Test Booklet No. _____

This booklet consists of 100 questions and 15 printed pages.

RGUCET/2024/__/_

Series NIL

RGUCET 2024
Common Entrance Test, 2024

MASTER OF SCIENCE (PHYSICS)

Full Marks: 100 **Time: 2 Hours**

Roll No. | | | | | | | | |

Day and Date of Examination: _____

Signature of Invigilator(s) _____

Signature of Candidate _____

General Instructions:

PLEASE READ ALL THE INSTRUCTIONS CAREFULLY BEFORE MAKING ANY ENTRY.

1. DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO.
2. Candidate must write his/her Roll Number on the space provided.
3. This Test Booklet contains 100 Multiple Choice Questions (MCQs) from the concerned subject. Each question carries 1 mark. There shall be negative marking of 0.25 against each wrong attempt.
4. Please check the Test Booklet to verify that the total pages and total number of questions contained in the test booklet are the same as those printed on the top of the first page. Also check whether the questions are in sequential order or not.
5. Candidates are not permitted to enter into the examination hall after the commencement of the entrance test or leave the examination hall within one hour thirty minutes.
6. Making any identification mark in the OMR Answer Sheet or writing Roll Number anywhere other than the specified places will lead to disqualification of the candidate.
7. Candidates shall maintain silence inside and outside the examination hall. If candidates are found violating the instructions mentioned herein or announced in the examination hall, they will be summarily disqualified from the entrance test.
8. In case of any dispute, the decision of the Entrance Test Committee shall be final and binding.
9. The OMR Answer Sheet consists of two copies, the Original copy and the Student's copy.

<table>
<tr><td>1</td><td colspan="4">Convert into the indirect speech of the following sentence: -
He said “Let him do whatever he likes”</td><td>c)</td></tr>
<tr><td></td><td>a) He said that let he did whatever he liked.</td><td>b) He said that he would not be allowed to do whatever he likes.</td><td>c) He said that he might be allowed to do whatever he liked.</td><td>d) He said that he be allowed whatever he liked to do.</td><td>He said that he might be allowed to do whatever he liked.</td></tr>
<tr><td>2</td><td colspan="4">Choose an appropriate “to be verb” to agree in the sentence: - Neither the teacher nor the students ……coming.</td><td>b)</td></tr>
<tr><td></td><td>a) am</td><td>b) are</td><td>c) may</td><td>d) is</td><td>are</td></tr>
<tr><td>3</td><td colspan="4">Fill the blanks with proper determiners in the sentence: -
Who is ……. happiest of all?</td><td>d)</td></tr>
<tr><td></td><td>a) this</td><td>b) an</td><td>c) a</td><td>d) the</td><td>the</td></tr>
<tr><td>4</td><td colspan="4">Change the following sentence into simple sentence: -
“Though he is poor, he is honest.”</td><td>b)</td></tr>
<tr><td></td><td>a) He can not help poverty but honest.</td><td>b) In spite of his poverty, he is honest.</td><td>c) As he is poor, he is honest</td><td>d) He is poor since he is honest.</td><td>In spite of his poverty, he is honest.</td></tr>
<tr><td>5</td><td colspan="4">Match the following antonym words in column I and column II: -
<table><tr><th>column I</th><th>column II</th></tr><tr><td>A. Confident</td><td>1. Retail</td></tr><tr><td>B. Civil</td><td>2. Bondage</td></tr><tr><td>C. Liberty</td><td>3. Diffident</td></tr><tr><td>D. wholesale</td><td>4. Rude</td></tr></table></td><td>a)</td></tr>
<tr><td></td><td>a)A-3, B-4, C-2, D-1</td><td>b) A-2, B-4, C-3, D-1</td><td>c) A-3, B-1, C-2, D-4</td><td>d) A-3, B-2, C-4, D-1</td><td>A-3, B-4, C-2, D-1</td></tr>
<tr><td>6</td><td colspan="4">If a is simple constant, what is the derivative of $y = e^{-x}$</td><td>d)</td></tr>
<tr><td></td><td>(a) $-e^{x}$</td><td>b) $\frac{1}{e^{x}}$</td><td>c) $-\frac{1}{e^{-x}}$</td><td>d) $-\frac{1}{e^{x}}$</td><td>$-\frac{1}{e^{x}}$</td></tr>
<tr><td>7</td><td colspan="4">Consider the points A(2, 3), B(4, k) and C(6, –3), for what value of k, the three points are colinear</td><td>a</td></tr>
<tr><td></td><td>a) 0</td><td>b) 1</td><td>c) -4</td><td>d) 4</td><td>0</td></tr>
<tr><td>8</td><td colspan="4">A player scored the following runs in 6 innings : 30, 19, 25, 30, 27, 30. The modal score of the player is</td><td>b</td></tr>
<tr><td></td><td>a) 25</td><td>b) 30</td><td>c) 27</td><td>d) 19</td><td>30</td></tr>
<tr><td>9</td><td colspan="4">A train is late 10 minutes while traveling at 3/4th of the original speed. What is the usual time taken by the train to accomplish the journey?</td><td>b</td></tr>
<tr><td></td><td>a) 120 minute</td><td>b) 30 minute</td><td>c) 40 minute</td><td>d) 90 minute</td><td>30 minute</td></tr>
<tr><td>10</td><td colspan="4">A person walks 5 km towards the south and then turns to the right. Upon walking 3 km he turns to the left and walks 5 km. In which direction is he facing at present?</td><td>d</td></tr>
<tr><td></td><td>a) North</td><td>b) East</td><td>c) West</td><td>d) South</td><td>South</td></tr>
<tr><td>11</td><td colspan="4">‘WihuKuh festival’ is celebrated by the Tangsa Tribe in which state?</td><td>c</td></tr>
<tr><td></td><td>a) Assam</td><td>b) West Bengal</td><td>c)Arunachal Pradesh</td><td>d)Madhya Pradesh</td><td>Arunachal Pradesh</td></tr>
</table>

12	What is the target year of global nutrition for India?				b
	a)2024	b)2025	c)2027	d)2030	2025
13	Which of the following schemes/programmes is not related to microfinance type of initiatives?				a
	a) Ujjwala Scheme	b) Jan Dhan Yojana	c)Jeevika Project	d)None	Ujjwala Scheme
14	Which Tennis player has won the Roland Garros 2023 trophy?				a
	a) Novak Djokovic	b) Carlos Alcaraz	c)Daniil Medvedev	d)Casper Ruud	Novak Djokovic
15	Which country is the host of the 'Multilateral Naval Exercise Komodo'?				a
	a) Indonesia	b) Myanmar	c)Nepal	d)Bangladesh	Indonesia
16	In which year Arunachal Pradesh became an Indian state ?				c)
	a) 1972	b) 1982	c) 1987	d) 1977	1987
17	*Mangifera indica* is the scientific name of which fruit ?				b)
	a) Guava	b) Mango	c) Jackfruit	d) Mangrove	Mango
18	Who has written the *Malgudi Days* ?				a)
	a) R. K. Narayan	b) Shankar Nag	c) Kavitha Lankesh	d) Sudha Murthy	R. K. Narayan
19	Who was the first musician to be awarded the Bharat Ratna				b)
	a) Lata Mangeshkar	b) M. S. Subbulakshmi	c) Pt. Ravi Shankra	d) Pt. Bhimsen Joshi	M. S. Subbulakshmi
20	Which Indian Physicist was nominated for Nobel Prize 9 times ?				d)
	a) Prof. J.C. Bose	b) Prof. S.N.Bose	c) Prof. C.V. Raman	d) Prof. E.C.G. Sudarshan	Prof. E.C.G. Sudarshan
21	The force is called as conservative coerce for which work done is independent of …….				(b)
	(a) Distance	(b) Path	(c) Time	(d) One of the above	Path
22	The dimensions of coefficients of viscosity is				(b)
	a) $[M^{-1}L^{1}T^{-1}]$	b) $[M^{1}L^{-1}T^{-1}]$	c) $[M^{1}L^{-1}T^{1}]$	d) $[M^{1}L^{1}T^{1}]$	$[M^{1}L^{-1}T^{-1}]$
23	The equation for continuity for gas may be written as				(a)
	(a) $A_1v_1 = A_2v_2$	(b) $\rho_1v_1 = \rho_2v_2$	(c) $A_1\rho_1 = A_2\rho$	(d) $A_1v_1\rho_1 = A_2v_2\rho_2$	$A_1v_1 = A_2v_2$
24	Which is correctly matched? A. Impulse — i. $Newton\ second$ B. Momentum — i. $Kg\ meter/second$ C. Surface Tension — i. $Newton/meter$				(d)

	D. Pressure		$.Newton/m^2$		
	a) A-ii, B-iii, C-i, D-iv	b) A-iii, B-i, C-ii, D-iv	c) A-iii, B-ii, C-iv, D-i	d) A-i, B-ii, C-iii, D-iv	A-i, B-ii, C-iii, D-iv
25	Which is correctly matched? A. A book resting on a table — i.Inertia B. A skydiver falling at terminal velocity — i.Net force C. A car accelerating from a stop — i.Equilibrium D. A rollercoaster moving in a loop — .Centripetal force				(b)
	a) A-iv, B-i, C-ii, D-iii	b) A-iii, B-i, C-ii, D-iv	c) A-iii, B-iv, C-ii, D-i	d) A-i, B-iii, C-ii, D-iv	A-iii, B-i, C-ii, D-iv
26	Which of the following statements is/are correct about friction? (i) Friction can be eliminated on any surface (ii) Rolling reduces friction (iii) Sliding friction is smaller than the rolling friction				(b)
	a) (i), (ii) only	b) (ii), (iii) only	c) (iii), (iv) only	d) (i), (iv) only	(ii), (iii) only
27	Among the following statements (i) Inelastic collisions conserve kinetic energy. (ii) An object moving at terminal velocity continues to accelerate downward due to gravity. (iii) When a block slides down a frictionless incline, its potential energy is converted entirely into kinetic energy. The true option is/are				(c)
	a) (i) and (ii)	b) (ii) only	c) (iii) only	d) (ii) and (iii)	(iii) only
28	**Assertion:** An object moving in a circular path at a constant speed is undergoing acceleration. **Reason:** Acceleration is a change in velocity, which can be a change in speed or direction. In the light of the above statements, choose the correct answer				(a)
	(a) Both the **Assertion** and the **Reason** are true, and the reason is the correct explanation of the assertion.	(b) Both the **Assertion** and the **Reason** are true, but the reason is not the correct explanation of the assertion.	(c) The **Assertion** is true, but the **Reason** is false.	(d) The **Assertion** is false, but the **Reason** is true.	Both the **Assertion** and the **Reason** are true, and the reason is the correct explanation of the assertion.
29	**Assertion:** In an elastic collision, the kinetic energy of the system is conserved. **Reason:** An elastic collision is one in which there is no loss of kinetic energy. In the light of the above statements, choose the correct answer				(a)
	(a) Both the **Assertion** and the **Reason** are true, and the reason is the	(b) Both the **Assertion** and the **Reason** are true, but the reason is not the correct	(c) The **Assertion** is true, but the **Reason** is false.	(d) The **Assertion** is false, but the **Reason** is true.	Both the **Assertion** and the **Reason** are true, and the reason

	correct explanation of the assertion.	explanation of the assertion.			is the correct explanation of the assertion.
30	Constant voltage can be provided by a				d
	a) p-n junction diode	b) tunnel diode	c) light emitting diode	d) Zener diode	Zener diode
31	The modulus of rigidity and Poisson's ratio of wire are $2.87 \times 10^{10}\ N/m^2$ and 0.379 respectively. What is the value of Young's modulus of the material of the wire?				(b)
	(a) $1.08773 \times 10^{10}\ N/m^2$	(b) $7.915 \times 10^{10}\ N/m^2$	(c) $7.5725 \times 10^{10}\ N/m^2$	(d) $0.1403 \times 10^{10}\ N/m^2$	$7.915 \times 10^{10}\ N/m^2$
32	The phase of the complex function $f(z) = e^z$, where $z = x + iy$ is				a)
	a) y/x	b) x/y	c) x	d) y	y/x
33	If f(z) is analytic inside and on the boundary C of a simply connected region R, then $\frac{1}{2\pi i}\int_C \frac{f(z)}{z-a}dz = f(a)$ is given by				c)
	a) Morera's theorem	b) Cauchy-Reimann theorem	c) Cauchy's integral formula	d) Poisson's integral formulae	Cauchy's integral formula
34	Identify the true(T)/false(F) statements of the following and choose the correct one from the alternatives: A. Fourier's series is obtained for any function defined over a certain regular interval of time. B. Taylor expansion of a continuous, infinite, and bounded function defined over a certain domain can be done. C. The inverse of a matrix exists if its non-zero determinant exists. D. The distortion factor between size in uv-space and size in xy-space is called the Jacobian.				b)
	a) A-T, B-F, C-T, D-F	b) A-F, B-F, C-T, D-T	c) A-F, B-T, C-F, D-T	) A-T, B-T, C-F, D-F	A-F, B-F, C-T, D-T
35	Identify the true(T)/false(F) statements of the following and choose the correct one from the alternatives: A. The partial derivative of two variable function taken random order of variables is immaterial. B. Parseval's theorem gives the relationship between the coefficients of the Fourier's series of a given function. C. De Moivre's Theorem states that it is not related to find the power of any complex number in the polar form. D. A singular matrix is a square matrix whose determinant is nonzero.				c)
	a) A-T, B-F, C-F, D-T	b) A-F, B-T, C-T, D-F	a) A-T, B-T,C-F,D-F	d) A-F, B-F, C-T, D-T	A-T, B-T, C-F, D-F
36	A:If $f(x) = x$ and $f(x) = \frac{x^2}{x}$, then $F(x) = f(x)$ always. R: At $x = 0$, $F(x)$ is not defined.				a)
	a) Assertion is correct, reason is correct;	b) Assertion is correct, reason is correct; reason is	c) Assertion is correct, reason is correct; reason	d) Assertion is correct, reason is correct; reason	Assertion is correct, reason is

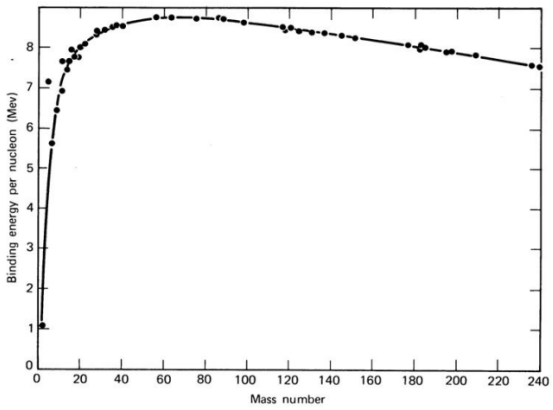
	reason is a correct explanation for assertion.	a correct explanation for assertion.	is a correct explanation for assertion.	is a correct explanation for assertion.	correct; reason is a correct explanation for assertion.
37	A: If $A=\begin{pmatrix}1 & 0 & -1\\ 2 & 0 & 6\\ 1 & 0 & 3\end{pmatrix}$, Det (A)=0 as all elements in second column are zero. R: Laplace expansion evaluates the determinant along any row or column.				a)
	a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.	b) Assertion is correct, reason is correct; reason is a correct explanation for assertion.	c) Assertion is correct, reason is correct; reason is a correct explanation for assertion.	d) Assertion is correct, reason is correct; reason is a correct explanation for assertion.	Assertion is correct, reason is correct; reason is a correct explanation for assertion.
38	If $\vec{A}$=(x, 0, 0), $\vec{B}$=(0, y, 0), then $\vec{\nabla}(\vec{A}.\vec{B})$ equals to				b)
	a) 1	b) 0	c) -1	d) $\hat{i}$	0
39	If the position vector is denoted by $\vec{r}$, then curl of $\vec{r}$ is				a)
	a) 0	b) 3	c) r	d) $r^{3/2}$	0
40	In a square matrix, each diagonal element is real and $a_{ij}=\bar{a}_{ij}$. The matrix will be				a)
	a) Symmetric	b) Skewsymmetric	c) Hermitian	d) Skew Hermitian	Symmetric
41	$\frac{1}{(\frac{d}{dx}-a)}Q(x)$ equals to				d)
	a) $e^{ax}\int Q(x)dx$	b) $e^{-ax}\int e^{ax}Q(x)dx$	c) $e^{-ax}\int Q(x)dx$	d) $e^{ax}\int e^{-ax}Q(x)dx$	$e^{ax}\int e^{-ax}Q(x)dx$
42	The eigen values of the matrix $A=\begin{pmatrix}1 & 0 & 0\\ -10 & -2 & 0\\ 1 & 3 & -1\end{pmatrix}$ is				c)
	a) (1,-10,1)	b) (1,-2,1)	c) (1,-2,-1)	d) (1,3,-1)	(1,-2,-1)
43	The solution of the differential equation $(x-y^2)dx+2xydy=0$ is				b)
	a) $ye^{y^2/x}$	b) $xe^{y^2/x}$	c) ye^{x/y^2}	d) xe^{x/y^2}	$xe^{y^2/x}$
44	Identify the true(T)/false(F) statements of the following and choose the correct one from the alternatives: A. The dot product of two vectors is a vector. B. The cross product of two vectors is a scalar. C. The scalar triple products of three vectors is a scalar. D. The vector triple product of three vectors is a vector.				a)

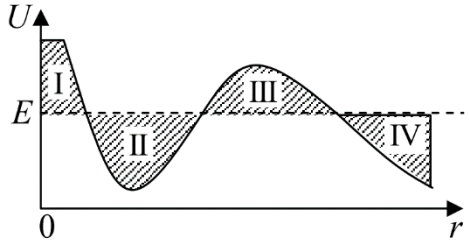
	a) A-F, B-F, C-T, D-T	b) A-F, B-T, C-T, D-F	c) A-T, B-F, C-T, D-F	d) A-F, B-T, C-T, D-T	A-F, B-F, C-T, D-T
45	Match the following column I and column II regarding matrices and choose the correct pair from the alternatives: - column I: A. Hermitian; B. Skew Hermitian; C. Unitary; D. Idempotent column II: 1 If $A^{\dagger} = -A$; 2 If $A^2 = A$; 3 If $A^{\dagger} = A$; 4 If $A^{\dagger} = A^{-1}$				b)
	a) A-2, B-3, C-1, D-4	b)A-3, B-1, C-4, D-2	c)A-2, B-4, C-3, D-1	d) A-2, B-4, C-1, D-3	A-3, B-1, C-4, D-2
46	The locus represented by $\|z-3\|+\|z+3\|=10$ is				c)
	a) circle	b) parabola	c) Ellipse	d) Hyperbola	Ellipse
47	Match the following column I and column II regarding differentials and choose the correct pair from the alternatives: - column I: A. The degree of the differential equation $\left(1+\frac{dy}{dx}\right)^3 = \left(\frac{d^2y}{dx^2}\right)^2$ is; B. The order of the differential equation $\left(1+\frac{dy}{dx}\right)^3 = \left(\frac{d^4y}{dx^4}\right)^2$ is; C. The order of the differential equation of all circles of given radius a is; D. The order of the differential equation: $\sin x = \frac{d^3y}{dx^3}$ is column II: 1. 3; 2. 1; 3. 2; 4. 4				a)
	a) A-3, B-4, C-2,D-1	b) A-4, B-3, C-2, D-3	c) A-3, B-4, C-1, D-2	d) A-1, B-2, C-4, D-3	A-3, B-4, C-2, D-1
48	The electric lines of force due to a positive charge are directed……. the charge. Fill up the blank.				b)
	a) toward	b) outward	c) tangential	d) oblique	outward
49	The total electric flux through the spherical surface enclosing an electric dipole is				b)
	a) $\frac{1}{\varepsilon}$	b) 0	c) ε	d) 1	0
50	Match the following column I and column II and choose the correct pair from the alternatives: - column I: A. Reluctivity; B. Permeance; C. Permeability; D. Reluctance column II: 1.Resistance; 2.Resistivity; 3.Conductance; 4. conductivity				b)

<table>
<tr><td></td><td>a) A-3, B-4, C-1,D-2</td><td>b) A-2, B-3, C-4, D-1</td><td>c) A-2, B-4, C-3, D-1</td><td>a) A-2, B-1, C-4, D-3</td><td>A-2, B-3, C-4, D-1</td></tr>
<tr><td>51</td><td colspan="4">A free electron is placed in the path of a plane electromagnetic wave. The electron will start moving</td><td>a)</td></tr>
<tr><td></td><td>a) along the electric field</td><td>b) along the magnetic field</td><td>c) along the direction of propagation of the wave</td><td>d) in a plane containing the magnetic and the plane of propagation</td><td>along the electric field</td></tr>
<tr><td>52</td><td colspan="4">Monochromatic electromagnetic waves mean that</td><td>a)</td></tr>
<tr><td></td><td>a) the field strength at a point varies with according to sine or cosine function</td><td>b) the wave always travels in the same direction</td><td>c) electric field vector lies in one direction only</td><td>d) electrom agnetic waves are transverse in nature</td><td>the field strength at a point varies with according to sine or cosine function</td></tr>
<tr><td>53</td><td colspan="4">The electric flux density is</td><td>b)</td></tr>
<tr><td></td><td>a) normal</td><td>b) tangentia l</td><td>c) opposite</td><td>d) unrelated</td><td>tangential</td></tr>
<tr><td>54</td><td colspan="4">Each of these questions contains two statements, Assertion (A) and Reason (R). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.
A: Due to high inductance of any coil, the current attains it peak value relatively late in it.
R:Due to self-induction, coil opposes the flow of current through it.</td><td>c)</td></tr>
<tr><td></td><td>a) Asserti on is correct, reason is correct; reason is a correct explanation for assertion.</td><td>b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion.</td><td>c) Assertion is correct, reason is incorrect.</td><td>d) Assertion is incorrect, reason is correct.</td><td>Assertion is correct, reason is incorrect.</td></tr>
<tr><td>55</td><td colspan="4">Match the following column I and column II and choose the correct pair from the alternatives: -

<table><tr><th>column I</th><th>column II</th></tr><tr><td>A. Time varying magnetic field</td><td>1. consists of oscillating electric and magnetic fields</td></tr><tr><td>B. Time varying electric field</td><td>2. induces magnetic field</td></tr><tr><td>C. Electromagnetic wave</td><td>3. resistance multiplied by current</td></tr><tr><td>D. Power</td><td>4. induces electric field</td></tr></table></td><td>c)</td></tr>
<tr><td></td><td>a) A-1, B-2, C-4, D-3</td><td>b) A-1, B-2, C-4, D-3</td><td>c) A-4, B-2, C-1, D-3</td><td>d) A-2, B-4, C-1, D-3</td><td>A-4, B-2, C-1, D-3</td></tr>
<tr><td>56</td><td colspan="4">Each of these questions contains two statements, Assertion (A) and Reason (R). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.
A: When number of turns N in a coil is doubled, coefficient of self-inductance (L) of the coil becomes 2 times.</td><td>c)</td></tr>
</table>

	R: As it is $L\alpha\frac{1}{N}$.				
	a) Assertion is correct; reason is correct; reason is a correct explanation for assertion.	b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion.	c) Assertion is correct, reason is incorrect.	d) Assertion is incorrect, reason is correct.	Assertion is correct, reason is incorrect.
57	Identify the true(T)/false(F) statements of the following and choose the correct one from the alternatives: - A. The current flowing through a wire of length 2.5 is 100. If the wire is made square, magnetising force at the centre of the square is 144 approximately. B. Magnetic susceptibility is the product of the magnetising intensity and the magnetising force. C. Magnetic poles cannot be isolated. D. A ring of radius r carries a linear charge density l. It is rotating with angular speed w. The magnetic field at its centre is proportional to the product of l and w.				a)
	a) A-T, B-F, C-T, D-T	b) A-F, B-F, C-T, D-T	c) A-T, B-T, C-F, D-T	d) A-T, B-F, C-F, D-F	A-T, B-F, C-T, D-T
58	Identify the true(T)/false(F) statements of the following and choose the correct one from the alternatives: - A. Electric field inside a charged spherical shell of radius R is proportional to R. B. Electric field inside a uniformly charged sphere of radius R is zero. C. The displacement current arises due to time varying electric field. D. The direction of propagation of electromagnetic wave is given the cross product of the electric and magnetic fields.				c)
	a) A-F, B-T, C-F, D-T	b) A-T, B-F, C-T, D-F	c) A-F, B-F, C-T, D-T	d) A-T, B-F, C-T, D-F	A-F, B-F, C-T, D-T
59	The electromagnetic energy resides in				c)
	a) magnetic field	b) electric field	c) electromagnetic field	d) conductor	electromagnetic field
60	For a given dielectric, the electric polarizability				c)
	a) increases with temperature	b) decreases with temperature	c) is not affected by temperature	d) may increase or decrease with temperature	is not affected by temperature
61	In a dielectric the polarization is				a)
	a) linear function of applied field	b) square function of applied function	c) exponential function of applied function	d) logarithmic function of applied function	linear function of applied field
62	If a proton is moved against the Coulomb force of an electric field,				b)
	a) work is done by the field	b) energy is used from outside source	c) the strength of the field is decreased	d) the energy of the system is decreased	energy is used from outside source
63	Electric field at a point varies as the inverse of the distance for				d)

	a) A point charge	b) Spherically symmetric charge distribution	c) A plane infinite sheet of charge	d) A line charge of infinite length	A line charge of infinite length
64	The variation of binding energy per nucleon with respect to the mass number of nuclei is shown in the figure:  Consider the following reactions: (i) $^{238}_{92}U \rightarrow {}^{206}_{82}Pb + 10p + 22n$ (ii) $^{238}_{92}U \rightarrow {}^{206}_{82}Pb + 8He + 6e^{-}$ Which one of the following statements is true for the given decay modes of $^{238}_{92}U$?				Answer option (a,b,c or d)
	a) Both (i) and (ii) are allowed	b) Both (i) and (ii) are forbidden	c) (i) is forbidden and (ii) is allowed	d) (i) is allowed and (ii) is forbidden	c
65	A free particle of energy *E* collides with a one-dimensional square potential barrier of height *V* and width *W*. Which one of the following statement(s) is/are correct? A. For $E < V$, the transmission coefficient changes more rapidly with *W* than with *V* B. For $E < V$, if *V* is doubled, the transmission coefficient will also be doubled C. For $E > V$, the transmission coefficient for the particle across the barrier will always be unity D. Sum of the reflection and the transmission coefficients is always one				Answer option (a,b,c or d)
	a) A and C only	b) A and B only	c) B and D only	d) A and D only	d
66	Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R): A: Radioactivity is a natural phenomenon that arises from the spontaneous decay of unstable atomic nuclei. R: The laws of radioactive decay, including alpha, beta, and gamma decay, govern the emission of particles and energy from unstable nuclei, with widespread applications in medicine, industry, and research. In the light of the above statements, choose the correct answer from the options given below:				Answer option (a,b,c or d)

	a) A is true, but the R is false.	b) Both A and R are true, and the R is the correct explanation for the A.	c) Both A and R are true, but the R is not the correct explanation for the A	d) Both A and R are false.	b
67	A γ -ray photon emitted from a ^{137}Cs source collides with an electron at rest. If the Compton shift of the photon is 3.25×10^{-13} m, then the scattering angle is closets to, (Given, Planck's constant $h = 6.626\times10^{-34}$ Js, electron mass $m_\theta = 9.109\times10^{-31}$ kg and velocity of light in free space $c = 3\times10^{8}$ m/s)				Answer option (a,b,c or d)
	a) 30°	b) 45°	c) 60°	d) 90°	a
68	The relation between angular frequency ω and wave number k for given type of waves is $\omega^2 = \alpha k + \beta k^3$. The wave number k_0 for which the phase velocity equals the group velocity is,				Answer option (a,b,c or d)
	a) $3\sqrt{\frac{\alpha}{\beta}}$	b) $\left(\frac{1}{3}\right)\sqrt{\frac{\alpha}{\beta}}$	c) $\sqrt{\frac{\alpha}{\beta}}$	d) $\left(\frac{1}{2}\right)\sqrt{\frac{\alpha}{\beta}}$	c
69	Match the following concepts with their corresponding descriptions: A. Inertial frames — i. Mathematical equations that describe how space and time coordinates change between inertial frames moving at constant relative velocities. B. Galilean invariance — ii. The assumption that the speed of light in a vacuum is constant for all observers, regardless of their motion. C. Postulates of special relativity — i.Frames of reference that move at a constant velocity with respect to one another. D. Lorentz transformations — .The principle stating that the laws of physics are the same in all inertial frames.				Answer option (a,b,c or d)
	a) A-iv, B-iii, C-ii, D-i	b) A-i, B-iii, C-ii, D-iv	c) A-iii, B-iv, C-i, D-ii	d) A-iii, B-iv, C-ii, D-i	d
70	The black body spectrum of an object O_1 is such that its radiant intensity (i.e., intensity per unit wavelength interval) is maximum at a wavelength of 200 *nm*. Another object O_2 has the maximum radiant intensity at 600 *nm*. The ratio of power emitted per unit area by O_1 to that of O_2 is				Answer option (a,b,c or d)
	a) $\frac{1}{81}$	b) $\frac{1}{81}$	c) 9	d) 81	d
71	A classical particle has total energy E. The plot of potential energy (U) as a function of distance (r) from the centre of force located at $r = 0$ is shown in the figure. Which of the regions are forbidden for the particle?  				Answer option (a,b,c or d)
	a) I and II	b) I and IV	c) II and IV	d) I and III	d
72	The current gain of a transistor in a common emitter circuit is 49, the base current gain is				a

	a) 0.98	b) 0.64	c) 0.49	d) 0.02	0.98
73	The spacing of the planes in a crystal is 0.12 nm and the angle for the first order reflection is 30^o. The energy of the X-ray is				b
	a) 103 eV	b) 10.3 eV	c) 153 eV	d) 15.3 eV	10.3 eV
74	In binary system, the subtractions of 10100 from 11011 gives				a
	a) 00111	b) 01101	c) 11011	d) 10111	00111
75	The rectification ratio for a germanium pn junction at 0.13 V and room temperature is given as				d
	a) e^2	b) e^3	c) e^4	d) e^5	e^5
76	Which is correctly matched? A Breakdown voltage — i Bipolar Junction Transistor B Forward current transfer ratio — ii Operational amplifier C Common-mode rejection ratio — iii Zener diode D De Morgan's theorem — iv Boolean expression				b
	a) A-ii, B-iii, C-i, D-iv	b) A-iii, B-i, C-ii, D-iv	c) A-iii, B-ii, C-iv, D-i	d) A-i, B-ii, C-iii, D-iv	A-iii, B-i, C-ii, D-iv
77	Assertion (A): For FCC crystal structure, the number of lattice points per unit cell is 4 Reason (R): There are 8 corner lattice points shared by 8 cells, 6 face centred points shared between two cells. In the light of the above statements, choose the correct answer				a
	a) Both A and R are true	b) A is true, R is false	c) Both A and R are false	d) A is false, R is true	Both A and R are true
78	Assertion (A): In common emitter configuration of a pnp transistor, the cut-off region is considered as off-state of the transistor. Reason (R): In this region the emitter and collector both are forward biased. In the light of the above statements, choose the correct answer				b
	a) Both A and R are true	b) A is true, R is false	c) Both A and R are false	d) A is false, R is true	A is true, R is false
79	The c/a ratio of hexagonal closed pack structure is				a
	a) 1.633	b) 0.74	c) 0.34	d) 0.68	1.633
80	The example of an amphoteric impurity is				a
	a) Si in GaAs	b) B in Si	c) P in Si	d) Al in ZnO	Si in GaAs
81	For a non-inverting amplifier, the voltage gain is (i) more than unity (ii) nearly equal to zero (iii) is negative (iv) is greater than zero but less than unity Find the correct option				a
	a) (i)	b) (ii)	c) (iii)	d) (iv)	(i)
82	Match the correct packing fraction for different crystal systems. A Simple cubic — i 0.74 B Body centred cubic — ii 0.74 C Face centred cubic — iii 0.52 D Hexagonal closed pack — iv 0.68				c
	a) A-iv, B-ii, C-i, D-iii	b) A-i, B-ii, C-iv, D-iii	c) A-iii, B-i, C-iv, D-ii	d) A-iii, B-iv, C-i, D-ii	A-iii, B-iv, C-i, D-ii
83	Which one of the following structures is not a Bravais lattice				c
	a) Triclinic	b) Hexagonal	c) Zinc blende	d) Trigonal	Zinc blende

84	The first law of thermodynamics is conservation of				Answer option b
	a) momentum	b) energy	c) momentum and energy	d) None of these	Answer energy
85	The wave function of fermions is not				Answer option c
	a) continuous	b) single Valued	c) symmetric	d) differentiable	Answer symmetric
86	Given below are two statements: one labelled as Assertion (A) and other labelled as Reason (R): **Assertion (A) :** Reversible systems are difficult to find in real world. **Reason (R):** More processes are dissipative in nature. Select your answer:				(a)
	a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.	b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.	c) Assertion is correct but Reason is incorrect.	d) Both Assertion and Reason are incorrect	Answer Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.
87	According to Maxwell's law of distribution of velocities of molecules, the most probable velocity is				d
	a) greater than the mean velocity	b) equal to the mean velocity	c) equal to root mean square velocity	d) less than the root mean square velocity	less than the root mean square velocity
88	Frictionless pendulum is an example of				b

	a) irreversible process	b) reversible process	c) internal combustion engine	d) heat engine	reversible process
89	The ratio of specific heat at constant pressure to the specific heat at constant volume for a monoatomic gas is				a
	a) 1.6	b) 1.2	c) 1.4	d) 1.8	1.6
90	**In the equation, PV = RT, V refers to the volume of what?**				Answer option b
	a)**1 g of a gas**	b)**1 mole of a gas**	c)**1 kg of gas**	d)**any amount of gas**	Answer **1 mole of a gas**
91	**A plane wave passes through a convex lens. The geometrical shape of the wavefront that emerges is**				Answer option (a,b,c or d)
	a) plane	b) converging spherical	c) diverging spherical	d) cylindrical	b) converging spherical
92	Type Questions here for matching pairs: A Reflection — i Superposition B Refraction — ii geometrical orientation of oscillations C Interference — iii change in phase of the wave D Polarization — iv change in wave speed				Answer option (a,b,c or d)
	a) A – iii, B – iv, C – i , D – ii	b) A – ii, B – i, C – iii , D – iv	c) A – iv, B – iii, C – ii , D – i	d) A – ii, B – iii, C – iv , D – i	a) A – iii, B – iv, C – i , D – ii
93	In an ideal spring-mass system, the total mechanical energy A varies as a sine or cosine function of time B is constant only when the mass is at maximum displacement C is maximum when the mass is at its equilibrium position D is constant, regardless of the displacement of the mass from the equilibrium position				Answer option (a,b,c or d)
	a) A& B	b)A&C	c) B	d) D	d) D
94	Type Questions here for assertion and justification A: In a stationary wave, there is no transfer of energy. B: The ratio of kinetic energy to potential energy is independent of the postion.				Answer option (a,b,c or d)

<table>
<tr><td></td><td colspan="4"></td><td></td></tr>
<tr><td></td><td>a)both, A and B are true and Reason is the correct explanation of the Assertion.</td><td>b)both, A and B are true but Reason is not a correct explanation of the Assertion.</td><td>c)A is true but B is false.</td><td>d)both,A and B are false.</td><td>c)A is true but B is false.</td></tr>
<tr><td>95</td><td colspan="4">What is the locus of all particles in a medium vibrating in the same phase called?</td><td>Answer option (a,b,c or d)</td></tr>
<tr><td></td><td>a) Wavefront</td><td>b)Fringe</td><td>c)Wavelet</td><td>d)none of the above</td><td>a) Wavefront</td></tr>
<tr><td>96</td><td colspan="4">In Young’s double slit experiment, the fringe width is 0.4mm. If the whole apparatus is immersed in water of refractive index 4/3, without changing its geometry, what will be the new fringe width ?</td><td>Answer option (a,b,c or d)</td></tr>
<tr><td></td><td>a)0.53 mm</td><td>b)0.4 mm</td><td>c)0.3 mm</td><td>d)0.54 mm</td><td>c)0.3 mm</td></tr>
<tr><td>97</td><td colspan="4">Match the following pairs:
<table><tr><td>A Newton’s ring</td><td>i Total-internal reflection</td></tr><tr><td>B Brewster’s Angle</td><td>ii Diffraction limit</td></tr><tr><td>C Airy disk</td><td>iii No reflection</td></tr><tr><td>D Mirage</td><td>iv Interference</td></tr></table></td><td>Answer option (a,b,c or d)</td></tr>
<tr><td></td><td>a) A-- iv, B-- iii, C – ii, D – i</td><td>b) A-- iii, B-- i, C – ii, D – iv</td><td>c) A-- ii, B-- iv, C – iii, D – i</td><td>d) A-- i, B-- ii, C – iii, D – iv</td><td>a) A-- iv, B-- iii, C – ii, D – i</td></tr>
<tr><td>98</td><td colspan="4">A particle executes simple harmonic oscillation. Its amplitude is a. The period of oscillation is T. The minimum time taken by the particle to travel half of the amplitude from the equilibrium position is ?</td><td>Answer option (a,b,c or d)</td></tr>
<tr><td></td><td>a) T / 8</td><td>b) T / 12</td><td>c) T / 2</td><td>d) T / 4</td><td>b) T / 12</td></tr>
<tr><td>99</td><td colspan="4">A stationary wave is produced in a string of length 1.25 m. If three nodes and two antinodes are produced in the string, then the wavelength of the wave is ?</td><td>Answer option (a,b,c or d)</td></tr>
<tr><td></td><td>a) 2.50 m</td><td>b) 3.75 m</td><td>c) 5.00 m</td><td>d) 1.25 m</td><td>d) 1.25 m</td></tr>
<tr><td>100</td><td colspan="4">In which of the following media does sound wave travel fastest ?</td><td>Answer option (a,b,c or d)</td></tr>
<tr><td></td><td>a) vacuum</td><td>b) gases</td><td>c) liquids</td><td>d) solids</td><td>d) solids</td></tr>
</table>