	Temperature
54.	The cosmic microwave background radi	ation	comes from:
	(1) Quasars	(2)	The solar nebula
	(3) The Big Bang	(4)	Radio galaxies
55.	The lattice parameter and density for a kg/m³ respectively. If the atomic weight cell is:	an fo	ce lattice of copper are $3.60 \text{ Å}$ and $9055$ copper is $63.6$ , the number atoms per unit
	(1) 4 (2) 6	(3)	8 (4) 12

Sea water has a refractive index of 1.33 and absorbs 99.8% of red light of wavelength

		Na <sup>+</sup> and Cl <sup>-</sup> ions when they are at 4 Å apart:	2
56.	The potential energy of system of	Nat and Claons when they	
	(1) -8.5  eV	(2) -3.6 eV	
	(2) 25 aV	(4) -5.5 eV	
	and the state of	ates with $(n_x^2 + n_y^2 + n_z^2) = 6$ is:	
57.	The degeneracy of the quantum sta	ates with $(n_x + n_y + n_z)$	
walt.	(1) 12	(3) 48 (4) 8	
58.		$(2) E>E_F$	
to the common to	$(1)  E = E_F$	the start of particular property of the	0
illi-inf	$(3) E < E_F$	$(4)  E >> E_F $	
59.	The electric field required to accept gap of 5.4 eV and lattice constant is:	elerate an electron in cubic diamond having en of $3.57 \text{ Å}$ over a distance equal to the atomic ra	Tone
	(1) $7 \times 10^{10}$ (2) $1.4 \times 10^{10}$	$0   (3)   9 \times 10^{10}   (4)   2.5 \times 10^{11}$	
60.	The net magnetic moment of F	Te atom in BCC crystal (a = $2.857 \text{ Å}$ ) is $2.2 \text{ Å}$	2μΒ.
100	The saturation magnetization of Fa	e at 0K is:	
ay ca	(1) 100 kA m <sup>-1)</sup>	(2) $1750 \text{ kA } m^{-1}$	
	(3) 2500 kA m <sup>-1</sup>	(4) $3520 \text{ kA } m^{-1}$	
61.	through a long thin superconduct found to be:	duminium is $7.9 \times 10^3$ A/m in which current ting write of diameter $10^{-3}$ m. The critical curre	
	(1) 34 A (2) 24.81 A	(3) 35.46 A (4) 15.55 A	
62.	The transition from the ferromagne	etic to the paramagnetic state is named after:	
	(1) Curie-Weiss (2) Neel	(3) Debye (4) Curie	
63.	The magnetization of a supercondu	uctor is ;	
	(1) Zero (2) -B	(3) Constant (4) –H	
PHD-J	EE-2023-24/(Physics)(SET-Y)/(A)		

m

64.	The electrical po	ower output of a ph	otodiode is	maximum	when a	15
	(1) Small forward	ard current flows the	ough it irre	espective of	the bias	Salar Salar
	(2) Small forward	ard bias exists acros	s it	taries à les re	the oras	Grand III
	(3) Large revers	se bias exists across	it	termine to work in		
2010		se bias exists across	it mounts		rojsva g sita steloj dispositiva gradina	
65.	lattice parameter	ropy of carbon is go rs for graphite be a ated number of ator	raphite who	ose crystal s $c = 6.701$	structure is hexago	onal. Let the
	(1) 6 (150 200 8 0 6 1	10 (2) 8 meth m	(3) 1	12 1 12 12 12 13 13 14 14 14 14 14 14 14 14 14 14 14 14 14		
66.	The packing effi	ciency of diamond	cubic unit	cell is:	en 2 to dignelse	
	(1) 0.34	(2) 0.52	(3) (	).68	(4) 0.74	
67.	In ionic solid if t	he radius of anion i	s $r_a$ and of	f cation is $r_{\rm c}$	, then bond length	ı is :
ioil	$(1) \left(r_c + r_a\right)$	$\frac{\partial \mathcal{L}}{\partial x} = -\frac{1}{2} \cdot \frac{\partial}{\partial x}$ $\frac{\partial \mathcal{L}}{\partial x} = -\frac{1}{2} \cdot \frac{\partial}{\partial x}$ $\frac{\partial \mathcal{L}}{\partial x} = -\frac{1}{2} \cdot \frac{\partial}{\partial x}$	(2)	$\sqrt{3}(r_c+r_a)$	entro el entro <mark>entr</mark> o	
ei,	(3) $\sqrt{3/2}(r_c + r_a)$	Height of our con-	(4)	$(r_c-r_a)$	544 CH862	
68.		ergy difference bet evel for the free ele				$= n_z = 1$ and
	(1) $1.13 \times 10^{-14}$	eV	(2) 4	$.46 \times 10^{-15}$	eV	
iu Hice	$(3) 5.86 \times 10^{-14}$	$eV_{\rm distribute}$ and $e$	(4) 9	$2.04\times10^{-13}$	eV	
69.	Calculate the Fer	mi energy of mono	valent bcc o	crystal whos	e lattice constant	is 2.54 Å.
	(1) 1.035 eV			.567 eV		
	(3) 8.991 eV	n glav 101 i sa ital	(4) 3	.456 <i>eV</i>		
70.	The fraction of e	lectrons excited ace (300 K) is:	ross the en	ergy gap in	Germanium ( $E_g$	=0.7eV) at
	(1) $7 \times 10^{-18}$		(2) 1	$.7 \times 10^{-12}$		

(4)  $1.3 \times 10^{-6}$ 

(3)  $4 \times 10^{-12}$ 

The BCC iron has lattice parameter of 2.87 Å and its saturation magnetization value of 2750 kA m<sup>-1</sup>. The net magnetic moment per iron atom in the crystal: (3) 7.4 (4) 6.3

(2) 3.5

72. Calculate the wavelength of the photon, which will be required to break a cooper pair in a superconductor like zirconium whose  $T_c$  is 0.56 K: (2) 1.5 × 10<sup>-4</sup> m  $(4) 3.8 \times 10^{-2} \,\mathrm{m}$ 

(1)  $7.2 \times 10^{-3}$  m

(3)  $4.3 \times 10^{-5}$  m

73. Laser-produced plasma consisting of a 50 µm diameter ball of radiates very strongly at a wavelength of 5 nm. At a distance of 0.75 m from the source, the spatial coherence resulting from light emitted from opposite sides of the plasma is:

(1)  $5 \times 10^{-5} m$ 

(2)  $0.55 \times 10^{-5} m$ 

(3)  $1.2 \times 10^{-5} m$  (4)  $7.5 \times 10^{-5} m$ 

74. Consider the two-level system with  $E_1 = -13.6 \ eV, E_2 = -3.4 \ eV$  and the co-efficient  $A_{21} = 6 \times 10^8 \, s^{-1}$ . The frequency of light emitted due to transition from  $E_2$  and  $E_1$  is: (2)  $4.5 \times 10^{16} \,\mathrm{Hz}$ 

(1)  $8.2 \times 10^{17}$  Hz

(3)  $2.5 \times 10^{15} \,\mathrm{Hz}$ 

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(4)  $6.5 \times 10^{14} \, \mathrm{Hz}$ 

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 co-efficient of stimulated emission is:

(1)  $1.3 \times 10^{19}$  m/kg

(2)  $1.3 \times 10^{19}$  m/g

(3)  $6.6 \times 10^{19}$  cm/kg

(4)  $6.6 \times 10^{19}$  m/g

The ratio of spontaneous emission to stimulation emission for a cavity of temperature 76. 50 K and wavelength of  $10^{-5}$  m:

(1)  $3.218 \times 10^{10}$ 

(2)  $3.218 \times 10^{12}$ 

 $(3) 3.218 \times 10^{14}$ 

(4)  $3.218 \times 10^{16}$ 

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77.	One of the following type of galaxies do not fall on Hubble's tuning fork diagram:
	(1) Barred spiral galaxies (2) Peculiar galaxies
	(3) Elliptical galaxies (4) Spiral galaxies
78.	A Michelson interferometer is used to determine the apparent diameter of a star. The fringe pattern disappears when the adjustable mirrors are at a separation of 10 m and wavelength of light used is $7 \times 10^{-4}$ mm. The angular diameter of the star is:
	(1) $8.54 \times 10^{-8}$ radians (2) $3.54 \times 10^{-9}$ radians
	(3) $1.34 \times 10^{-8}$ radians (4) $1.22 \times 10^{-8}$ radians
79.	The proton proton chain reaction:
	(1) Produces chains of protons which are then broken apart to produce the Sun's energy with and a solid poster of any solid poster of a so
	(2) Is a three-step process which converts some mass to energy as helium nuclei are formed
	(3) Is the runaway reaction that produces the fission of iron during a supernoval explosion
	(4) adds protons together until a massive carbon nucleus is produced at the core of the sun
80.	An approximate diameter of Milky Way:
	(1) 1000 light years (2) 100000 light years
	(3) 10000 light years (4) 1000000 light years
81.	A beam of protons of 5MeV kinetic energy traverses a gold foil, one particle in $5 \times 10^6$ is scattered so as to hit a surface $0.5 \text{ cm}^2$ in area at a distance 10 cm from the foil and in a direction making an angle of $60^\circ$ with the initial direction of the beam and the tickness of the foil is:
	$(2)$ 2.1 $\mu$ m $(3)$ 5.31 $\mu$ m $(4)$ 7.31 $\mu$ m

82. If the radius of silver nucleus (Z = 47), is  $7 \times 10^{-15}$  m, the minimum energy that the particle should have to just reach it is:

(1) 9.34 MeV

(2) 1.34 MeV (3) 4.34 MeV

(4) 19.34 MeV

(3) 592.06 MeV

 $^{63}_{29}Cu$  atoms):  $^{63}_{29}Cu$  atoms):

PHD-EE-2023-24/(Physics)(SET-Y)/(A)

	(1) $4.6 \times 10^{24}  \text{MeV}^{-1}$	
	(3) $5.6 \times 10^{28}  MeV$	(4) $5.3 \times 10^{22}  MeV$
85.	The effective radius of deuteron can be	taken to be 2 fm. The hight of potential barrier
u tol:	for head-on collision of two deuterons i	s เมื่อ เพื่อใช้ จากของใหญ่ กุรณะ ของปกต
70115	(1) 104 keV (2) 100 keV	(3) 180 keV (4) 380 keV
86.	The energy released by fission of 1.0 kg	g of <sup>235</sup> U in a fission reactor is:
Si Ber :	(1) $6.1 \times 10^{22}  MeV$	(2) $3.1 \times 10^{25}  MeV$
	(3) $0.1 \times 10^{21}  MeV$	(4) $5.1 \times 10^{26}  MeV$
87.	The electric field in a region is radically contained in a sphere of radius, r centred	outward with magnitude of E = Ar. The charge of at the origin is $(A = 100 \text{ V/m}^2 \text{ and } r = 20 \text{ cm})$ :
Ser a	(1) $2.389 \times 10^{-7} \mathrm{C}$	(2) $1.89 \times 10^{-9}$ C
ni tan en l'ui	(3) $5.32 \times 10^{-7}$ C	(4) $8.89 \times 10^{-9}$ C
88.	point P close to the centre of the plate plate of the same geometrical dimension	is 10 V/m. If the plate is replaced by a copper ons and carrying the same charge Q, the electric
	(1) Zero (2) 5 V/m	(3) 10 33

The State of the S

83. The binding energy of the nuclei  $_{26}^{56}Fe$  in units of MeV:

and the series of a companied and experience of the series of the series

84. A given coin has a mass of 3.0 g. The nuclear energy that would be required to separate

all the neutrons and protons from each other is (assume that the coin is entirely made of

(4) 402.26 MeV

(1) 492.26 MeV (2) 42.16 MeV

89	. A metallic particle having no net charg positive charge. The electric force on the	e is placed near a finite metal plate carrying a particle will be : I m bonder the yarran
	(1) towards the 1	(2) Away from the plate
dott	(3) Parallel to the plate	(4) zero
90.	The magnitude of the electric field at a $2 \times 10^{-6}$ /m is:	point 4 cm away from a line charge of density
	(1) $3.0 \times 10^3 \text{ N/C}$	(2) $9.0 \times 10^5 \text{ N/C}$
an, i		(4) $9.0 \times 10^9 \text{ N/C}$
91.	charge of 0.12 µC when connected to a material filling the gap is equal to:	a rea 100 cm <sup>2</sup> and separation 1mm holds a 120 V battery. The dielectric constant of the
92.		I created by a point charge falls off with the
	(1) $\frac{1}{r}$ (2) $\frac{1}{r^2}$	(3) $\frac{1}{r^3}$ (4) $\frac{1}{r^4}$
93.	An electron moves in a circle of radius 1 electric current at a point on the circle is	0 cm with a constant speed of $4 \times 10^6$ m/s. The
	(1) $3.0 \times 10^{-10} A$	(2) $1.0 \times 10^{-12} A$
ŭing.	(3) $4.0 \times 10^{-13} A$	(4) 5.0 × 10 <sup>-11</sup> A
94.		ry through a resistance of 10 W. It is found that sitor rises to 4.0 V in 1 µs. The capacitance of

(3)  $3.25 \mu F$ 

(2) 4.25 µF

(1) 1.25 μF

PHD-EE-2023-24/(Physics)(SET-Y)/(A)

(4) 0.25 μF

O.T. 7. 1202. 24 (Physics)(SET-T)(A)

		III K and 2K are in the		(1) (1 . 2
	(1) 1:2	(2) 2:1007	(3) 1:4	fini(4)(1:3 costs)
<b>96.</b>	A simple loop of	oron 1 cm² carrying	a current of 10 A	is placed in a magnetic field orque on the loop due to the
97.	Which of the fo	ollowing particles v	will experience	a maximum magnetic force
	(magnitude) when	projected with the sa	me velocity perpe	endicular to a magnetic field?
a anking		(2) Proton	(3) He <sup>+</sup>	(4) Li <sup>++</sup>
98.	The magnetic field	B due to a current c	arrying circular lo	op radius 12 cm at its centre is
	$0.50 \times 10^{-4}$ T. The	magnetic field due to	this loop at a po	int on the axis at a distance of
. 300	5.0 cm from the ce	entre is:		
tile the	(1) $1.9 \times 10^{-7} T$	nicaj k'ad huismo l	(2) $3.9 \times 10^{-5}$ T	d Mieusto Talline 1971 - 38 lined publicant combabili
	(3) $5.9 \times 10^{-4} \text{ T}$		(4) $0.9 \times 10^{-3}$ T	
99.	The magnetic mon	nent of the assumed	dipole at the earth	n's centre is $8.0 \times 1022 \text{ A m}^2$ .
SET EX				arth is (radius of earth is 6400
	km):		a slow an main	
	(1) 60 μT	(2) 120 μT	(3) 240 μT	(4) 480 μT
100.	The sunlight reach	ing the earth has ma	ximum electric fie	eld of 810 V/m. The maximum
san bes	magnetic field in th	nis light is:	and Vergan	
30 2 60	(1) 6 μT	a to the salades a second	(2) 120 μT	Cuto pich horsonski
	(3) $2.7 \mu\text{T}$		(4) 33 uT	The Williams
	(4) (1125 prof.)	The American		
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95. Two resistors R and 2R are connected in series in an electric circuit. The thermal

energy developed in R and 2R are in the ratio: will are received to a grant away to the

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Branch Company	- /	10030
		Sr. No
Time: 11/4 Hours	Max. Marks: 100	Total Questions : 10
Roll No. (in figures)	(in words)	
Name	Date of Birth	
Father's Name	Mother's Name	
Date of Examination		
(Signature of the Candidate)		(Signature of the Invigilator)
CANDIDATES MUST READ TH STAI 1. All questions are compulsory.	RE FOLLOWING INFORMATION PAPE	

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 unfairmeans / mis-behaviour 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. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to

the candidate so that a copy of OMR Sheet may be kept by the candidate.

4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.

5. 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.

- 6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

PHD-EE-2023-24/(Physics)(SET-Y)/(B)

	× ·				
1.	Which planet can never be seen on the	meridian at	midnight	7 of the continue	- Park
	(1) Jupiter (2) Mercury	(3) Satur	n	(4) Mars	
2.	For an n-channel silicon FET with concentration of 10 <sup>15</sup> electrons/cm <sup>3</sup> . The the pinch of voltage is:				
	(1) 10 V Research for Landon Co. E. C. 1	(2) 13.5	V		
	(3) 6.8 V	(4) 15.5			
3.	A half-wave rectifier is supplied with a down transformer having a turn ratio of output DC voltage of diode is:	an AC supp	ly of 120	V at 60 Hz thr an ideal diode	rough a step- e is used, the
	(1) 5.40 V (2) 7.8 V	(3) 8.5 V		(4) 3.3 V	
4.	Consider an ideal op-amplifier with in of independent voltage sources connect respectively, and let V <sub>o</sub> be the output voltage.	ted to the p	ositive an	d negative inp	oe the values ut terminals
riey.	(1) Zero (1) (1) (2) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	(S) (S)	ite edictable		
<b>5.</b>	common input signal of 3.2 V to both	ircuit voltag terminals ar	ge again o	f 100. This am ts in an output	plifier has a signal of 26
134.	mV, the CMRR is: (1) 81.8 dB (2) 55.4 dB		dΒ	(4) 36.7 dB	
6.	. The laser action is mainly characterize	d by:			
(10257)	(1) Spontaneous emission process	(2) Stim	ulated em	ission process	200
	(3) Thermionic emission process	(4) Plasr	monic pro	cess	
	en and the second second				

joule of work:

(1) -3.399 eV

(3) -13.595 eV

PHD-EE-2023-24/(Physics)(SET-Y)/(B)

(1)  $4524.2 \times 10^{18} / m^3$ 

jole 6 Št. Le	Wavelength ic :	complex refractive dielectric constant at this
	(1) $1.77 + i 9.2 \times 10^{-8}$	(2) 2 27 1 : 4 1 1 10-5
	(3) $i \ 9.2 \times 10^{-8}$	(4) $2.23 + i \cdot 1.2 \times 10^{-6}$
10.	The Doppler broadening of the emission	n wavelength takes place in :
nie-	(1) He-Ne laser	(2) Nd:YAG laser
ia ant	(3) Nd:glass laser	With the state of
11.	The BCC iron has lattice parameter of of 2750 kA m <sup>-1</sup> . The net magnetic mome	2.87 $\mathring{A}$ and its saturation magnetization value on the per iron atom in the crystal:
	(1) 4 (2) 3.5	(3) 7.4 (4) 6.3
12.	Calculate the wavelength of the photon in a superconductor like zirconium who	which will be required to break a cooper pair se T <sub>c</sub> is 0.56 K:
	(1) $7.2 \times 10^{-3}$ m	(2) $1.5 \times 10^{-4}$ m
	(3) $4.3 \times 10^{-5}$ m	(4) $3.8 \times 10^{-2}$ m
13.	resulting from light emitted from opposi	50 μm diameter ball of radiates very strongly at 0.75 m from the source, the spatial coherence ite sides of the plasma is:
	(1) $5 \times 10^{-5}  m$	(2) $0.55 \times 10^{-5} m$
	(3) $1.2 \times 10^{-5} m$	(4) $7.5 \times 10^{-5} m$

7. The number of photons, from green light of mercury ( $\lambda = 4961 \,\mathring{A}$ ), required to do one

The binding energy of the electron for the lowest energy level of the hydrogen atom is :

Sea water has a refractive index of 1.33 and absorbs 99.8% of red light of wavelength

(2)  $3.399 \ meV$ 

(4) -13595 meV

of countries. The relative dicteoria constant of sillions of

(2)  $2.4961 \times 10^{18}/m^3$ 

14. Consider the two-level system with  $E_1 = -13.6 \ eV$ ,  $E_2 = -3.4 \ eV$  and the co-efficient  $A_{21} = 6 \times 10^8 \ s^{-1}$ . The frequency of light emitted due to transition from  $E_2$  and  $E_1$  is:

(1)  $8.2 \times 10^{17} \, \text{Hz}$ 

(1)  $8.2 \times 10^{17} \text{ Hz}$  (2)  $4.5 \times 10^{16} \text{ Hz}$  (3)  $2.5 \times 10^{15} \text{ Hz}$  (4)  $6.5 \times 10^{14} \text{ Hz}$ 

15. A solid-state laser emits radiation of wavelength of 6000  $\mathring{A}$  and the life time,  $\tau_{sp} = 10^{-6}$  s. Assume that the refractive index of the medium is one and the co-efficient of stimulated emission is: material Ching the gap is usual to :

(1)  $1.3 \times 10^{19}$  m/kg

(2) (2)  $1.3 \times 10^{19}$  m/g

(3)  $6.6 \times 10^{19}$  cm/kg (4) and the sharp sold because

(4)  $6.6 \times 10^{19}$  m/g

16. The ratio of spontaneous emission to stimulation emission for a cavity of temperature 50 K and wavelength of 10<sup>-5</sup> m

(1)  $3.218 \times 10^{10}$  (2)  $3.218 \times 10^{12}$ 

 $^{1}$  80 (3)  $3.218 \times 10^{14}$  10 12 10 10 10 (4)  $3.218 \times 10^{16}$ 

17. One of the following type of galaxies do not fall on Hubble's tuning fork diagram:

(1) Barred spiral galaxies

(2) Peculiar galaxies

(3) Elliptical galaxies

(4) Spiral galaxies

18. A Michelson interferometer is used to determine the apparent diameter of a star. The fringe pattern disappears when the adjustable mirrors are at a separation of 10 m and wavelength of light used is  $7 \times 10^{-4}$  mm. The angular diameter of the star is:

R and H. see conceeding to spice in an electric circuit The themself

(1)  $8.54 \times 10^{-8}$  radians (2)  $3.54 \times 10^{-9}$  radians

(3)  $1.34 \times 10^{-8}$  radians (4)  $1.22 \times 10^{-8}$  radians

19. The proton proton chain reaction:

(1) Produces chains of protons which are then broken apart to produce the Sun's energy

(2) Is a three-step process which converts some mass to energy as helium nuclei are

(3) Is the runaway reaction that produces the fission of iron during a supernova explosion

(4) adds protons together until a massive carbon nucleus is produced at the core of the

20. An approximate diameter of Milky Way:

material filling the gap is equal to:

(3) 10000 light years

(1) 1000 light years

	(1) 11.3	g(2) 17)1 × £ 1 (5)		2 (4) 20
22.			d created by a p	oint charge falls off with the
THEFT	distance from	the point charge is : alcum		
	(1) -	$(2) \frac{1}{2}$	(3) $\frac{1}{3}$	(4) 4 4 (1) 4 (1) 4 (1)
23.		noves in a circle of radius nt at a point on the circle is		tant speed of $4 \times 10^6$ m/s. The
	(1) $3.0 \times 10^{-1}$	$oldsymbol{A}^{(i)}$ and the state of $oldsymbol{A}^{(i)}$	$(2) 1.0 \times 10^{-12} A$	garaottol adrio anti Th
	(3) $4.0 \times 10^{-}$	13 A Peculiar galaxies (E) Spical galaxies	$(4) \ 5.0 \times 10^{-11}  A$	ning foring Lorent (1) on taking happenglish (4)
<b>24.</b> 500 1 30 500 10	the potential	difference across the capa	citor rises to 4.0 \	tance of 10 W. It is found that V in 1 µs. The capacitance of
	(1) $1.25  \mu F$	2000 (2) 4.25 μF (5) 2000 (2) 4.25 μF (5)	(3) 3.25 uF	(4) 0.25 uF
25.	Two resistors energy develo	R and 2R are connected ped in R and 2R are in the	d in series in an	electric circuit. The thermal
Under the same		(2) 2:1		(4) 1:3
26.	A circular loo of 0.1. T per magnetic field	pendicular to the plane of	a current of 10 A.  f the loop. The to	is placed in a magnetic field orque on the loop due to the
wis to s	(1) Zero	(2) 10 <sup>-4</sup> Nm	(3) 10 <sup>-3</sup> Nm	(4) 10 <sup>-2</sup> Nm
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(2) 100000 light years

A parallel plate capacitor having plate area 100 cm<sup>2</sup> and separation 1mm holds a charge of 0.12 µC when connected to a 120 V battery. The dielectric constant of the

(4) 1000000 light years

or stimulated emission is a

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27.	Which of the	following particles	will experienc	e a maximur	n magnetic	force
enti		en projected with the			_	
	(1) Electron	(2) Proton	(3) He <sup>+</sup> (1)	(4) Li	++in- A2	
28.		eld B due to a curren	t carrying circula	r loop radius 12	2 cm at its cer	ntre is

	$0.50 \times 10^{-4}$ T. The magnetic field due to this loop at a point on the axis at a distance of
Tara I	5.0 cm from the centre is:
	(1) $1.9 \times 10^{-7} T$ (2) $3.9 \times 10^{-5} T$

- $(2) 3.9 \times 10^{-3} T_{\text{original at a point at a second at a seco$ (3) 5.9 × 10<sup>-4</sup> T. TENNE LEURINGUES DE « (4) 0.9 × 10<sup>-3</sup> T LEU SHIROUS A FELLI
- The magnetic moment of the assumed dipole at the earth's centre is  $8.0 \times 1022 \text{ A m}^2$ . 29. The magnetic-field B at the geomagnetic poles of the earth is (radius of earth is 6400 km):
  - (1) 60 μT (2) 120 μT (3) 240 μT (4) 480 μT work required solutes a unit mass from point P on a creatism infinity as a
- The sunlight reaching the earth has maximum electric field of 810 V/m. The maximum 30. magnetic field in this light is:
  - (1)  $6 \mu T$ (3)  $2.7 \mu T$
  - The directional derivative of  $\varphi = x^2yz + 2xz^3$  at (1, 1, -1) in the direction  $2\hat{i} 2\hat{j} + \hat{k}$
  - (2)  $-\frac{2}{3}$ (4)  $\frac{1}{2}$ (5) (4)  $\frac{1}{2}$ (6)  $\frac{1}{3}$ 
    - (1)  $\frac{2}{3}$  (3)  $\frac{2}{3}$
- The angle between the surfaces  $x^2 + y^2 + z^2 = 1$  and  $z = x^2 + y^2 1$  at the point (1, +1, -1) is:
  - (1) 15.76° (2) 1.75°

    - (3) 2.53° (4) 25.23°

A G.M. counter records 4,900 background counts in 100 min. with a radioactive source in position, the same total number of counts are recorded in 20 min. The percentage of S.D. with net counts due to the source is:

(1) 5.5%

(2) 1.8%

The alpha ray activity of a material is measured after equal successive intervals (hours), 34. in terms of its initial activity as unity to the 0.835; 0.695; 0.580; 0.485; 0.405 and 0.335. Assuming that the activity obeys an exponential decay law, the half-life is:

(2) 8.05 h

1100 zi (3) 2.15 h than a dres at

(4) 3.82 h

A thin uniform annular disc of mass M has outer radius 4R and inner radius 3R. The 35. work required to take a unit mass from point P on its axis to infinity is:

(2)  $-\frac{2GM}{7R}(4\sqrt{2}-5)$ 

(3)  $\frac{GM}{4R}$  (4)  $\frac{2GM}{5R}(\sqrt{2}-1)$ 

Two masses  $m_1$  and  $m_2$  connected by a spring of spring constant k rest on a frictionless 36. surface. If the masses are pulled apart and let go, the time period of oscillation is:

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

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

(3)  $T = 2\pi \sqrt{\frac{m_1}{n_1}}$ 

(4)  $T = 2\pi \sqrt{\frac{m_2}{h}}$ 

37.	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:

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$$(1) E = m_o c^2$$

(2) 
$$E = 2m_o c^2$$

(3) 
$$E = 3m_o c^2$$

(3) 
$$E = 3m_o c^2$$
 (4)  $E = 1/2m_o c^2$ 

A thermal neutron has a speed v at temperature T = 300K and kinetic energy 38.  $m_n v^2 / 2 = 3kT / 2$ . The de-Broglie wavelength of thermal neutron is: The part of the contraction of the same A and A and A and A are the same scient part A and A are the same scient A and A are the same scient

(3) 2.27 A

(4) 3.17 A

Using the uncertainty principle, the ground state energy of a linear oscillator is 39. expressed by:

- $\frac{1}{2}\hbar\omega \qquad (2) \hbar\omega \qquad (3) \frac{3}{2}\hbar\omega$

An electron is trapped in an infinitely deep potential well of width L = 106 fm. The 40. wavelength of photon emitted from the transition  $E_4 \to E_3$  is :

- (2) 4.665 nm
- (3) 1.435 nm the blocker field regards to excelerate an electron in cubic discussed Barring energy
- (4) 0.453 nm

The wavelength of radiation emitted by an LED made up of a semiconducting material with band gap energy 2.8 eV:

61 01 x 10 (E)

THE TAKE OF PRINCE OF STREET OF THE WAR TO SEE THE THE

(1) 2.8 A

(2) 4.3308 A

(3) 5548.4 A

(4) 4430.8 A

Goldilocks Zone means: 42.

(1) Habitable Zone

- (2) Porridge Zone
- (3) Ursa Major Zone
- (4) Just right distance from Jupiter

43.	determine the gal	axy's:	A CONTRACTOR	stance to a galaxy if they can
MIEI.	(1) Spectral type	ra calcimiques to	(2) Mass	the first of the same in
	(3) Velocity of re	ecession	(4) Temperatu	
44.	The cosmic micro	owave background ra	diation comes from	m: 5 per 1
	(1) Quasars		(2) The solar r	nebula
(gran	(3) The Big Bang	j = Tonumberonsi	(4) Radio gala	xies ombon L. mond A. g
45.	The lattice paran	neter and density fo	r an fcc lattice of	f copper are 3.60 Å and 9055 3.6, the number atoms per unit
	(1) 4	(2) 6	(3) 8	(4) 12
46.	The potential ener	gy of system of Na <sup>+</sup>	and Cl ions when	they are at 4 A apart:
	(1) -8.5 eV	(2) -3.6 eV	(3) -2.5 eV	(4) -5.5 eV
47.	The degeneracy of	f the quantum states	with $\left(n_x^2 + n_y^2 + n_z^2\right)$	= 6 is:
ett si	(1) 12 A May 1	, ( <b>(2) 24</b> more quel	(3) 48 (1 (3) 11 )	eng (4) 8
48.	At 0 K, the probab	only of finding an ele	ectron at energy le	vel E is unity, when:
	$(1)  E = E_F$	$(2)  E > E_F$		$(4) E >> E_F$
49.	The electric field gap of 5.4 eV and	required to accelera	te an electron in	cubic diamond having energy
	is:		Prince to a second	Value of the atomic radius
		(2) $1.4 \times 10^{10}$	(3) $9 \times 10^{10}$	(4) $2.5 \times 10^{11}$
50.	The outeration mag	moment of Fe atometization of Fe at 0.	A 15.	al (a = 2.857 $\mathring{A}$ ) is 2.2 $\mu$ B.
	(1) $100 \text{ kA m}^{-1}$	121 Pointing Zen.	(2) 1750 kA m <sup>-1</sup>	SWO V Also said 1
	(3) 2500 kA m <sup>-1</sup>	mildh ofgerhad, ch)	(4) 3520 kA m <sup>-1</sup>	annis pourie ( and an i
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51.	through a long thi	in superconducting w	vrite of diameter 1	A/m in which current 0 <sup>-3</sup> m. The critical curre	
		(2) 24.81 A	(3) 35 46 A	(4) 15 55 A	
		n the ferromagnetic to			
		(2) Neel	(3) Debye	(4) Curie	
53.	The magnetization	of a superconductor	is:		
Nig.	(1) Zero annado	or (2) ;-B its ring and	(3) Constant	(4) -H	
iknob	that aday the are a	ite. To citalistic gits	ties and the Pitt	The spring sprifes	
54.	The electrical power output of a photodiode is maximum when a:  (1) Small forward current flows through it irrespective of the bias				
	The state of the s	and the state of the same of t	n it irrespective of	the bias	
		bias exists across it			
	the state of the s	bias exists across it			
	(4) Small reverse	bias exists across it			
55.	lattice parameters		451 $A; c = 6.701$	ructure is hexagonal. Le	
	(1) 6 224 14 2151	(2) 8	(3) 12	(4) 4	
56.	The packing effici	ency of diamond cubi	ic unit cell is:	rent Man-11, mily - A	
7 ,250	(1) 0.34	(2) 0.52	(3) 0.68	(4) 0.74	
57.		e radius of anion is $r_a$		then bond length is:	

58. Calculate the energy difference between the two levels for which  $n_x = n_y = n_z = 1$  and the next higher level for the free electron in a solid cube of side 10 mm:

(1)  $1.13 \times 10^{-14} eV$ 

(2)  $4.46 \times 10^{-15} \, eV$ 

(3)  $5.86 \times 10^{-14} \, eV$ 

(4)  $9.04 \times 10^{-13} \, eV$ 

(3)  $\sqrt{3}/2(r_c + r_a)$  (4)  $(r_c - r_a)$ 

	(3) 8.991 eV	(4) 3.456 eV	hatest
60.	or electrons exerted act	coss the energy gap in Germanium (1	
		(2) $1.7 \times 10^{-12}$	
	(3) $4 \times 10^{-12}$	(4) $1.3 \times 10^{-6}$	
61.	melting point = 80°C, latent heat = 3 of liquid = 0.981 g/cc is:	sthalene per atmospheric change of prosperior of solid = 1.145 g/c	c and density
25.	(1) 100 K	(2) 300 K	
	(3) 273 K	(4) 273.0346 K	
62.	The amount of heat (in eV) must be accessible states to increase by a factor	be added to a system at 27°C for the	e number of
	(1) 0.477 eV	1) 40(2) 1.235 eV mm hancming n/A	
		(4) 2.365 eV	
63.	A wire of length 1m and radius 1mm; radiant power. Treating the wire as a particular temperature of the wire is:	perfect blackbody and ignoring any end	effects, the
	(1) $1358 K$ (2) $1294 K$	(3) 273 K   (4) 8569 K	U1
64.	A blackbody has its cavity of cubical volume in the wavelength region 4,99	shape. The number of modes of vibration 0–5,010 Å is:	ion per unit
	(1) $1.038 \times 10^{19} / m^3$ (3) $8.038 \times 10^{17} / m^3$	(2) $5.038 \times 10^{11} / m^3$ (4) $0.038 \times 10^{19} / m^3$	
PHD-E	E-2023-24/(Physics)(SET-Y)/(B)	PART TO Provide MEST FOR IN	~ 4 4. 175 W

59. Calculate the Fermi energy of monovalent bcc crystal whose lattice constant is 2.54 Å.

(1) 1.035 eV (2) 4.567 eV

	A common-emitter current is $10  mA$ . The				(β) as 50 and the collector
	(1) 10.2 mA	(2) 45.8 mA	(3)	22.4 mA	(4) 12.5 mA
66.		collector current of	5 m	A, when the e	mitter voltage is 20 mV. At
THING	(1) 80 mA	alt say to materials	(2)	280 mA	lart situation rate from
	(3) 480 mA	and to	(4)	1080 mA	ωΛ (1 + n) (1)
67.	The operating frequ	ency of a Wien-brid	lge os	scillator is give	en by :
	$(1) \ \frac{1}{2\pi\sqrt{LC}}$	62(A (A)	(2)	$\frac{1}{4\pi\sqrt{LC}}$	will 5 - Car (E)
	$(3) \ \frac{1}{2\pi RC}$	arden and still	(4)	$\frac{1}{2\pi\sqrt{RC}}$	73. The residence of l
68.	The reverse saturati	on current in a p-n o	liode	holom ang se	Silt to locate of only Ar
10.1	(1) Increases			Decreases	
	(3) Remains consta	nt 201 2 2 2 (2)		Oscillates	
69.	the state of the s	_		•	s of a transistor connected in
		I - BISBY OF THE	7500	si et bailique si	7s. If a payment free prosent required to i
	(1) 360° (3) 90°	me by C. (b)	(2) (4)	180° 270°	more Flat ( )
70.	The DC current gai	n of a common-base	e tran	sistor is 0.956	and emitter current is 10 mA.
	(1) 0.66 mA		(2)	0.38 mA	13.46.15.75.13.25.13
	(3) 0.25 mA		(4)	0,44 mA	
'HD-	EE-2023-24/(Physics	s)(SET-Y)/(B)		(44.7-7.12)	P. T. O.

71.	A particle of mass $m_e$ trapped in an infinite depth well of width $L = 1$ nm. Consider the	
	transition from the excited state $n = 2$ to the ground state $n = 1$ . The wavelength of light	
	emitted is:	

(1) 1234 nm

(2) 8864 nm

(3) 4321 nm

(4) 8790 nm

to the state of the control of and when the country wange is 10 as A particle of mass m and charge q oscillating with frequency  $\omega$  is subjected to a uniform electric field E parallel to the direction of oscillation. The stationary energy levels is:

(1)  $\left(n+\frac{1}{2}\right)\hbar\omega$ 

 $(2) \frac{1}{2}\hbar\omega$ 

militare asbad mark also yananpan i

(3)  $\left(n^2 + \frac{1}{2}\right)\hbar\omega$ 

(4)  $\hbar\omega$ 

73. The rms velocity of hydrogen molecules at NTP and at 127° C is:

(1) 148 m/s

(2) 2134 m/s

(3) 876 m/s

(4) 3149 m/s

The fraction of the oxygen molecule with velocities between 199 m/s and 201 m/s at 74. 27°C:

(1)  $1.29 \times 10^{-3}$ 

(3)  $2.29 \times 10^{-3}$ 

ear. The object difference between the input and major collages of a majorissor chandetestant If 1 g of water freezes into ice, the change in its specific volume is 0.091 cc. The pressure required to be applied to freeze 10 g of water at -1°C.

(1) 3.345 atm

(2) 0.254 atm

(3) 2.24 atm

(4) 2.587 atm

A 50  $\Omega$  resistor carrying a constant current of 1A is kept at a constant temperature of 300 K by a stream of cooling water. In a time interval of 1 sec, the change in entropy of the resistor is:

(1) Zero

(2)  $10 JK^{-1}$  (3)  $1000 JK^{-1}$ 

(4) Infinity

77.	Consider six dist	inguishable particl	es are distributed ov	ver three nondegenerate energ
obsa	levels. Level 1 is	at zero energy; le	vel 2 has an energy	€; and level 3 has energy 2€
	The total number	of microstates for	the system is:	
	(1) 10	(2) 1168	(3) 555	(4) 729
78.	An ideal Fermi g	gas is at rest at abs		ero and has a Fermi energy ∈
in control			a solution and the second	of a molecule, then $\overline{v}_x^2$ is:
	(1) 2∈/5m	(2) 5∈/2 <i>m</i>	(3) 2 <i>m</i> /5∈ ···	(4) 5m/2∈ 11 m
79.		at which an ideal g	as whose molecules	have an average kinetic energ
	of 1 eV is:	n en en die nichten	To gol 0.1 ho noise it	95. The openity related by
	(1) 10345 K	3.4 × 10 1/10	(2) 11594 K	Your ( - 1.3 (f)
	(3) 1234 K	99M NEOT × 1.75 (	(4) 4532 K	(3) 0.1 × 10 <sup>21</sup> steV
80.	The classical value	ue of molar specific	c heat is: an ar noig	BZ. The observer held at a re-
tor	(1) $R_{\rm u}/2$	(2) $3R_{\rm u}$	$(3) R_{\rm u}$	(4) $3R_{\rm u}/2$
81.	scattered so as to direction making of the foil is:	hit a surface 0.5 c an angle of 60° w	m <sup>2</sup> in area at a distar ith the initial direction	old foil, one particle in $5 \times 10^6$ ince 10 cm from the foil and in on of the beam and the ticknes
etta al	(1) 1.31 μm			(4) 7.31 μm
82.		silver nucleus (Z = ave to just reach it		, the minimum energy that th
	THE STATE OF THE PERSON NAMED AND ADDRESS OF THE PERSON NAMED ADDRESS OF THE PERSON NAMED AND	AR TOWN TOUR PROPERTY OF	THE COURSE OF SECURITION	(4) 19.34 MeV
83.				wan siangen tellman is sed s Siverif Square was se
	(1) 492.26 MeV		(2) 42.16 MeV	Company of Company
	(2) 502.06 MaV		(4) 402.26 M	V

Į	
84.	A given coin has a mass of 3.0 g. The nuclear energy that would be required to separate all the neutrons and protons from each other is (assume that the coin is entirely made of
5. (3	all the neutrons and protons from each other is (assume that
	(1) $4.6 \times 10^{24} \text{ MeV}$ (2) $1.6 \times 10^{25} \text{ MeV}$
	(3) $5.6 \times 10^{28}  MeV$ (4) $5.3 \times 10^{22}  MeV$
85.	The effective radius of deuteron can be taken to be 2 fm. The hight of potential barrier for head-on collision of two deuterons is:
Tiess )	(1) 104 keV (2) 100 keV (3) 180 keV (4) 380 keV

The energy released by fission of 1.0 kg of 235 in a fission reactor is:

- (1)  $6.1 \times 10^{22} MeV$
- (2)  $3.1 \times 10^{25} MeV$
- (3)  $0.1 \times 10^{21} MeV$  (4)  $5.1 \times 10^{26} MeV$

The electric field in a region is radically outward with magnitude of E = Ar. The charge 87. contained in a sphere of radius, r centred at the origin is  $(A = 100 \text{ V/m}^2 \text{ and } r = 20 \text{ cm})$ :

(1)  $2.389 \times 10^{-7}$  C

(2)  $1.89 \times 10^{-9}$  C

- (3)  $5.32 \times 10^{-4}$  C (4)  $8.89 \times 10^{-9}$  C

A charge Q is uniformly distributed over a large plastic plate. The electric field at a point P close to the centre of the plate is 10 V/m. If the plate is replaced by a copper plate of the same geometrical dimensions and carrying the same charge Q, the electric field at the point P will become: as the employed mostly has a the grant

- (1) Zero
- (2) 5 V/m
- (3) 10 V/m (4) 20 V/m

A metallic particle having no net charge is placed near a finite metal plate carrying a 89. positive charge. The electric force on the particle will be:

- (1) towards the plate (2) Away from the plate
- (3) Parallel to the plate
- (4) zero

90.	The magnitude of the electric field at a $2 \times 10^{-6}$ /m is:	point 4 cm away from a line charge of density
	(1) $3.0 \times 10^3 \text{ N/C}$	$(2) 9.0 \times 10^5 \text{ N/C}$
	(3) $4.0 \times 10^7 \text{ N/C}$	(4) $9.0 \times 10^9 \text{N/C}$
91.	In the triode region, the $I_D - V_{DS}$ character	eristics of a MOSFET are:
		(2) Linear a garmullor set to double .08
	(3) Quadratic (4) teachy (6)	(4) Exponential
92.	The output of operational amplifier incre	eases 5 V in 15 µs. The slew rate is:
	(1) 90 V/μs 2228 Wol nim 28 1029 (Δ)	(2) 0.333 V/µs
	(3) 30 V/μs 2000 nghi chav a . (1) (1)	(4) 5 V/μs
93.	The efficiency of a full-wave rectifier is	: icenam dibuta distribution (1991)
	(1) Same as half-wave rectifier	(2) Double the half-wave rectifier
	(3) One-half of half-wave rectifier	(4) One-third of half-wave rectifier
94.	The most unique property of laser:	
	(1) speed	(2) directional
, de t	(3) coherence	(4) wavelength
95.	Which of the following is an example of	optical pumping?
	(1) Ruby laser	(2) Helium-Neon laser
	(3) Semiconductor laser	(4) Dye laser
96.	The following type of laser can be used	for generation of laser pulse :
	(1) Nd-YAG laser	(2) Carbon dioxide laser
	(3) Helium neon laser	(4) Ruby laser

What is the need to achieve population inversion?			
(1) To excite most of the atoms			
(2) To bring most of the atoms to groun	nd state	10 10 A 10 1 A 10	
(3) To achieve stable condition		为区(作文度	
(4) To reduce the time of production of	laser meanly active class	di noigo de region in	
	and the second of the second o	Typerbolio	
(1) Laser (2) Quartz	(3) Maser	(4) Helium	
The shape of the Earth's orbit:	usi rajiiqas isa	o navogo in mines	
(1) eclipse with low excitability	(2) eclipse with	low eccentricity	
(3) circle	(4) ellipse with	high eccentricity	
The "Planetoids" are located between:	at Afiles Sygn	loks, koʻli malsale.	
(1) Earth & Mars (1997) State of the Control of the		piter ()g <sub>il</sub>	
(3) Saturn & Jupiter (1) (1) (1)			
	<ol> <li>To excite most of the atoms</li> <li>To bring most of the atoms to ground</li> <li>To achieve stable condition</li> <li>To reduce the time of production of the following is used in atomic</li> <li>Laser (2) Quartz</li> <li>The shape of the Earth's orbit:</li> <li>eclipse with low excitability</li> <li>circle</li> <li>Earth &amp; Mars</li> </ol>	(1) To excite most of the atoms (2) To bring most of the atoms to ground state (3) To achieve stable condition (4) To reduce the time of production of laser  Which of the following is used in atomic clocks? (1) Laser (2) Quartz (3) Maser  The shape of the Earth's orbit: (1) eclipse with low excitability (2) eclipse with (3) circle (4) ellipse with	

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	Physics	N .
		10027
		Sr. No
Time: 11/4 Hours	Max. Marks . 100	Total Questions: 100
Roll No. (in figures)	(in words)	
Name	Date of Birth	0/
Father's Name	Mother's Name	7
Date of Examination		
(Signature of the Candidate)	8) to the second	(Signature of the Invigilator)
All questions are compulsory.     The candidates must return the concerned before leaving the	question booklet as well as ON Examination Hall, failing whistered against him / her, in add such a candidate will not be ever of the examination system, carl	MR Answer-Sheet to the Invigilator nich a case of use of unfair-dition to lodging of an FIR with the aluated.  bonless OMR Sheet is provided to

- 4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
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melting point = 80°C, latent heat =	hthalene per atmospheric change of pressure, given 35.5 cal/g, density of solid = 1.145 g/cc and density
of liquid = $0.981$ g/cc is:	NIVE.
(1) 100 K	(2) 300 K
(3) 273 K	(4) 273.0346 K
2. The amount of heat (in eV) must	be added to a system at 27°C for the number of
accessible states to increase by a fac	
(1) 0.477 eV	(2) 1.235 eV
(3) 1.874 eV	(4) 2.365 eV
enderge veltages of retransieror comected in	
3. A wire of length 1m and radius 1mm	is heated via an electric current to produce 1 kW or
radiant power. Treating the wire as a temperature of the wire is:	perfect blackbody and ignoring any end effects, the
(1) 1358 K (2) 1294 K	(3) 273 K (4) 8569 K
4. A blackbody has its cavity of cubical volume in the wavelength region 4,99	shape. The number of modes of vibration per uni
(1) $1.038 \times 10^{19}/m^3$	(2) $5.038 \times 10^{11}/m^3$
(3) $8.038 \times 10^{17} / m^3$	
, isintua entrapaorimente de qui abom CEA, i n	
5. A common-emitter transistor has a to current is 10 mA. The emitter current	ypical value of gain $(\beta)$ as 50 and the collector is:
(1) 10.2 mA (2) 45.8 mA	(3) 22.4 mA (4) 12.5 mA
6. A transistor has a collector current of	of 5 $mA$ , when the emitter voltage is 20 $mV$ . At
30 mV. At 30 mV, the current is 30 mA	. At 50 mV, it is :
(1) 80 mA (53) 50(maada nigra ka) (1)	(2) 280 mA
(3) 480 mA	(4) 1080 mA
PHD-EE-2023-24/(Physics)(SET-Y)/(C)	P. T. C

7. The operating frequency of a	Wien-bridge oscillator is given by:
---------------------------------	-------------------------------------

(2) 1 2 5 8 V

(1)	13 F	970
(1)	2π <sub>√</sub>	TO
	2117	LC

$$(2) \frac{1}{4\pi\sqrt{LC}}$$

$$(3) \ \frac{1}{2\pi RC}$$

$$(4) \ \frac{1}{2\pi\sqrt{RC}}$$

8. The reverse saturation current in a p-n diode:

(1) Increases

- (2) Decreases
- (3) Remains constant

(4) Oscillates

9. The phase difference between the input and output voltages of a transistor connected in common emitter arrangement is:

- (1) 360° E goloone bas thoda ...
- (2) 180°

(3) 90°

(4) 270°

10. 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

11. The wavelength of radiation emitted by an LED made up of a semiconducting material with band gap energy 2.8 eV:

Am LOCE TEL

MINDAE SE

handsty by

(1) 2.8 Å

(2) 4.3308 Å

(3) 5548.4 Å

(4) 4430.8 Å

12. Goldilocks Zone means:

(1) Habitable Zone

(2) Porridge Zone

(3) Ursa Major Zone

(4) Just right distance from Jupiter

THE PROBLEM LANGER WHEN IN THE YORK

	(3) Velocity of recession	(4) Temperature			
14.	The cosmic microwave background rad	liation comes from:			
H20 362		(2) The solar nebula			
13.	(3) The Big Bang	(4) Radio galaxies			
	CAPIFEC OF CEAN A AND THE RES				
15.	kg/m³ respectively. If the atomic weight cell is:	an fcc lattice of copper are $3.60 \text{ Å}$ and $905 \text{ ht}$ of copper is $63.6$ , the number atoms per un	5 it		
	(1) 4 (2) 6 (3) CP (3)	(3) 8 (4) 12			
	The potential energy of system of Na <sup>+</sup> a				
2) m/3()	(1) $-8.5  eV$ (2) $-3.6  eV$	(3) $-2.5 \text{ eV}$ (4) $-5.5 \text{ eV}$			
17.	The degeneracy of the quantum states w	with $(n_x^2 + n_y^2 + n_z^2) = 6$ is:			
i gi jamet	(1) 12 (2) 24 (2) (3) (4) (4) (4) (4) (4) (5) (6) (4) (4) (5) (6) (6) (7) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7				
18.	At 0 K, the probability of finding an electron at energy level E is unity, when:				
	(1) $E = E_{F,\ell-1,1}$	$(2) E > E_F$			
	(3) $E < E_F$				
with the second		THE TENED OF THE PERSON AND THE PERSON AND THE			
19.	[HELD: 4] 전 12 - 6] : - (12 - 12 - 12 - 12 - 12 - 12 - 12 - 1	te an electron in cubic diamond having energ $57 \text{ Å}$ over a distance equal to the atomic radiu			
Turni.	(1) $7 \times 10^{10}$ (2) $1.4 \times 10^{10}$	(3) $9 \times 10^{10}$ (4) $2.5 \times 10^{11}$			
	HT [1] [1] HE BOOK (HE HE H	om in BCC crystal (a = $2.857 \text{ Å}$ ) is $2.2\mu\text{E}$	3.		
	The saturation magnetization of $Fe$ at $0$				
	(1) $100 \text{ kA m}^{-1}$ (3) $2500 \text{ kA m}^{-1}$	(2) $1750 \text{ kA m}^{-1}$			
	(3) $2500 \text{ kA m}^{-1}$	(4) $3520 \text{ kA m}^{-1}$			
PHD-E	E-2023-24/(Physics)(SET-Y)/(C)		0		

13. Hubble's Law enables astronomers to estimate the distance to a galaxy if they can determine the galaxy's:

(1) Spectral type 10 millionin leading and (2) Mass of the state of th

21,	scattered so as to	hit a surface 0.5 c	energy traverses a gold em <sup>2</sup> in area at a distance with the initial direction	e 10 cm from the foil a	and in a ickness
	(1) $1.31  \mu m$	(2) $2.1  \mu m$	(3) 5.31 μm	(4) 7.31 μm	

22. If the radius of silver nucleus (Z = 47), is  $7 \times 10^{-15}$  m, the minimum energy that the particle should have to just reach it is:

(1) 9.34 MeV

(2) 1.34 MeV

(3) 4.34 MeV

(4) 19.34 MeV

23. The binding energy of the nuclei  $_{26}^{56}Fe$  in units of MeV:

(1) 492.26 MeV

(2) 42.16 MeV

(3) 592.06 MeV

(4) 402.26 MeV

24. A given coin has a mass of 3.0 g. The nuclear energy that would be required to separate all the neutrons and protons from each other is (assume that the coin is entirely made of  $^{63}_{29}Cu$  atoms):

(1)  $4.6 \times 10^{24} \, MeV$  (2)  $1.6 \times 10^{25} \, MeV$  (3)  $5.6 \times 10^{28} \, MeV$  (4)  $5.3 \times 10^{22} \, MeV$ 

25. The effective radius of deuteron can be taken to be 2 fm. The hight of potential barrier for head-on collision of two deuterons is:

(1) 104 keV

(2) 100 keV

(3) 180 keV

(4) 380 keV

26. The energy released by fission of 1.0 kg of <sup>235</sup>U in a fission reactor is:

(1)  $6.1 \times 10^{22} MeV$ 

(2)  $3.1 \times 10^{25} MeV$ 

(3)  $0.1 \times 10^{21} MeV$ 

(4)  $5.1 \times 10^{26} MeV$ 

27. The electric field in a region is radically outward with magnitude of E = Ar. The charge contained in a sphere of radius, r centred at the origin is  $(A = 100 \text{ V/m}^2 \text{ and } r = 20 \text{ cm})$ :

(1)  $2.389 \times 10^{-7}$  C

(2)  $1.89 \times 10^{-9}$  C

(3)  $5.32 \times 10^{-4}$  C

(4)  $8.89 \times 10^{-9}$  C

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28.	A charge Q is uniformly distributed over a large plastic plate. The electric field at a
1	point P close to the centre of the plate is 10 V/m. If the plate is replaced by a copper
	plate of the same geometrical dimensions and carrying the same charge Q, the electric
	field at the point P will become:

111	7
4 1 1	Zero
(1)	200

(1) Zero (2) 5 V/m (3) 10 V/m (4) 20 V/m

A metallic particle having no net charge is placed near a finite metal plate carrying a positive charge. The electric force on the particle will be:

(1) towards the plate

(2) Away from the plate

(3) Parallel to the plate

(4) zero

The magnitude of the electric field at a point 4 cm away from a line charge of density  $2 \times 10^{-6}$ /m is:

endered the service of the property biggines and the research to the contract of

(1)  $3.0 \times 10^3$  N/C

(2)  $9.0 \times 10^5$  N/C

(3)  $4.0 \times 10^7 \text{ N/C}$ 

(4)  $9.0 \times 10^9$  N/C

The BCC iron has lattice parameter of 2.87 Å and its saturation magnetization value of 2750 kA m<sup>-1</sup>. The net magnetic moment per iron atom in the crystal:

(1) 4 (2) 3.5 (3) 7.4 (4) 6.3

of the arts to total wife on the area of

Calculate the wavelength of the photon, which will be required to break a cooper pair 32. in a superconductor like zirconium whose T<sub>c</sub> is 0.56 K:

(1)  $7.2 \times 10^{-3}$  m

(2)  $1.5 \times 10^{-4}$  m

(3)  $4.3 \times 10^{-5}$  m

(4)  $3.8 \times 10^{-2}$  m

33. Laser-produced plasma consisting of a 50 µm diameter ball of radiates very strongly at a wavelength of 5 nm. At a distance of 0.75 m from the source, the spatial coherence resulting from light emitted from opposite sides of the plasma is:

(1)  $5 \times 10^{-5} m$  (2)  $0.55 \times 10^{-5} m$ 

(3)  $1.2 \times 10^{-5} m$ 

(4)  $7.5 \times 10^{-5} m$ 

34. Consider the two-level system with  $E_1 = -13.6 \ eV$ ,  $E_2 = -3.4 \ eV$  and the co-efficient  $A_{21} = 6 \times 10^8 \, s^{-1}$ . The frequency of light emitted due to transition from  $E_2$  and  $E_1$  is:

 $10^{10} \text{ Mz} = 10^{17} \text{ Hz}$ 

(3)  $2.5 \times 10^{15}$  Hz

(4)  $6.5 \times 10^{14} \, \text{Hz}$ 

35. A solid-state laser emits radiation of wavelength of 6000 A and the life time,  $\tau_{sp} = 10^{-6}$  s. Assume that the refractive index of the medium is one and the co-efficient of stimulated emission is: " because a aguado con ou sweet and and additional

(1)  $1.3 \times 10^{19}$  m/kg

(2)  $1.3 \times 10^{19} \text{ m/g}$ 

(3) 6.6×10<sup>19</sup> cm/kg

(4)  $6.6 \times 10^{19} \,\mathrm{m/g}$ 

36. The ratio of spontaneous emission to stimulation emission for a cavity of temperature 50 K and wavelength of 10<sup>-5</sup> m: 1500 L Is blod by

(i)  $3.218 \times 10^{10}$ 

(2)  $3.218 \times 10^{12}$ 

STAN OF SOM

 $(3) 3.218 \times 10^{14}$ 

 $(4) 3.218 \times 10^{16}$ 

P\$(1)-1:1-20:2-2:18(Pa) mandal: 1-Y)/(E)

One of the following type of galaxies do not fall on Hubble's tuning fork diagram:

(1) Barred spiral galaxies

(2) Peculiar galaxies

(3) Elliptical galaxies

(4) Spiral galaxies

A Michelson interferometer is used to determine the apparent diameter of a star. The 38. fringe pattern disappears when the adjustable mirrors are at a separation of 10 m and wavelength of light used is  $7 \times 10^{-4}$  mm. The angular diameter of the star is :

(1)  $8.54 \times 10^{-8}$  radians

(2)  $3.54 \times 10^{-9}$  radians

(3)  $1.34 \times 10^{-8}$  radians

(4)  $1.22 \times 10^{-8}$  radians

39. The proton proton chain reaction:

(1) Produces chains of protons which are then broken apart to produce the Sun's

(2) Is a three-step process which converts some mass to energy as helium nuclei are formed thousand the same of the

(3) Is the runaway reaction that produces the fission of iron during a supernova

(4) adds protons together until a massive carbon nucleus is produced at the core of the

(1) 1000 light years

(3) 10000 light years

PHD-EE-2023-24/(Physics)(SET-Y)/(C)

41		finite depth well of width $L = 1$ nm. Consider the to the ground state $n = 1$ . The wavelength of light
42.	A particle of mass m and charge q uniform electric field E parallel to the levels is:	(3) 4321 nm (4) 8790 nm oscillating with frequency $\omega$ is subjected to a direction of oscillation. The stationary energy $(2) \frac{1}{2}\hbar\omega$
	- Parl (1981) - 1982 - 1982 - 1982 - 1982 - 1982 - 1982 - 1983 - 1983 - 1983 - 1983 - 1983 - 1983 - 1983 - 198	(4) ħω
	(1) 148 m/s (2) 2134 m/s	
44.	27°C:	with velocities between 199 m/s and 201 m/s a $(2) 2.29 \times 10^{-2}$
		$(4) \ 5.29 \times 10^{-2}$
45.	If 1 g of water freezes into ice, the	change in its specific volume is 0.091 cc. The e 10 g of water at -1°C.
	(1) 3.345 atm	(2) 0.254 atm
	(3) 2.24 atm	

40. An approximate diameter of Milky Way:

lo berraini er id e

(2) 100000 light years

(4) 1000000 light years

46.	A 50 Ω resistor carrying a constant cu	rrent of 1A is kept	at a constant temperature	e of
	300 K by a stream of cooling water. In			
	the resistor is:			
	(1) Zero	(2) 10 JK <sup>-1</sup>		
	(3) $1000 JK^{-1}$	(4) Infinity	t say tradi nyuteneh tatibilihidi	
47.	Consider six distinguishable particles a	are distributed over	three nondegenerate ene	ergy
	levels. Level 1 is at zero energy; level	2 has an energy ∈	; and level 3 has energy	2∈.
Quest by	The total number of microstates for the	system is:	recorder and many A. 18	2
	(1) 10 (2) 1168	(3) 555	(4) 729	
48.	An ideal Fermi gas is at rest at absolution. The mass of each particle is $m$ . If $\nu$ denotes			/ €.
	(1) $2 \in 1/5m$ (2) $5 \in 1/2m$	(3) 2 <i>m</i> /5∈	(4) 5 <i>m</i> /2∈	
49.	The temperature at which an ideal gas v of 1 eV is:	whose molecules ha	ave an average kinetic ene	rgy
	(1) 10345 K	(2) 11594 K		
	(3) 1234 K	(4) 4532 K	Courte management of	
50.	The classical value of molar specific he	at is:		
	(1) $R_{\rm u}/2$	(2) $3R_{\rm u}$		
	(3) $R_{\rm u}$	(4) $3R_{\rm u}/2$		
51.	In the triode region, the $I_D - V_{DS}$ characters (1) $I_{DS} = V_{DS}$	teristics of a MOS	FET are:	
	(1) Hyperbolic			
	(2) () 1	(4) Exponential		
PHD-F	EE-2023-24/(Physics)(SET-Y)/(C)	Chy.Th		

52.	. The output of operational amplifier incr	rease	es 5 V in 15 µs. The slew rate is :		
	(1) 90 V/µs and wat third exquire (2)	(2)	ο) 0.333 V/μs (1)		
	(3) 30 V/μs robothylli drive a spike (ev	(4)	) 5 V/μs		
53.	The efficiency of a full-wave rectifier is	: 110	environ teament on "storage of self		
	(1) Same as half-wave rectifier	(2)	) Double the half-wave rectifier		
	(3) One-half of half-wave rectifier	(4)	One-third of half-wave rectifier		
54.	The most unique property of laser:	, y	a m to realizable feedback to be		
	(1) speed	(2)	) directional		
	(3) coherence $\frac{2}{5}$	(4)	) wavelength		
55.	Which of the following is an example of	f opti	tical pumping?		
ogi Linga Aci	(1) Ruby laser	(2)	Helium-Neon laser		
HEAT	(3) Semiconductor laser	(4)	Dye laser is a swind a size as T		
56.	The following type of laser can be used	for g	generation of laser pulse :		
	(1) Nd-YAG laser		Carbon dioxide laser		
al to	(3) Helium neon laser (1911 or antique but	3			
57.	What is the need to achieve population in				
Marian	(1) To excite most of the atoms				
	(2) To bring most of the atoms to groun				
regress.	(3) To achieve stable condition				
	(4) To reduce the time of production of	laser	The Paris of Paris and St. St. St. St.		
58.	Which of the following is used in atomic				
	(1) Laser (2) Quartz	(3)	Maser (4) Helium		

59.	The shape of the Earth's orbit: A streamount of the speciment of the state of the s
	(1) eclipse with low excitability (2) (2) eclipse with low eccentricity (1)
	(3) circle (4) ellipse with high eccentricity
60.	The "Planetoids" are located between:
	(1) Earth & Mars Mad addition (C) (2) Mars and Jupiter day at 111
15.5	(3) Saturn & Jupiter to Lands and (4) Mercury and Venus Marcury and Venus
61.	The directional derivative of $\varphi = x^2yz + 2xz^3$ at $(1, 1, -1)$ in the direction $2\hat{i} - 2\hat{j} + \hat{k}$
	is: h95qc, (1)
	(1) $\frac{2}{3}$ dignilisary (b) (2) $-\frac{2}{3}$ expression (f)
4.7.	
	(3) $\frac{5}{3}$ is a regard to $\Sigma$ graph and a supply of $4$ ) $\frac{1}{3}$ as a graph of $\Sigma$ and $\Sigma$ and $\Sigma$
	(2) Heigh idan
62.	The angle between the surfaces $x^2 + y^2 + z^2 = 1$ and $z = x^2 + y^2 - 1$ at the point
17.	(1, +1, -1) is:
	(1) 15.76° (2) 1.75° (3) 2.53° (4) 25.22°

- A G.M. counter records 4,900 background counts in 100 min. with a radioactive source 63. in position, the same total number of counts are recorded in 20 min. The percentage of S.D. with net counts due to the source is : " in the source is in the source in the source in the source is in the source in the source is in the source in th
  - (1) 5.5%
- (2) 1.8%

(2) Carolin darried this

- (3) 0.5% (4) 2.5%

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- that where the view is lift to represent the to The alpha ray activity of a material is measured after equal successive intervals (hours), 64. in terms of its initial activity as unity to the 0.835; 0.695; 0.580; 0.485; 0.405 and 0.335. Assuming that the activity obeys an exponential decay law, the half-life is:
  - (1) 5.63 h

- (3) 2.15 h
- (4) 3.82 h

65. A thin uniform annular disc of mass M has outer radius 4R and inner radius 3R. The work required to take a unit mass from point P on its axis to infinity is:

(1) 
$$\frac{2GM}{7R} \left(4\sqrt{2}-5\right)$$
 (2)  $-\frac{2GM}{7R} \left(4\sqrt{2}-5\right)$  (2)

(2) 
$$-\frac{2GM}{7R}(4\sqrt{2}-5)$$

$$(3) \ \frac{GM}{4R}$$

(3) 
$$\frac{GM}{4R}$$
 (4)  $\frac{2GM}{5R} (\sqrt{2}-1)$  triginbian to purbinom only as  $\frac{1}{5R} (\sqrt{2}-1)$ 

Two masses m<sub>1</sub> and m<sub>2</sub> connected by a spring of spring constant k rest on a frictionless 66. surface. If the masses are pulled apart and let go, the time period of oscillation is: impub

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

(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)  $T = 2\pi \sqrt{\frac{m_2}{k}}$ 

$$(4) \quad T = 2\pi \sqrt{\frac{m_2}{k}}$$

67. Two particles of rest mass  $m_0$  approach each other with equal and opposite velocity  $\nu$ , in the laboratory frame. The total energy of one particle as measured in the rest frame of other is:

(1) 
$$E = m_o c^2$$
 (2)  $E = 2m_o c^2$ 

$$(2) E = 2m_o c^2$$

The 
$$E=3m_oc^2$$
 can be expected when the problem of the constraint  $E=1/2m_oc^2$  . The second second is the second secon

(3) 
$$E = 3m_o c^2$$
 (4)  $E = 1/2m_o c^2$ 

A thermal neutron has a speed  $\nu$  at temperature T = 300K and kinetic energy  $m_n v^2 / 2 = 3kT / 2$ . The de-Broglie wavelength of thermal neutron is:

- (1) 0.27 A
- (2)  $1.37 \mathring{A}$  (3)  $2.27 \mathring{A}$
- (4) 3.17 Å

Using the uncertainty principle, the ground state energy of a linear oscillator is expressed by: 6 21 man L ben Automor dead at 12 to be be an account

- (1)  $\frac{1}{2}\hbar\omega$  (2)  $\hbar\omega$  (3)  $\frac{3}{2}\hbar\omega$  (4)  $2\hbar\omega$

70.	An electron is tr	anned in an infinitel	v deen potential v	well of width $L = 106  fm$ . The
	wavelength of ph	oton emitted from th	e transition $E_4 \rightarrow$	E <sub>3</sub> is: 15 (1995) 110 (1995)
	(1) 3.453 nm	Part Marie	(2) 4.665 nm	- 10 - 10 m 3 m - 11 m
	(3) 1.435 nm	the Cotypy (P)	(4) 0.453 nm	
71.		never be seen on the		77. 32. 32. 32. 32. 32. 32. 32. 32. 32. 32
229120	(1) Jupiter	(2) Mercury	(3) Saturn	(4) Mars
72.		10 <sup>15</sup> electrons/cm <sup>3</sup> . T		$3 \times 10^{-4}$ cm and the dopant ric constant of silicon is 12 and
	(1) 10 V	NVI	(2) 13.5 V	WHI.
	(3) 6.8 V		(4) 15.5 V	
, 1 <b>73.</b> 1		r having a turn ratio		120 V at 60 Hz through a step- ming an ideal diode is used, the (4) 3.3 V
				The state of the s
74.	of independent w	op-amplifier with i	nfinite voltage gai	n. Let $V_1$ and $V_2$ be the values
VACORIN	respectively, and	let V <sub>o</sub> be the output	voltage. If $V_1 \neq V_2$	we and negative input terminals, then $V_0$ will be:
	(1) Zero (1977)	or an indicate the first	(2) Infinite	STYLENT WILLIAM STATE
4.4	(3) Finite (1)	13.2 (6)	(4) Unpredict	able
75.	A differential am common input sig mV, the CMRR is	gual of 3.2 V to both	circuit voltage aga terminals and it	nin of 100. This amplifier has a results in an output signal of 26
	(1) 81.8 dB	(2) 55.4 dB	(3) 23.4 dB	(4) 36.7 dB
PHD-E	EE-2023-24/(Physi	ics)(SET-Y)/(C)		Carry con a fact to the same

/ 76 <b>.</b>	The laser action is mainly characterized	i by kardo slome ani ishom composa at . A8	
	(1) Spontaneous emission process	(2) Stimulated emission process	
v.	(3) Thermionic emission process	(4) Plasmonic process	
77.		ght of mercury ( $\lambda = 4961 \mathring{A}$ ), required to do o	
iadi br Io stat	(1) $4524.2 \times 10^{18} / m^3$	(2) $2.4961 \times 10^{18}/m^3$	
	(3) $2.4961/m^3$	(4) 2.4961/m	
78.	The binding energy of the electron for t	the lowest energy level of the hydrogen atom is	s:
103201	(1) -3.399 eV (2) 3.399 meV (1)	(3) -13.595 eV (4) -13595 meV	
79.	있는데 하다 마리아 아이에 가는 아이를 가는데 하는데 하는데 하는데 하는데 하는데 하는데 하는데 하는데 하는데 하	3 and absorbs 99.8% of red light of waveleng complex refractive dielectric constant at the	
197	$(1)^{i} 1.77 + i 9.2 \times 10^{-8}$	(2) $3.37 + i 4.1 \times 10^{-5}$	
nii (a)	(3) $i 9.2 \times 10^{-8}$	(4) $2.23 + i \cdot 1.2 \times 10^{-6}$	
80.	The Doppler broadening of the emission (1) He-Ne laser	(2) Nd:YAG laser	
	(3) Nd:glass laser	(4) Ruby laser	
81.	A parallel plate capacitor having plate charge of 0.12 μC when connected to	e area 100 cm <sup>2</sup> and separation 1mm holds a 120 V battery. The dielectric constant of the	a he
	(1) 11.3 (2) 7	(3) 15 (4) 20	
82.		d created by a point charge falls off with the	he
	distance from the point charge is:	Street Control of AVI A. B. V.	
	(1) 1 (2) $\frac{1}{2}$	(3) $\frac{1}{3}$ (4) $\frac{1}{4}$	

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	(1) $3.0 \times 10^{-10} A$ (2)	$1.0 \times 10^{-12} A_{\rm const}$ 2 mas and 1 (E)
	(2) (0 10-13)	$5.0 \times 10^{-11} A$
84.	. A capacitor is connected to a 12 V battery t	
1 1111)	(1) 1.25 $\mu$ F (2) 4.25 $\mu$ F (3)	) 3.25 μF (4) 0.25 μF
	energy developed in R and 2R are in the rat	
id) id	$(1)_{1}1:2$	(4) 1:3
86.		urrent of 10 A. is placed in a magnetic field are loop. The torque on the loop due to the
	(1) Zero (2) 10 <sup>-4</sup> Nm	3) 10 <sup>-3</sup> Nm (4) 10 <sup>-2</sup> Nm
87.	7. Which of the following particles will (magnitude) when projected with the same	experience a maximum magnetic force velocity perpendicular to a magnetic field?
odi ilo	(1) Electron (2) Proton (3)	
88.	0.50 × 10 <sup>-4</sup> T. The magnetic field due to the	ring circular loop radius 12 cm at its centre is us loop at a point on the axis at a distance of
(Arnia)	(1) $1.9 \times 10^{-7} T$	2) 3.9 × 10 <sup>-5</sup> T mod that the
		4) $0.9 \times 10^{-3} \mathrm{T}$

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83. An electron moves in a circle of radius 10 cm with a constant speed of  $4 \times 10^6$  m/s. The

electric current at a point on the circle is:

89	The magnetic moment of the assumed dipole at the earth's centre is $8.0 \times 1022$ A m <sup>2</sup> . The magnetic-field B at the geomagnetic poles of the earth is (radius of earth is 6400 km):					
	(1) 60 μΤ	(2) 120 μΤ	(3) 240 μT	(4) 480 μΤ		
90.	magnetic field in t	nis light is :		d of 810 V/m. The maximum		
TALE	<ul><li>(1) 6 μT</li><li>(3) 2.7 μT</li></ul>			ergenara auto melinulatik (dist Li seri suriged Lapris di		
		TO STRABLIFA	(4) 33 μ1	n mexicos		
91.	The critical magn through a long the found to be:	in superconducting	write of diameter 1	A/m in which current flow 0 <sup>-3</sup> m. The critical current is		
	(1) 34 A	(2) 24.81 A	(3) 35.46 A	(4) 15.55 A		
92.	The transition from	the ferromagnetic to	o the paramagnetic	state is named after:		
PRINT.	(1) Curie-Weiss	(2) Neel	(3) Debye	(4) Curie		
93.	The magnetization	of a superconductor	is:			
	(1) Zero	(2) -B	(3) Constant	(4) –H		
94.	The electrical power	er output of a photod	iode is maximum w	hen a :		
	(1) Small forward current flows through it irrespective of the bias					
	(2) Small forward bias exists across it					
Transition of the second	(3) Large reverse b	oias exists across it				
	(4) Small reverse b					
95.	lattice parameters f	y of carbon is graphi for graphite be a = 2. I number of atoms in	451 $A$ ; $c = 6.701 A$	and with density of 2.2589		
	(1) 6	(2) 8	(3) 12	(4) 4		
PHD-E	EE-2023-24/(Physics	s)(SET-Y)/(C)	(2))((3-3,34)	P. T. O.		

walk 3

- 96. The packing efficiency of diamond cubic unit cell is:
- (1) 0.34 (2) 0.52 (3) 0.68 (4) 0.74

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- 97. 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)  $\sqrt{3}(r_{c}+r_{u})$
- (3)  $\sqrt{3}/2(r_c + r_a)$ 

  - strigg alife at their elegants of Calculate the energy difference between the two levels for which  $n_x = n_y = n_z = 1$  and 98. the next higher level for the free electron in a solid cube of side 10 mm:
    - (1)  $1.13 \times 10^{-14} eV$

(2)  $4.46 \times 10^{-15} \, eV$ 

- (3)  $5.86 \times 10^{-14} \, eV$
- $(4) 9.04 \times 10^{-13} eV$
- Calculate the Fermi energy of monovalent bcc crystal whose lattice constant is 2.54 Å. 99.
  - (1)  $1.035 \, eV$

(2) 4.567 eV

(3) 8.991 eV

- (4) 3.456 eV
- the restling against the formula concern to the paramagnetic The fraction of electrons excited across the energy gap in Germanium  $(E_g = 0.7eV)$  at 100. room temperature (300 K) is:

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sales. It is reading as presented by a control of the property to a growth out to solo execution of the first of the f

(1)  $7 \times 10^{-18}$ 

(2)  $1.7 \times 10^{-12}$ 

(3)  $4 \times 10^{-12}$ 

(4)  $1.3 \times 10^{-6}$ 

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Total No. of Printed Pages: 17

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	Physics	
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	and the state of the state of	reage 1600 1901 villa 1817
Time: 11/4 Hours	Max. Marks : 100	Total Questions: 100
Roll No. (in figures)	(in words)	
Name	Date of Birth	
Father's Name	Mother's Name	
Date of Examination	The state of the s	what his less with the their
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(Signature of the Candidate)	(Sig	nature of the Invigilator)
	THE FOLLOWING INFORMATION/INS	STRUCTIONS BEFORE

- 1. All questions are compulsory.
- 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 unfairmeans / mis-behaviour 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. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
- 4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
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- 6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

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char		hen conne	cted to	a 120 V battery. Th	e die	lectric co	onstant	
(1)	11.3 (	2) 7		(3) 15	(4)	20		

2. The energy density in the electric field created by a point charge falls off with the distance from the point charge is:

(1)  $\frac{1}{r}$  (2)  $\frac{1}{r^2}$  (3)  $\frac{1}{r^3}$  (4)  $\frac{1}{r^4}$ 

3. An electron moves in a circle of radius 10 cm with a constant speed of  $4 \times 10^6$  m/s. The electric current at a point on the circle is:

- (1)  $3.0 \times 10^{-10} A$  (2)  $1.0 \times 10^{-12} A$ 
  - (3)  $4.0 \times 10^{-13} A$  (4)  $5.0 \times 10^{-11} A$

4. A capacitor is connected to a 12 V battery through a resistance of 10 W. It is found that the potential difference across the capacitor rises to 4.0 V in 1 μs. The capacitance of the capacitor is:

(1)  $1.25 \,\mu\text{F}$  (2)  $4.25 \,\mu\text{F}$  (3)  $3.25 \,\mu\text{F}$  (4)  $0.25 \,\mu\text{F}$ 

5. Two resistors R and 2R are connected in series in an electric circuit. The thermal energy developed in R and 2R are in the ratio:

(1) 1:2 (2) 2:1 (3) 1:4 (4) 1:3

6. A circular loop of area 1 cm<sup>2</sup>, carrying a current of 10 A. is placed in a magnetic field of 0.1. T perpendicular to the plane of the loop. The torque on the loop due to the magnetic field is:

- (1) Zero (2) 10<sup>-4</sup> Nm
- (3)  $10^{-3}$  Nm (4)  $10^{-2}$  Nm

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		그렇게 그 사람들이 얼마를 하고 있는데 얼마를 하고 있다.
7.	Which of the following particles w	vill experience a maximum magnetic force
a To	(magnitude) when projected with the sai	me velocity perpendicular to a magnetic field?
	(1) Electron (2) Proton	(3) He <sup>+</sup> (4) Li <sup>++</sup>
	(3) 15 (4) 20 (4)	(S)
8.		urrying circular loop radius 12 cm at its centre is
1 (3)		this loop at a point on the axis at a distance of
	5.0 cm from the centre is:	t as expression on pair meets accounted to
	(1) $1.9 \times 10^{-7} T$	(2) $3.9 \times 10^{-5} \text{ T}$
	(3) $5.9 \times 10^{-4} \mathrm{T}$	(4) $0.9 \times 10^{-3} \text{ T}$
9.	The magnetic moment of the assumed of	dipole at the earth's centre is $8.0 \times 1022 \text{ A m}^2$ .
0.		ic poles of the earth is (radius of earth is 6400
	km):	the poles of the cartin is (radius of cartin is o rec
		(2) 120 v.T
	(1) 60 μT	(2) 120 μT
		(4) 480 μT
10.	The sunlight reaching the earth has max	timum electric field of 810 V/m. The maximum
	magnetic field in this light is:	
	(1) 6 μT	(2) 120 μT
11.1.1.1.	(3) 2.7 µT a abstacle are no some as	(4) 33 μT
		adam sio Asiloni di a Propilovolo y Lorsoni i
11.	In the triode region, the $I_D - V_{DS}$ charac	teristics of a MOSFET are:
	(1) Hyperbolic	(2) Linear
aliai Lor	(3) Quadratic	(4) Exponential
		reases 5 $V$ in 15 $\mu$ s. The slew rate is:
		(2) 0.333 V/μs
	(3) 30 V/μs	(4) 5 V/μs
	등(2) 6 5 시간, 400 시간 전환 15 시간 전기 경기 전환 경기 시간	

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13.	The efficiency of a full-wave rectifier is	is : capatal leascalers ductous 4 est	
	(1) Same as half-wave rectifier (4)	(2) Double the half-wave rectifier	1
	(3) One-half of half-wave rectifier	(4) One-third of half-wave rectifier	-
14.	The most unique property of laser:	The SCC area has lawer per renter of 2	
F.Y.	(1) speed in terms with a count work 150 103	(2) directional	200
	(3) coherence 4.7 (E)	(4) wavelength	
15.	Which of the following is an example of	of optical pumping ?	) i
100	(1) Ruby laser	(2) Helium-Neon laser	ī
	(3) Semiconductor laser	(4) Dye laser	
16.	The following type of laser can be used	d for generation of laser pulse:	Į.
ALOTO!	(1) Nd-YAG laser on add mont in 25.0 i	(2) Carbon dioxide laser	
	(3) Helium neon laser in add to colin an	(4) Ruby laser	
(a)	(2) (ESS) AND WE with the second set.	and the second second second	
17.	What is the need to achieve population i	inversion?	
	(1) To excite most of the atoms		
raium)	(2) To bring most of the atoms to groun	ind state	
21	(3) To achieve stable condition	SHIRT AN AND MARKET AND ADDRESS OF THE PARTY	
	(4) To reduce the time of production of	of laser	
	Section 19 (1) is the contract of the contract		
18.	Which of the following is used in atomic	nic clocks ?	
ini sa sa	(1) Laser (2) Quartz	(3) Maser (4) Helium	
19.	The shape of the Earth's orbit:		
	(1) eclipse with low excitability	(2) eclipse with low eccentricity	
	(3) circle	(4) ellipse with high eccentricity	

23.

(1) Earth & M	ars hid significaci	(2) Mars and	Jupiter less than the control of the	
	upiter to Light 3nO		and Venus	
The BCC iron of 2750 kA m <sup>-1</sup> .	has lattice paramete The net magnetic i	er of 2.87 $\mathring{A}$ and its noment per iron aton	saturation magnetization vanishing the crystal:	alue
(1) 4	(2) 3.5	(3) 7.4	(4) 6.3	
Calculate the w	vavelength of the plactor like zirconium	hoton, which will be whose T <sub>c</sub> is 0.56 K:	required to break a cooper	pair
(1) $7.2 \times 10^{-3}$ m	n i santh-recii	(2) $1.5 \times 10^{-4}$	m Total 6 9 61	
(3) $4.3 \times 10^{-5}$ n		(4) $3.8 \times 10^{-2}$	m democrature march (3)	
a wavelength of	5 nm. At a distan	of a 50 µm diameter ce of 0.75 m from the pposite sides of the p	ball of radiates very strongle the source, the spatial cohere clasma is:	y at ence
(1) $5 \times 10^{-5} m$		(2) $0.55 \times 10^{\circ}$		
(3) $1.2 \times 10^{-5} m$	chang the contract	(4) $7.5 \times 10^{-5}$	dan al band all distant and m	

D

Consider the two-level system with  $E_1 = -13.6 \ eV, E_2 = -3.4 \ eV$  and the co-efficient  $A_{21} = 6 \times 10^8 \,\text{s}^{-1}$ . The frequency of light emitted due to transition from  $E_2$  and  $E_1$  is:

The "Planetoids" are located between:

22. Calculate the wavelength of the photon,

(1) 
$$8.2 \times 10^{17} \,\text{Hz}$$

(3)  $1.2 \times 10^{-5} m$ 

(2) 
$$4.5 \times 10^{16} \,\text{Hz}$$

(3) 
$$2.5 \times 10^{15} \,\text{Hz}$$

(4) 
$$6.5 \times 10^{14} \,\mathrm{Hz}$$

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 co-efficient of stimulated emission is:

(1) 
$$1.3 \times 10^{19}$$
 m/kg

(2) 
$$1.3 \times 10^{19}$$
 m/g

(3) 
$$6.6 \times 10^{19}$$
 cm/kg

(4) 
$$6.6 \times 10^{19}$$
 m/g

Chily-Paranaginal and Assume

14 clime a with high expendently

D 26. The ratio of spontaneous emission to stimulation emission for a cavity of temperature 50 K and wavelength of  $10^{-5}$  m: which is the many matter of the state of the s (2)  $3.218 \times 10^{12}$  edg 198 () = Sample to (1)  $3.218 \times 10^{10}$  $(4) 3.218 \times 10^{16}$ (3)  $3.218 \times 10^{14}$ One of the following type of galaxies do not fall on Hubble's tuning fork diagram: (1) Barred spiral galaxies (2) Peculiar galaxies (4) Spiral galaxies (3) Elliptical galaxies A Michelson interferometer is used to determine the apparent diameter of a star. The 28. fringe pattern disappears when the adjustable mirrors are at a separation of 10 m and wavelength of light used is  $7 \times 10^{-4}$  mm. The angular diameter of the star is: (2)  $3.54 \times 10^{-9}$  radians (1)  $8.54 \times 10^{-8}$  radians (4)  $1.22 \times 10^{-8}$  radians (3)  $1.34 \times 10^{-8}$  radians 29. The proton proton chain reaction: (1) Produces chains of protons which are then broken apart to produce the Sun's > 3 Her. (5.) energy (2) Is a three-step process which converts some mass to energy as helium nuclei are formed (3) Is the runaway reaction that produces the fission of iron during a supernova explosion (4) adds protons together until a massive carbon nucleus is produced at the core of the the training of authority the the the the the the training to be the training to the training 30. An approximate diameter of Milky Way: (1) 1000 light years (2) 100000 light years (3) 10000 light years (4) (4) 1000000 light years

	melting point = 80°C, latent heat = 3	5.5 cal/g, density of s	olid = 1.145 g/cc and de	nsity
	of liquid = $0.981$ g/cc is:		M A-12-	
	(1) 100 K	(2) 300 K	· 自由原建设工程。	
	(3) 273 K	(4) 273.0346 K	harmatet en toka	
102202200	The amount of heat (in eV) must be accessible states to increase by a factor	e added to a system		r of
	(1) 0.477 eV (2) 1.235 eV	The second state of the second		
	A wire of length 1m and radius 1mm is radiant power. Treating the wire as a patemperature of the wire is:	is heated via an electri perfect blackbody and	c current to produce 1 kV ignoring any end effects,	
	(1) 1358 K (2) 1294 K			
34.	A blackbody has its cavity of cubical volume in the wavelength region 4,99		modes of vibration per t	ınit
	(1) $1.038 \times 10^{19}/m^3$	(2) $5.038 \times 10^{11}/r$	$n^3$	
il for	$(3) 8.038 \times 10^{17} / m^3$	(4) $0.038 \times 10^{19} / n$	$n^3$	
35.	A common-emitter transistor has a transition of the current is 10 mA. The emitter current		$(\beta)$ as 50 and the collection	ctor
il iu	(1) 10.2 mA (2) 45.8 mA	(3) 22.4 mA	(4) 12.5 mA	
36.	A transistor has a collector current of	of $5 mA$ , when the en	nitter voltage is 20 mV.	At

(2)  $280 \, mA$ 

(4) 1080 mA

30 mV. At 30 mV, the current is 30 mA. At 50 mV, it is:

31. The change of melting point of naphthalene per atmospheric change of pressure, given

(1) 80 mA

(3) 480 mA

37.			ge oscillator is given		
			Kathada way Sangana.		
	(1) $\frac{1}{2\pi\sqrt{LC}}$	sagist to King with a	$(2) \frac{1}{4\pi\sqrt{LC}}$	his which flower, CEX-	y 254
	And the second second		di szeron zarrzo anie	(3) 1. 30s. 1 (2)	
	$(3) \ \frac{1}{2\pi RC}$	(2) In jun.	$(4) \frac{1}{2\pi\sqrt{RC}}$	a perpasa April (a)	
15 15 1	Tenne shill hi endish	reja Teta del Saloria es	digang a Wodania wa	gordalis (de la care)	WAS I
38.	The reverse saturate	ion current in a p-n c	liode : of surgery to	Y sustaining the Substill	
	(1) Increases		(2) Decreases		
	(1) Increases	(3) 12		8.411	
1773	(3) Remains consta	ant .	(4) Oscillates		
	70.4	i zalipu pine a	iono hacamate to go-	availte garbeg efficie	-3A
39.	The phase different	ce between the input	and output voltages	of a transistor conne	cted in
	common emitter ar	rangement is:			
	(1) 2600	(2) 1909	(3) 90°	(4) 2700	The
	(1) 300	(2) 180	(3) 90	(4) 270	
40.	The DC current gai		transistor is 0.956 ar	nd emitter current is	10 mA
40.	The base current va		transistor is 0.750 th		10 1121
			4B 339 BT 195		
p. In			(2) 0.38 mA		
	(3) 0.25 mA	s impility tylos a 953	(4) 0.44 mA	Application of Many 221	
		15 1 30 × 30 × 1 (5)		4. 40 . 15 (1)	
41.	The critical magne	etic field for alumin	nium is $7.9 \times 10^3$ A	Im in which curren	nt flow
	through a long this	n superconducting v	vrite of diameter 10	<sup>-3</sup> m. The critical cur	rrent is
	found to be:	h we crystal which	every of meanwhen	Lights I that the mate I	
	(1) 34 A	(2) 24.81 A	(3) 35.46 A	(4) 15.55 A	
		WHEN E YER	AND THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TO THE PERSON NAMED IN COLU	24 Dec 101	
42.	The transition from	the ferromagnetic to	o the paramagnetic st	ate is named after:	
			(3) Debye		
		A CONTRACTOR OF THE CONTRACTOR	Charles and the Carlot	P. W. B. S.	
43.	The magnetization	of a superconductor	is:		
	(1) Zero	(2) -B		(4) –H	
	(1) 200				

	(1) Small forward current flows	s through it irrespective of	f the bias
	(2) Small forward bias exists ac	The state of the s	Titlet
	(3) Large reverse bias exists acr		
	(4) Small reverse bias exists acr		241.2
45.	One of the allotropy of carbon i	s graphite whose crystal	structure is hexagonal. Let the
MA:	lattice parameters for graphite by $g/cm^3$ . An estimated number of a	be a = 2.451 $\mathring{A}$ ; $c = 6.701$ atoms in their unit cell:	$\mathring{A}$ and with density of 2.2589
	(1) 6 (2) 8	(3) 12	(4) 4
46.	The packing efficiency of diamo	ond cubic unit cell is:	
i beir	(1) 0.34 (2) 0.52		(4) 0.74
47.	In ionic solid if the radius of ani	on is $r_a$ and of cation is $r_a$	, then bond length is:
	$(1) \left( r_c + r_a \right)$	$(2) \sqrt{3}(r_c + r_a)$	
Am 01	(3) $\sqrt{3}/2(r_c + r_a)$	$(4) \left(r_c - r_a\right)$	more from a 1971 of 1 104 of 1
48.	Calculate the energy difference the next higher level for the free	between the two levels for electron in a solid cube of	or which $n_x = n_y = n_z = 1$ and side 10 mm:
	(1) $1.13 \times 10^{-14}  eV$	(2) $4.46 \times 10^{-15}$	eV
roft a Likior	(3) $5.86 \times 10^{-14}  eV$	(4) $9.04 \times 10^{-13}$	eVincin Leithe all August
49.	Calculate the Fermi energy of mo	onovalent bcc crystal whos	e lattice constant is 2.54 Å
	(1) 1.035 eV (4)	(2) 4.567 eV	3 2.34 A.
54	(3) 8.991 eV	(4) 0 400	
50.	The fraction of electrons excited room temperature (300 K) is:	l across the energy gap in	Germanium $(E_g = 0.7eV)$ at

(4)  $1.3 \times 10^{-6}$ 

(2)  $1.7 \times 10^{-12}$ 

HIRLY-INCHORPOTABLE

room temperature (300 K) is:

(1)  $7 \times 10^{-18}$ 

(3)  $4 \times 10^{-12}$ 

PHD-EE-2023-24/(Physics)(SET-Y)/(D)

The electrical power output of a photodiode is maximum when a:

51.	A beam of protons of 5MeV kinetic energy traverses a gold foil, one particle in $5 \times 10^6$ is
CLUAN	scattered so as to hit a surface 0.5 cm2 in area at a distance 10 cm from the foil and in a
A M	direction making an angle of 60° with the initial direction of the beam and the tickness
enave e	of the foil is:

(1) 1.31  $\mu m$  (2) 2.1  $\mu m$  (3) 5.31  $\mu m$ 

and at the close P will become

If the radius of silver nucleus (Z = 47), is  $7 \times 10^{-15}$  m, the minimum energy that the 

(1) 9.34 MeV

(2) 1.34 MeV (3) 4.34 MeV (4) 19.34 MeV

The binding energy of the nuclei  ${}^{56}_{26}Fe$  in units of MeV: 53.

(1) 492.26 MeV

(2) 42.16 MeV

(3) 592.06 MeV

Estab banarante atribe another as a server a trade a trade a first of the server details A given coin has a mass of 3.0 g. The nuclear energy that would be required to separate all the neutrons and protons from each other is (assume that the coin is entirely made of 63<sub>29</sub>Cu atoms):

(1) 4.6 × 10<sup>24</sup> MeV 314 01 × 0.2 (4)

(2)  $1.6 \times 10^{25} MeV$ 

(3)  $5.6 \times 10^{28} \, MeV$ 

(4)  $5.3 \times 10^{22} \, MeV$ 

The effective radius of deuteron can be taken to be 2 fm. The hight of potential barrier 55. for head-on collision of two deuterons is:

x f to delive tomach dies i it was a (2)  $100 \ keV$ 

(3)  $180 \ keV$ 

The energy released by fission of 1.0 kg of <sup>235</sup> U in a fission reactor is: 56.

(1)  $6.1 \times 10^{22} MeV$ 

(2)  $3.1 \times 10^{25} MeV$ 

(3)  $0.1 \times 10^{21} MeV$ 

(4)  $5.1 \times 10^{26} MeV$ 

The electric field in a region is radically outward with magnitude of E = Ar. The charge contained in a sphere of radius, r centred at the origin is  $(A = 100 \text{ V/m}^2 \text{ and } r = 20 \text{ cm})$ :

(1)  $2.389 \times 10^{-7}$  C

(2)  $1.89 \times 10^{-9}$  C

(3)  $5.32 \times 10^{-4}$  C

(4)  $8.89 \times 10^{-9}$  C

PHD-EE-2023-24/(Physics)(SET-Y)/(D)

		- leatric field at
<b>58.</b>	The plate	ver a large plastic plate. The electric field at a is 10 V/m. If the plate is replaced by a copper
ceomoto	plate of the same geometrical dimension	ns and carrying the same charge Q, the electric
	A	(3) 10 V/m (4) 20 V/m
edit don	r gasas similared at 100 s. 7 st.	The West of silver nucleus IV as an
59.	A metallic particle having no net charge	ge is placed near a finite metal plate carrying a
	positive charge. The electric force on th	e particle will be:
	(1) towards the plate	(2) Away from the plate
	(3) Parallel to the plate	(4) zero
60.	The magnitude of the electric field at a $2 \times 10^{-6}$ /m is:	point 4 cm away from a line charge of density
£12 350701	(1) $3.0 \times 10^3$ N/C	(2) $9.0 \times 10^5 \text{ N/C}$
	(3) $4.0 \times 10^7 \text{N/C}$	(4) $9.0 \times 10^9$ N/C
61.	Which planet can never be seen on the	meridian at midnight ?
shirmi	(1) Jupiter (2) Mercury	(3) Saturn (4) Mars
62.		hannel width of $3 \times 10^{-4}$ cm and the dopant e relative dielectric constant of silicon is 12 and
W.	the pinch of voltage is:	
	(1) 10 $V$	(2) 13.5 V
	(2) 6 9 17	(4) 15 5 T

63. A half-wave rectifier is supplied with an AC supply of 120 V at 60 Hz through a stepdown transformer having a turn ratio of 10: 1. By assuming an ideal diode is used, the output DC voltage of diode is:

(1) 5.40 V

(2) 7.8 V

(3) 8.5 V

(4) 3.3 V

64.	Consider an ideal op-amplifier with inf	inite voltage gain. Let V <sub>1</sub> and V <sub>2</sub> be the values
	of independent voltage sources connect	ted to the positive and negative input terminals,
	respectively, and let Vo be the output vo	oltage. If $V_1 \neq V_2$ , then $V_0$ will be
117443	1) Lines and the state of the s	(2) Infinite
	(3) Finite	(4) Unpredictable
65.	를 보냈다면 보았다. 이번 대적인 경향 선생님이 많아 없어요? 얼마나 사이를 보내면 보내면 하는 것을 보냈다. 그렇게 되었다면 얼마나 네트트를 보냈다면 다른 사이를 보냈다면 살아 보다는 것이다.	rcuit voltage again of 100. This amplifier has a
160	common input signal of 3.2 V to both t	erminals and it results in an output signal of 26
	mV, the CMRR is:	: 2003m and Valuation of 20
	(1) 81.8 dB (2) 55.4 dB	(3) 22 4 dP (4) 26 7 IP
	(4) dust right distance from Jupiter	(3) 23.4 dB (4) 36.7 dB
66.	The laser action is mainly characterized	by:
by (	(1) Spontaneous emission process	(2) Stimulated emission process
	(3) Thermionic emission process	A Contract of the Contract of
	Transfer of the street of the	(4) Plasmonic process
67.		ht of mercury ( $\lambda = 4961 \mathring{A}$ ), required to do one
	joule of work:	duct being last was one in the second of the
	(1) $4524.2 \times 10^{18} / m^3$	(2) $2.4961 \times 10^{18} / m^3$
	2012 00 00 00 00 00 00 00 00 00 00 00 00 00	(4) 2.4961/m
Post I		(4) 2.4961/m
Maria Caraca Car		he lowest energy level of the hydrogen atom is:
	(1) -3.399 eV (3) -13.595 eV	(4) 12505 - 17
		(4) -13595 meV
69,		3 and absorbs 99.8% of red light of wavelength
	[2] - [2] -	complex refractive dielectric constant at this
	wavelength is:	(2) $3.37 + i 4.1 \times 10^{-5}$
		(4) $2.23 + i \cdot 1.2 \times 10^{-6}$
1	(3) $i 9.2 \times 10^{-8}$	(T) 2.23 T 1 1.2 X 10

70.	The Doppler broad	dening of the emission	on waveleng	th takes place in:
	(1) He-Ne lacer	The second secon	(2) Nd:Y	AG laser
14157241	(3) Nd:glass laser	age of the Asset Same	(4) Ruby	laser, Visit for Expression
71.		f radiation emitted b		ade up of a semiconducting material
	(1) 2.8 $\mathring{A}$		(2) 4.330	8 Å
East S	(3) 5548.4 Å	le mage og dev like er segraf bas dkembre	(4) 4430. (4) 400 01 V	8 Å mangan iku en tida e
72.	Goldilocks Zone n			A SERVICE CONTRACTOR
	(1) Habitable Zon	e BEELLE	(2) Porrio	lge Zone
	(3) Ursa Major Zo		(4) Just r	ight distance from Jupiter
73.		ables astronomers to	estimate th	e distance to a galaxy if they can
	(1) Spectral type	win monteeld (4)	(2) Mass	a con Theomorae, empshirm no
	(3) Velocity of rec	ession	(4) Temp	erature
		wave background rad		s from:
	(1) Quasars	e Herby and a great	(2) The se	olar nebula
	(3) The Big Bang	Nagoza w seres i 1,2 nagoza w seres i 1,2	(4) Radio	galaxies
75.	The lattice parame kg/m³ respectively cell is:	eter and density for If the atomic weigh	an fcc latti	ce of copper are $3.60 \text{ Å}$ and $9055$ is 63.6, the number atoms per unit
	(1) 4	(2) 6	(3) 8	(4) 12
76.	The potential energ	y of system of Na <sup>+</sup> a	nd Cl ions v	when they are at 4 $\mathring{A}$ apart:
) 11	(1) $-8.5  eV$	(2) -3.6 eV	(3) -2.5 e	V (4) -5.5 eV
77.	The degeneracy of	the quantum states w	with $(n^2 + n^2)$	$+n^2$ )=6 is:
	(1) 12	(2) 24	(3) 48	(4) 9

PHD-EE-2023-24/(Physics)(SET-Y)/(D)

78.	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) $E < E_F$ (4) $E >> E_F$
79.	The electric field required to accelerate an electron in cubic diamond having energy gap of 5.4 eV and lattice constant of 3.57 $\mathring{A}$ over a distance equal to the atomic radius is:
Irvi	(1) $7 \times 10^{10}$ (2) $1.4 \times 10^{10}$ (3) $9 \times 10^{10}$ (4) $2.5 \times 10^{11}$
	The net magnetic moment of $Fe$ atom in $BCC$ crystal ( $a = 2.857 \text{ Å}$ ) is $2.2\mu\text{B}$ . The saturation magnetization of $Fe$ at $0K$ is :
Stern	(1) $100 \text{ kA m}^{-1}$ (2) $1750 \text{ kA m}^{-1}$ (3) $2500 \text{ kA m}^{-1}$ (4) $3520 \text{ kA m}^{-1}$
	The directional derivative of $\phi = x^2 yz + 2xz^3$ at $(1, 1, -1)$ in the direction $2\hat{i} - 2\hat{j} + \hat{k}$ is:
yst.w	(1) $\frac{2}{3}$ reggo has $\lim_{\epsilon \to 0}$ (2) $\frac{2}{9}$ reggo has $\lim_{\epsilon \to 0}$ (2) $\frac{1}{3}$ (4) $\frac{1}{3}$
82.	The angle between the surfaces $x^2 + y^2 + z^2 = 1$ and $z = x^2 + y^2 - 1$ at the point
	(1, +1, -1) is: (1) 15.76° (2) 1.75° (3) 2.53° (4) 25.23° $\frac{1}{2} \frac{1}{2} $
83.	A G.M. counter records 4,900 background counts in 100 min. with a radioactive source
2500	in position, the same total number of counts are recorded in 20 min. The percentage of S.D. with net counts due to the source is:
	(1) 5.5% (2) 1.8% (2) (3) 0.5% (4) 2.5%
84.	The alpha ray activity of a material is measured after equal successive intervals (hours),
YA.	in terms of its initial activity as unity to the 0.835; 0.695; 0.580; 0.485; 0.405 and 0.335. Assuming that the activity obeys an exponential decay law, the half-life is:
	(1) $5.63 h$ (2) $8.05 h$ (3) $2.15 h$ (4) $3.82 h$

(1) 5.63 h

A thin uniform annular disc of mass M has outer radius 4R and inner radius 3R. The work required to take a unit mass from point P on its axis to infinity is:

$$(1) \ \frac{2GM}{7R} \left(4\sqrt{2}-5\right)$$

(1) 
$$\frac{2GM}{7R} (4\sqrt{2} - 5)$$
 (2)  $-\frac{2GM}{7R} (4\sqrt{2} - 5)$  (3)  $\frac{GM}{4R}$  (4)  $\frac{2GM}{5R} (\sqrt{2} - 1)$ 

$$(3) \ \frac{GM}{4R}$$

$$(4) \ \frac{2GM}{5R} \left( \sqrt{2} - 1 \right)$$

ALSEE OF Two masses m<sub>1</sub> and m<sub>2</sub> connected by a spring of spring constant k rest on a frictionless 86. 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)  $T = 2\pi \sqrt{k \left( \frac{m_1 + m_2}{m_1 m_2} \right)}$ 

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

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

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

Two particles of rest mass  $m_0$  approach each other with equal and opposite velocity  $\nu$ , 87. in the laboratory frame. The total energy of one particle as measured in the rest frame THE BUTTON START OF THE SALE of other is: (2)  $E = 2m_o c^2$ (4)  $E = 1/2m_o c^2$ 

(1) 
$$E = m_o c^2$$

$$(2) \quad E = 2m_o c^2$$

$$(3) E = 3m_o c^2$$

(4) 
$$E = 1/2m_o c^2$$

a the serious for a discount of the serious base relative that his construction is the first of 88. A thermal neutron has a speed v at temperature T = 300K and kinetic energy  $m_{\rm w}v^2/2 = 3kT/2$ . The de-Broglie wavelength of thermal neutron is:

- (1) 0.27 Å (2) 1.37 Å (3) 2.27 Å (4) 3.17 Å

89. Using the uncertainty principle, the ground state energy of a linear oscillator is o citas o discontinuo en grava a indica di la divisi o

- (1)  $\frac{1}{2}\hbar\omega$  (2)  $\hbar\omega$  (3)  $\frac{3}{2}\hbar\omega$  (4)  $2\hbar\omega$

Self-regulation of the self-regulation of the

			ė <b>1</b>
90.	An electron is trapped in an infinitely	deep potential well	of width $L = 106  fm$ . The
) (con	wavelength of photon emitted from the		
	(1) 3.453 nm	(2) 4.665 nm	el resisor (d)
	(3) 1.435 nm (4) TAL 0001 (E)	(4) 0.453 nm	one 5, e.o.
91.	A particle of mass $m_e$ trapped in an infitransition from the excited state $n = 2$ to emitted is:  (1) 1234 nm (2) 8864 nm	the ground state $n = \frac{1}{n}$	1. The wavelength of light
d)	A particle of mass $m$ and charge $q$ of uniform electric field $E$ parallel to the levels is: $(1) \left(n + \frac{1}{2}\right)\hbar\omega$	scillating with frequency direction of oscillat	uency ω is subjected to a ion. The stationary energy
21112	CONTRACTOR OF THE STATE OF THE	and the second	

93. The rms velocity of hydrogen molecules at NTP and at 127° C is:

(1) 148 m/s

(3)  $\left(n^2 + \frac{1}{2}\right)\hbar\omega$ 

- (2) 2134 m/s
- (3) 876 m/s

(4)  $\hbar\omega$ 

(4) 3149 m/s

94. The fraction of the oxygen molecule with velocities between 199 m/s and 201 m/s at 27°C:

(1)  $1.29 \times 10^{-3}$ 

(2)  $2.29 \times 10^{-2}$ 

 $(3) 2.29 \times 10^{-3}$ 

(4)  $5.29 \times 10^{-2}$ 

95. If 1 g of water freezes into ice, the change in its specific volume is 0.091 cc. The pressure required to be applied to freeze 10 g of water at -1°C.

- (1) 3.345 atm
- (2) 0.254 atm
- (3) 2.24 atm
- (4) 2.587 atm

			£ 1.4 is kent	at a constant temperature of
96.	A 50 Ω resistor ca	arrying a constant cu	rrent of 17 is kept	at a constant temperature of
	300 K by a stream	of cooling water. In	a time interval of 1	sec, the change in entropy of
	the resistor is:	121 v. (8) f. n. n.		ma S
	(1) Zero	(2) 10 JK <sup>-1</sup> (1)	(3) 1000 JK <sup>-1</sup>	(4) Infinity
97.	Consider six distir	nguishable particles a at zero energy; level	are distributed over 2 has an energy ∈	three nondegenerate energy; and level 3 has energy 2e
		of microstates for the		
		(2) 1168		(4) 729
				o and has a Fermi energy ∈
Lipsain	The mass of each p	particle is m. If v deno	otes the velocity of	a molecule, then $\overline{v}_x^2$ is:
	(1) 2∈/5 <i>m</i>	(2) 5∈/2 <i>m</i>	(3) 2 <i>m</i> /5∈	(4) 5 <i>m</i> /2∈
99.	ally the 10% of the recycle of a	t which an ideal gas v	whose molecules ha	ave an average kinetic energ
	of 1 eV is:	(a) hot		
	(1) 10345 K		(2) 11594 K	
	(3) 1234 K	m VIP and at 127%	(4) 4532 K	a conference of the
100.	The classical value	e of molar specific he	eat is:	And the
11.27.64	(1) $R_{\rm u}/2$	onVijač i muorev da	$(2) 3R_{\rm u}$	non the art of the second
	(3) R <sub>u</sub>		(4) $3R_{\rm u}/2$	270
		El alent (e).		A STATE OF THE STATE OF

Ans	wer keys of PHD-EE-20	23-24 (PHYSICS) entra	nce exam dated 22.03	.2024
Q. NO.	Α	В	С	D
1	2	2	4	1
2	1	3	1	4
3	2	1	2	2
4	4	2	3	4
5	1	1	1	1
6	1	2	4	1
7	3	2	3	4
8	2	3	3	2
9	1	1	2	1
10	1	1	4	3
11	2	2	4	3
12	1	1	1	2
13	4	4	3	2
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15	3	1	1	1
16	1	2	2	4
17	4	2	2	1
18	1	1	3	3
19	2	2	1	2
20	2	2	2	2
21	4	1	1	2
22	1	4	4	1
23	2	2	1	4
24	3	4	2	3
25	1	1	3	1
26	4	1	4	2
27	3	4	4	2
28	3	2	3	1
29	2	1		2
	4	3	2	2
30 31	3	2	2	4
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34 35	3	4	3	3
		1	2	1
36	4	1		4
37	1	3	2	3
38	3	2	1	3
39	2	1	2	2
40	2	1	,2	4
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44	2	3	3	2
45	1	1	3	3
46	2	2	1	1
47	2	2	4	1
48	3	3	1	1
49	1	1	2	3
50	1	2	2	4

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	1		nce exam dated 22.03	
Q. NO.	A	В	С	D
51	4	2	3	1
52	1	4	2	4
53	3	4	2	1
54	3	2	3	2
55	1	3	1	3
56	2	1	4	4
57	2	1	1	4
58	3	1	3	3
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60	2	4	2	2
61	2	4	2	2
62	4	1	1	3
63	4	2	2	1
64	2	3	4	2
65	3	1	1	
				1
66	1	4	1	2
67	1	3	3	2
68	1	3	2	3
69	3	2	1	1
70	4	4	1	1
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80	2	2	1	2
81	1			
		1	1	2
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83	1	1	2	2
84	2	2	4	4
85	3	3	1	1
86	4	4	1	1
87	4	4	4	3
88	3	3	2	2
89	1	1	1	1
90	2	2	.3	1
91	1	3	2	2
92	4	2	4	1
93	2	2	4	4
94	4	3	2	3
95	1	1	3	3
96	1	4	1	1
97	4			
		1	1	4
98	2	3	1	1
99	1	2	3	2

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Page 2 of 2

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Jul 32/03/24