

## PREVIEW QUESTION BANK

Module Name : SCPH24 Physics - Physical Sciences - ENG  
Exam Date : 30-Oct-2023 Batch : 14:30-17:30

| Sr. No.            | Client Question ID | Question Body and Alternatives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Marks | Negativ Marks |
|--------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------|
| Objective Question |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |               |
| 1                  | 990001             | <p>As the temperature of a metallic wire is increased, the product of its resistivity and conductivity</p> <ol style="list-style-type: none"> <li>Increases</li> <li>Decreases</li> <li>Remains constant</li> <li>May increase or decrease</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p>                                                                                                                                                                                                                                | 4.0   | 0.00          |
| Objective Question |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |               |
| 2                  | 990002             | <p>A current passes through a wire of non-uniform cross section. Which of the following quantities are independent of the cross-section ?</p> <p>(A) The charge crossing in a given time interval</p> <p>(B) Drift speed</p> <p>(C) Current Density</p> <p>(D) Free electron density</p> <p>Choose the CORRECT answer from the options given below:</p> <ol style="list-style-type: none"> <li>(A) and (B)</li> <li>(B) and (C)</li> <li>(C) and (D)</li> <li>(A) and (D)</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0   | 0.00          |
| Objective Question |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |               |
| 3                  | 990003             | <p>X-ray of wavelength <math>\lambda = a</math> is reflected from the (111) plane of simple cubic lattice. If the lattice constant is <math>a</math>, the corresponding Bragg angle (in radian) is</p> <ol style="list-style-type: none"> <li><math>\pi/6</math></li> <li><math>\pi/4</math></li> <li><math>\pi/3</math></li> <li><math>\pi/8</math></li> </ol>                                                                                                                                                                              | 4.0   | 0.00          |

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|  |  | A1 : 1 |  |  |
|  |  | A2 : 2 |  |  |
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|  |  | A4 : 4 |  |  |

## Objective Question

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| 4 | 990004 | <p>Davision and Germer were the first to demonstrate</p> <ol style="list-style-type: none"> <li>1. The straight line propogation of light</li> <li>2. The diffraction of photons</li> <li>3. The effective mass of the electron</li> <li>4. Wave nature of the atomic particle</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 5 | 990005 | <p>In G. P. Thomson's experiment of diffraction, he used</p> <ol style="list-style-type: none"> <li>1. Slow neutrons</li> <li>2. Slow electrons</li> <li>3. Fast neutrons</li> <li>4. Fast electrons</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 6 | 990006 | <p>Consider a metal which obeys the Sommerfield model exactly. If <math>E_F</math> is the Fermi energy of the metal at <math>T = 0</math> K, and <math>R_H</math> is the Hall coefficient, which of the following statements is CORRECT?</p> <ol style="list-style-type: none"> <li>1. <math>R_H \propto E_F^{3/2}</math></li> <li>2. <math>R_H \propto E_F^{2/3}</math></li> <li>3. <math>R_H \propto E_F^{-3/2}</math></li> <li>4. <math>R_H</math> is independent of <math>E_F</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> | 4.0 | 0.00 |
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|                    |        | A4 : 4                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |      |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |      |
| 7                  | 990007 | <p>A Ge semiconductor is doped with acceptor impurity having concentration of <math>10^{15}</math> atoms/cm<sup>3</sup>. For given mobility of 1800 cm<sup>2</sup>/V.sec, the resistivity of this material is</p> <p>1. 0.288 <math>\Omega</math>-cm<br/> 2. 0.694 <math>\Omega</math>-cm<br/> 3. 3.472 <math>\Omega</math>-cm<br/> 4. 6.944 <math>\Omega</math>-cm</p> <p>A1 : 1<br/><br/> A2 : 2<br/><br/> A3 : 3<br/><br/> A4 : 4</p> | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |      |
| 8                  | 990008 | <p>Which of the following can NOT be explained by considering a harmonic approximation for the lattice vibrations in solid ?</p> <p>1. Debye T<sup>3</sup> law<br/> 2. Dulong Petit's law<br/> 3. Optical branches in lattice<br/> 4. Thermal expansion</p> <p>A1 : 1<br/><br/> A2 : 2<br/><br/> A3 : 3<br/><br/> A4 : 4</p>                                                                                                             | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |      |
| 9                  | 990009 | <p>In the X-ray diffraction experiment, X-rays having energy of 10's of keV are focused on the sample. These X-rays can be focused with help of</p> <p>1. High electric field<br/> 2. High magnetic field<br/> 3. Single crystal<br/> 4. Glass</p> <p>A1 : 1<br/><br/> A2 : 2<br/><br/> A3 : 3<br/><br/> A4 : 4</p>                                                                                                                      | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |      |
| 10                 | 990010 |                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4.0 | 0.00 |

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|  |  | <p>Magnetic susceptibility (<math>\chi</math>) is equal to</p> <ol style="list-style-type: none"> <li>1. Dipole moment per unit volume</li> <li>2. Torque per unit area</li> <li>3. Magnetization per unit magnetic field intensity</li> <li>4. Dipole moment per unit area</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> |  |  |
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## Objective Question

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| 11 | 990011 | <p>In a ferromagnetic material, susceptibility is</p> <ol style="list-style-type: none"> <li>1. very small and positive</li> <li>2. very small and negative</li> <li>3. very large and positive</li> <li>4. very small and negative</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 12 | 990012 | <p>Susceptibility of the paramagnetic and diamagnetic materials can be determined by</p> <ol style="list-style-type: none"> <li>1. Thomson Method</li> <li>2. Gouy Method</li> <li>3. Langevin Method</li> <li>4. Weiss Method</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 13 | 990013 |  | 4.0 | 0.00 |
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|  |  | <p>Consider two crystalline solids, one of which has a simple cubic structure and the other has a tetragonal structure. The effective spring constant between atoms in the c-direction is half of the effective spring constant between atoms in the a and b directions. At low temperatures, the behavior of the lattice contribution to the specific heat will depend on the temperature T as</p> <ol style="list-style-type: none"> <li>1. <math>T^2</math> for tetragonal solid but as <math>T^3</math> for the simple cubic solid</li> <li>2. T for tetragonal solid but as <math>T^2</math> for the simple cubic solid</li> <li>3. T for both solids</li> <li>4. <math>T^3</math> for both solids</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> |  |  |
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## Objective Question

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| 14 | 990014 | <p>According to Ohm's law, the current I flowing in a wire is propotional to the potential drop V along the wire: <math>V = IR</math>. The resistance of the wire depends on physical dimension of the wire but _____.</p> <ol style="list-style-type: none"> <li>A. is dependent on the magnitude of the current.</li> <li>B. is dependent on the magnitude of the potential drop.</li> <li>C. is independent on the magnitude of the current.</li> <li>D. is independent on the magnitude of the potential drop.</li> </ol> <p>Choose the CORRECT answers from the above.</p> <ol style="list-style-type: none"> <li>1. A and B Only</li> <li>2. A and D Only</li> <li>3. C and D Only</li> <li>4. B and C Only</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 15 | 990015 | <p>The resonances (ESR, NMR) studied in solids provide information about _____</p> <ol style="list-style-type: none"> <li>1. the electronic structure of single defects.</li> <li>2. the motion of spin of the surroundings.</li> <li>3. collective spin spin excitations.</li> <li>4. external magnetic fields sampled by the spin.</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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| Objective Question |        |                                                                                                                                                                                                                                                                                                                        |     |      |
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| 16                 | 990016 | <p>All vibrations producing a change in the electric dipole moment of molecule yield:</p> <ol style="list-style-type: none"> <li>1. Raman Spectra</li> <li>2. Infrared spectra</li> <li>3. Ultra-Violet spectra</li> <li>4. X-ray spectra</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p>           | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                        |     |      |
| 17                 | 990017 | <p>Pure rotational spectrum of a diatomic molecule consists of -</p> <ol style="list-style-type: none"> <li>1. Two equally spaced lines</li> <li>2. Three equally spaced lines</li> <li>3. Many equally spaced lines</li> <li>4. No regular pattern</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                        |     |      |
| 18                 | 990018 | <p>The Lyman series of hydrogen spectrum lies in the region</p> <ol style="list-style-type: none"> <li>1. Radio frequency</li> <li>2. Infrared</li> <li>3. Visible</li> <li>4. Ultra-Violet</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p>                                                         | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                        |     |      |
| 19                 | 990019 | <p>In normal Zeeman effect, the d-energy level splits into</p> <ol style="list-style-type: none"> <li>1. 3</li> <li>2. 4</li> <li>3. 5</li> <li>4. 6</li> </ol>                                                                                                                                                        | 4.0 | 0.00 |

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|  |  | A1 : 1 |  |  |
|  |  | A2 : 2 |  |  |
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|  |  | A4 : 4 |  |  |

## Objective Question

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| 20 | 990020 | <p>Raman shift is _____.</p> <ol style="list-style-type: none"> <li>1. independent of frequency of incident radiation, but depends on scatterer</li> <li>2. independent of scatterer, but depends on the frequency of incident radiation</li> <li>3. independent on both the frequency of incident radiation and scatterer</li> <li>4. dependent on both the frequency of incident radiation and scatterer</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 21 | 990021 | <p>The Lande g factor for the level <math>^3D_3</math> is</p> <ol style="list-style-type: none"> <li>1. 2/3</li> <li>2. 3/2</li> <li>3. 3/4</li> <li>4. 4/3</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 22 | 990022 | <p>The numerical value of the radius of first orbit of hydrogen is</p> <ol style="list-style-type: none"> <li>1. 0.0529 nm</li> <li>2. 5.29 nm</li> <li>3. 0.529 nm</li> <li>4. 5.92 nm</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 23 | 990023 | <p>L value for state <math>^2D_{3/2}</math> is given by</p> <ol style="list-style-type: none"> <li>1. 0</li> <li>2. 1</li> <li>3. 2</li> <li>4. 3</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 24 | 990024 | <p>The spectral term for <math>L = 2</math> and <math>S = 1</math> is given by :</p> <ol style="list-style-type: none"> <li>1. <math>^1P_{3/2}</math></li> <li>2. <math>^3D_3</math></li> <li>3. <math>^2S_1</math></li> <li>4. <math>^3D_{5/2}</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 25 | 990025 | <p>The refractive index (<math>n</math>) of the entire environment of a double slit interference setup is changed from <math>n = 1</math> to <math>n = 0.5</math>. Which one of the following statement is correct about the change in the interference pattern?</p> <ol style="list-style-type: none"> <li>1. Fringe width of the interference pattern increases by a factor of 2.</li> <li>2. The interference pattern disappears.</li> <li>3. The central bright maximum turns black, i.e. becomes a minimum.</li> <li>4. Fringe width of the interference pattern decreases by a factor of 2.</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 26 | 990026 |  | 4.0 | 0.00 |
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|  |  | <p>A collimated white light source illuminates the slits of a double slit interference experiment and forms the interference pattern on the screen. If one slits is covered with a yellow filter, which one of the following statement is CORRECT?</p> <ol style="list-style-type: none"> <li>1. Interference pattern disappears.</li> <li>2. Interference pattern remains unchanged.</li> <li>3. A yellow interference pattern is observed.</li> <li>4. The central maximum is yellow with colored higher order maxima.</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> |  |  |
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## Objective Question

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| 27 | 990027 | <p>In how many states, does the 3p state of hydrogen atom split in a strong external magnetic field?</p> <ol style="list-style-type: none"> <li>1. 2</li> <li>2. 3</li> <li>3. 7</li> <li>4. 5</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 28 | 990028 | <p>The magnetic field strength needed to make an upward maximum fractional energy shift <math>\Delta E/E</math> of <math>10^{-4}</math> on the <math>^3D_{5/2}</math> state of hydrogen is estimated to be -</p> <ol style="list-style-type: none"> <li>1. 0.35 T</li> <li>2. 0.23 T</li> <li>3. 0.5 T</li> <li>4. 0.32 T</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 29 | 990029 |  | 4.0 | 0.00 |
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Given  $f(x) = 3x^3 - 4x - 5$ . Use Newton-Raphson method to determine the value of the root to its nearest value at the next iteration when initial guess is taken as  $x = 2$ .

1. 1.551
2. 1.556
3. 1.653
4. 1.671

A1 : 1

A2 : 2

A3 : 3

A4 : 4

#### Objective Question

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| 30 | 990030 | <p>Given a function <math>f(x) = x^3 - 3x + k</math>. If <math>f(x)</math> has one real root in the interval <math>[-1, 1]</math> then the range of <math>k</math> is given by</p> <ol style="list-style-type: none"> <li>1. <math>-1 &lt; k &lt; 1</math></li> <li>2. <math>-1 \leq k &lt; 2</math></li> <li>3. <math>-2 &lt; k \leq 1</math></li> <li>4. <math>-2 &lt; k &lt; 2</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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#### Objective Question

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| 31 | 990031 | <p>The Planck's constant applies to-</p> <ol style="list-style-type: none"> <li>1. Macroscopic bodies</li> <li>2. Microscopic bodies</li> <li>3. Both Macroscopic and Microscopic bodies</li> <li>4. Heavy bodies</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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#### Objective Question

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| 32 | 990032 |  | 4.0 | 0.00 |
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|  |  | <p>Which one is the TRUE unit of Planck's constant?</p> <ol style="list-style-type: none"> <li>1. erg Sec<sup>-1</sup></li> <li>2. J Sec<sup>-1</sup></li> <li>3. eV Sec</li> <li>4. Hz Sec</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> |  |  |
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## Objective Question

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| 33 | 990033 | <p>Out of the following quantities, identify the one which shares the same dimension as that of Planck's constant?</p> <ol style="list-style-type: none"> <li>1. Torque</li> <li>2. Angular Momentum</li> <li>3. Energy</li> <li>4. Power</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 34 | 990034 | <p>The value of Boltzmann constant in erg/K is</p> <ol style="list-style-type: none"> <li>1. <math>1.38 \times 10^{-16}</math></li> <li>2. <math>8.6 \times 10^{-25}</math></li> <li>3. <math>1.05 \times 10^{-16}</math></li> <li>4. <math>6.02 \times 10^{-23}</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
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## Objective Question

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| 35 | 990035 |  | 4.0 | 0.00 |
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The Boltzmann constant in terms of gas constant is expressed by-

1.  $k = \sqrt{\frac{R}{N_A}}$

2.  $k = \frac{R}{N_A^2}$

3.  $k = \frac{R}{N_A}$

4.  $k = \frac{N_A}{R}$

A1 : 1

A2 : 2

A3 : 3

A4 : 4

Objective Question

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|------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 36                                                                                                                           | 990036 | Which law explains the distribution of energy emitted by a black body over different wavelengths as a function of temperature? | 4.0 | 0.00 |
| <p>1. Hook's law<br/>2. Planck's law<br/>3. Ohm's law<br/>4. Kepler's law</p> <p>A1 : 1<br/>A2 : 2<br/>A3 : 3<br/>A4 : 4</p> |        |                                                                                                                                |     |      |

Objective Question

|                                                                                                                        |        |                                                                            |     |      |
|------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------------------------|-----|------|
| 37                                                                                                                     | 990037 | When a black body is at absolute zero temperature, its radiated energy is- | 4.0 | 0.00 |
| <p>1. Infinite<br/>2. Zero<br/>3. Variable<br/>4. Equal to its mass</p> <p>A1 : 1<br/>A2 : 2<br/>A3 : 3<br/>A4 : 4</p> |        |                                                                            |     |      |

Objective Question

|    |        |  |     |      |
|----|--------|--|-----|------|
| 38 | 990038 |  | 4.0 | 0.00 |
|----|--------|--|-----|------|

The measurement of  $e/m$  was possible because of an instrument made by-

1. T. Edison
2. J. Perrin
3. N. Bohr
4. J. J. Thomson

A1 : 1

A2 : 2

A3 : 3

A4 : 4

#### Objective Question

39 990039

An experiment to determine Planck's constant was designed in which a metal surface was exposed to light of different wavelengths and the emitted photoelectron energies were measured by applying a stopping potential. The data for wavelength ( $\lambda$ ) of incident light at corresponding stopping potential ( $V_0$ ) is given below:

| $\lambda(\text{nm})$ | $V_0(\text{V})$ |
|----------------------|-----------------|
| 0.4                  | 1.0             |
| 0.5                  | 0.4             |

If the velocity of light ( $c$ ) =  $3 \times 10^8$  m/sec and  $e = 1.6 \times 10^{-19}$  C, what is the value of Planck's constant in this experiment?

1.  $6.6 \times 10^{-34}$  J Sec
2.  $6.2 \times 10^{-34}$  J Sec
3.  $6.3 \times 10^{-34}$  J Sec
4.  $6.4 \times 10^{-34}$  J Sec

A1 : 1

A2 : 2

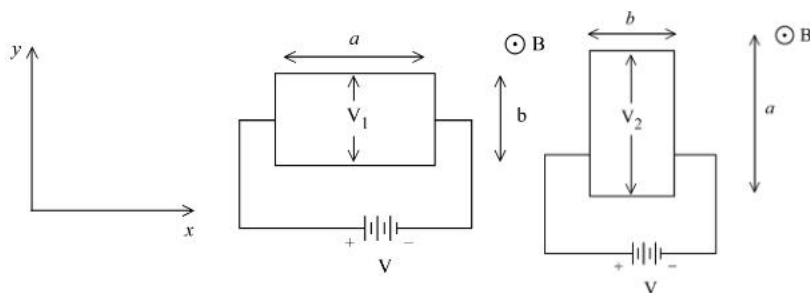
A3 : 3

A4 : 4

#### Objective Question

40 990040

A thin rectangular conducting plate of length  $a$  and width  $b$  is placed in XY-plane in two different orientations as shown in the figures below. In both cases, a magnetic field  $B$  is applied in the z-direction and a current flows in the x-direction due to applied voltage  $V$ .



If the Hall voltage across the Y-direction in the two cases satisfy  $V_2 = 2V_1$ , the ratio  $a:b$  must be

1. 1 : 2
2. 1 :  $2^{1/2}$
3. 2 : 1
4.  $2^{1/2}$  : 1

A1 : 1

A2 : 2

A3 : 3

A4 : 4

#### Objective Question

41 990041

A single crystal of NaCl is irradiated with a beam of X rays. The separation of Bragg plane is  $d = 0.25$  nm. If first Bragg reflection is observed at an angle of  $30^\circ$ , estimate the wavelength of the X rays used?

1. 0.25 nm
2. 0.125 nm
3. 0.50 nm
4. 0.35 nm

A1 : 1

A2 : 2

A3 : 3

A4 : 4

4.0

0.00

#### Objective Question

42 990042

4.0

0.00

Consider the following data was measured in the GM Counter

| Counts measured by GM Counter |                      |
|-------------------------------|----------------------|
| Applied Voltage (Volt)        | Counts in 60 Seconds |
| 300                           | 25                   |
| 325                           | 125                  |
| 350                           | 475                  |
| 375                           | 480                  |
| 400                           | 465                  |
| 425                           | 485                  |
| 450                           | 525                  |
| 475                           | 825                  |
| 500                           | 975                  |

The background counts measured for 60 second is 25.

The operating voltage of G.M. Counter is

1. 350 V
2. 400 V
3. 450 V
4. 500 V

A1 : 1

A2 : 2

A3 : 3

A4 : 4

#### Objective Question

43 990043

Consider the following data was measured in the GM Counter

| Counts measured by GM Counter |                      |
|-------------------------------|----------------------|
| Applied Voltage (Volt)        | Counts in 60 Seconds |
| 300                           | 25                   |
| 325                           | 125                  |
| 350                           | 475                  |
| 375                           | 480                  |
| 400                           | 465                  |
| 425                           | 485                  |
| 450                           | 525                  |
| 475                           | 825                  |
| 500                           | 975                  |

The background counts measured for 60 second is 25.

The width of plateau region (in Volt) for the G.M Counter is

1. 50
2. 100
3. 150
4. 130

A1 : 1

A2 : 2

A3 : 3

A4 : 4

4.0

0.00

## Objective Question

44

990044

4.0

0.00

Consider the following data was measured in the GM Counter

Counts measured by GM Counter

| Applied Voltage (Volt) | Counts in 60 Seconds |
|------------------------|----------------------|
| 300                    | 25                   |
| 325                    | 125                  |
| 350                    | 475                  |
| 375                    | 480                  |
| 400                    | 465                  |
| 425                    | 485                  |
| 450                    | 525                  |
| 475                    | 825                  |
| 500                    | 975                  |

The background counts measured for 60 second is 25.

The error in true count per minute at 450 V is -

1. 17

2. 20

3. 23

4. 26

A1 : 1

A2 : 2

A3 : 3

A4 : 4

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                 |     |      |
|----|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 45 | 990045 | <p>The marks of 13 students of group A are given below:</p> <p>70,72,74,76,78,80,82,84,86,88,90,92,94</p> <p>Two students having marks 100 and 79 join this group. The average marks of the group will increase by</p> <ol style="list-style-type: none"> <li>1. 7</li> <li>2. 5</li> <li>3. 3</li> <li>4. 1</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                    |     |      |
|----|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 46 | 990046 | <p>Which of the following scintillation detector has best energy resolution to measure the energy of gamma-ray?</p> <ol style="list-style-type: none"> <li>1. BaF<sub>2</sub></li> <li>2. CsI(Tl)</li> <li>3. NaI(Tl)</li> <li>4. BC502</li> </ol> | 4.0 | 0.00 |
|----|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

|  |  |        |  |  |
|--|--|--------|--|--|
|  |  | A1 : 1 |  |  |
|  |  | A2 : 2 |  |  |
|  |  | A3 : 3 |  |  |
|  |  | A4 : 4 |  |  |

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                  |     |      |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 47 | 990047 | <p>The length of pen measured by four students is 135.0 cm, 136.5 cm, 134.0 cm and 134.5 cm. The final result (in cm) for these measurements is</p> <ol style="list-style-type: none"> <li>1. <math>134.0 \pm 0.5</math></li> <li>2. <math>135.0 \pm 1.0</math></li> <li>3. <math>135.0 \pm 3.5</math></li> <li>4. <math>134.5 \pm 1.0</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |      |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 48 | 990048 | <p>Consider the following measurements:</p> <p>A. Time interval measured using a slow stop watch.</p> <p>B. Length of a thread measured by several students.</p> <p>C. Measurement done by a voltmeter with zero cross error</p> <p>D. Counts measured by a detector for radioactive sample.</p> <p>Which of these measurements involve random errors?</p> <ol style="list-style-type: none"> <li>1. (A), (B), (C) and (D)</li> <li>2. (A) and (C) only</li> <li>3. (B) and (D) only</li> <li>4. (C) only</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                       |     |      |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 49 | 990049 | <p>The mean weight of 9 items is 15 kg. If one more item is added to these items, the mean weight becomes 16 Kg. What is the weight of the added item in Kg?</p> <ol style="list-style-type: none"> <li>1. 35</li> <li>2. 25</li> <li>3. 15</li> <li>4. 20</li> </ol> | 4.0 | 0.00 |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

A1 : 1

A2 : 2

A3 : 3

A4 : 4

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                   |     |      |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 50 | 990050 | <p>Which one of the following is CORRECT relation between the FWHM and standard deviation for a Gaussian peak function?</p> <p>1. FWHM=2.35/standard deviation<br/> 2. FWHM=2.35 × standard deviation<br/> 3. FWHM=2/standard deviation<br/> 4. FWHM=2 × standard deviation</p> <p>A1 : 1<br/> A2 : 2<br/> A3 : 3<br/> A4 : 4</p> | 4.0 | 0.00 |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |      |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 51 | 990051 | <p>Consider a particle of mass <math>m</math> confined in a 1-D potential given by <math>V(x) = \begin{cases} 0, &amp; 0 \leq x \leq L \\ \infty, &amp; \text{otherwise} \end{cases}</math></p> <p>The initial wavefunction at time <math>t=0</math> is given by <math>\Psi(x,0) = \begin{cases} A x(L-x), &amp; 0 \leq x \leq L \\ 0, &amp; \text{otherwise} \end{cases}</math>, where <math> A  = \sqrt{\frac{30}{L^5}}</math>. The wavefunction at any time <math>\Psi(x,t)</math> is given by</p> <p>1. <math>\sqrt{\frac{30}{L}} \left(\frac{2}{\pi}\right)^3 \sum_{n=2,4,6,\dots} \sin\left(\frac{n\pi x}{L}\right) e^{-i\frac{n^2\pi^2\hbar t}{2mL^2}}</math></p> <p>2. <math>\sqrt{\frac{30}{L}} \left(\frac{2}{\pi}\right)^3 \sum_{n=1,3,5,\dots} \frac{1}{n^3} \sin\left(\frac{n\pi x}{L}\right) e^{-i\frac{n^2\pi^2\hbar t}{2mL^2}}</math></p> <p>3. <math>\sqrt{\frac{30}{L}} \left(\frac{2}{\pi}\right)^3 \sum_{n=1}^{\infty} \frac{1}{n^3} \sin\left(\frac{n\pi x}{L}\right) e^{-i\frac{n^2\pi^2\hbar t}{2mL^2}}</math></p> <p>4. <math>\sqrt{\frac{30}{L}} \left(\frac{2}{\pi}\right)^3 \sum_{n=1}^{\infty} \frac{1}{n^3} \cos\left(\frac{n\pi x}{L}\right) e^{-i\frac{n^2\pi^2\hbar t}{2mL^2}}</math></p> <p>A1 : 1<br/> A2 : 2<br/> A3 : 3<br/> A4 : 4</p> | 4.0 | 0.00 |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |  |     |      |
|----|--------|--|-----|------|
| 52 | 990052 |  | 4.0 | 0.00 |
|----|--------|--|-----|------|

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|  |  | <p>Given <math>u = e^{-x}(x \sin y - y \cos y)</math> is harmonic and <math>f(z) = u + iv</math> is analytic function. Then <math>v</math> and <math>f(z)</math> are given by -</p> <ol style="list-style-type: none"> <li>1. <math>v = e^{-x}(x \sin y - y \cos y) + c</math> &amp; <math>f(z) = z e^{-z} + c</math>, where <math>c</math> is a constant</li> <li>2. <math>v = e^{-x}(x \cos y + y \sin y) + c</math> &amp; <math>f(z) = i z e^{-z} + c</math>, where <math>c</math> is a constant</li> <li>3. <math>v = e^{-x}(y \sin y - x \cos y) + c</math> &amp; <math>f(z) = z \exp(i z) + c</math>, where <math>c</math> is a constant</li> <li>4. <math>v = e^{-y}(x \cos y + y \sin y) + c</math> &amp; <math>f(z) = i z e^{-z} + c</math>, where <math>c</math> is a constant</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> |  |  |
|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |      |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 53 | 990053 | <p>The following statements are given for the function <math>f(z) = \sec(1/z)</math>:</p> <ol style="list-style-type: none"> <li>A. <math>z = 2/[(2n+2)\pi]</math>, <math>n = 0, \pm 1, \pm 2, \dots</math> are simple poles and isolated singularities, respectively.</li> <li>B. <math>z = 2/[(2n+2)\pi]</math>, <math>n = 0, \pm 1, \pm 2, \dots</math> are simple poles and non-isolated singularities, respectively.</li> <li>C. <math>z = 0</math> is an essential &amp; isolated singularity.</li> <li>D. <math>z = 0</math> is an essential &amp; non-isolated singularity.</li> </ol> <p>Which of the above statements are CORRECT for the function <math>f(z)</math>?</p> <ol style="list-style-type: none"> <li>1. A &amp; D</li> <li>2. A &amp; C</li> <li>3. B &amp; C</li> <li>4. B &amp; D</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |      |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 54 | 990054 | <p>The Fourier transform of <math>\sin(\omega_0 t)</math> is proportional to:</p> <ol style="list-style-type: none"> <li>1. <math>\delta(\omega + \omega_0)</math></li> <li>2. <math>\delta(\omega - \omega_0)</math></li> <li>3. <math>\delta(\omega + \omega_0) - \delta(\omega - \omega_0)</math></li> <li>4. <math>\delta(\omega + \omega_0) + \delta(\omega - \omega_0)</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                   |     |      |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 55 | 990055 | <p>The Wronskian of the functions <math>\cos(ax)</math> and <math>\sin(ax)</math> is</p> <ol style="list-style-type: none"> <li>1</li> <li><math>a^2</math></li> <li><math>a</math></li> <li>0</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |      |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 56 | 990056 | <p>The Laplace transform of <math>f(x) = \sin(\pi x)</math> is <math>F(s) = \frac{\pi}{(s^2 + \pi^2)}</math>; <math>s &gt; 0</math>. Then Laplace transform for <math>x \sin(x)</math> is</p> <ol style="list-style-type: none"> <li><math>\frac{2\pi}{(s^2 + \pi^2)^2}</math></li> <li><math>s</math></li> <li><math>\frac{\pi}{s^2(s^2 + \pi^2)}</math></li> <li><math>\frac{2\pi s}{(s^2 + \pi^2)^2}</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                       |     |      |
|----|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 57 | 990057 | <p>The trace of a <math>4 \times 4</math> diagonal matrix is 8 and its determinant is -24. If two of its eigen values are 3 and 4, then the other two eigen values are</p> <ol style="list-style-type: none"> <li>-2 and 1</li> <li>2 and 1</li> <li>2 and -1</li> <li>-2 and -1</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> | 4.0 | 0.00 |
|----|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

A4 : 4

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |      |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 58 | 990058 | <p>Consider the following sets</p> <p>I. (1,0,0); (0,1,0); (0,0,1)</p> <p>II. (1,1,1); (1,1,0); (1,0,0)</p> <p>III. (1,1,1); (1,2,3); (2,-1,1)</p> <p>IV. (1,1,2); (1,2,5); (5,3,4)</p> <p>Which of the above sets will form the basis in <math>R^3</math> space?</p> <p>1. (I), (II), (III), (IV)</p> <p>2. (I), (II), (III) only</p> <p>3. (I), (II), (IV) only</p> <p>4. (I), (II) only</p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |      |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 59 | 990059 | <p>The first and second order Legendre polynomials are given by</p> $P_1(\mu) = \cos \theta, P_2(\mu) = \frac{3}{2} \cos^2 \theta - \frac{1}{2}, \text{ where } \mu = \cos \theta$ <p>The integral <math>\int_0^\pi P_1(\mu)P_2(\mu) \sin \theta d\theta</math> will be</p> <p>1. <math>\pi</math></p> <p>2. <math>3\pi</math></p> <p>3. <math>-\pi</math></p> <p>4. 0</p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                       |     |      |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 60 | 990060 | <p>The reverse saturation current in silicon (Si) diode is of the order :</p> <p>1. 1 nA</p> <p>2. 1 <math>\mu</math>A</p> <p>3. 1 mA</p> <p>4. 1 A</p> <p>A1 : 1</p> | 4.0 | 0.00 |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

|  |  |        |  |  |
|--|--|--------|--|--|
|  |  | A2 : 2 |  |  |
|  |  | A3 : 3 |  |  |
|  |  | A4 : 4 |  |  |

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |      |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 61 | 990061 | <p>An atom with one outer electron having orbital angular momentum <math>l</math> is placed in a weak magnetic field. The number of energy levels into which the higher total angular momentum state will split is given by</p> <ol style="list-style-type: none"> <li>1. <math>2l-1</math></li> <li>2. <math>2l+1</math></li> <li>3. <math>2l+2</math></li> <li>4. <math>2l</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |      |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 62 | 990062 | <p>If <math>L</math>, <math>S</math> and <math>J</math> are the quantum numbers corresponding to ground state of boron (<math>Z=5</math>) atom, then value of <math>L</math>, <math>S</math> and <math>J</math> are:</p> <ol style="list-style-type: none"> <li>1. <math>L=0, S=3/2, J=3/2</math></li> <li>2. <math>L=1, S=3/2, J=1/2</math></li> <li>3. <math>L=1, S=1/2, J=1/2</math></li> <li>4. <math>L=0, S=1/2, J=3/2</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                               |     |      |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 63 | 990063 | <p>The life time of an atomic state is 1 ns. The natural line width of the spectral line in the emission spectrum of this state is of the order of-</p> <ol style="list-style-type: none"> <li>1. <math>10^{-6}</math> eV</li> <li>2. <math>10^{-10}</math> eV</li> <li>3. <math>10^{-3}</math> eV</li> <li>4. <math>10^{-9}</math> eV</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> | 4.0 | 0.00 |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

|                    |        |                                                                                                                                                                                                                                                                                      |     |      |
|--------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
|                    |        | A3 : 3                                                                                                                                                                                                                                                                               |     |      |
|                    |        | A4 : 4                                                                                                                                                                                                                                                                               |     |      |
| Objective Question |        |                                                                                                                                                                                                                                                                                      |     |      |
| 64                 | 990064 | <p>Assuming that the L-S coupling is valid, the number of permitted transitions from <math>^2P_{3/2}</math> to <math>^2S_{1/2}</math> due to a weak magnetic field is -</p> <p>1. 2</p> <p>2. 4</p> <p>3. 6</p> <p>4. 10</p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                      |     |      |
| 65                 | 990065 | <p>The minimum wavelength of X-ray produced by X-ray tube operated at 12.38 kV is -</p> <p>1. 2 nm</p> <p>2. 1 Å</p> <p>3. 5 nm</p> <p>4. 10 Å</p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p>                                                                           | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                      |     |      |
| 66                 | 990066 | <p>Total number of ions in the unit cell of CsCl crystal is -</p> <p>1. 4</p> <p>2. 3</p> <p>3. 2</p> <p>4. 1</p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p>                                                                                                            | 4.0 | 0.00 |

| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
|--------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 67                 | 990067 | <p>If the Fermi energy of a metal is 1.4 eV, then its Fermi temperature is approximately given by -</p> <ol style="list-style-type: none"> <li>1. <math>1.6 \times 10^3</math> K</li> <li>2. <math>1.6 \times 10^4</math> K</li> <li>3. <math>1.6 \times 10^5</math> K</li> <li>4. <math>1.6 \times 10^6</math> K</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |

| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                           |     |      |
|--------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 68                 | 990068 | <p>In the BCS model of superconductivity, the critical temperature (<math>T_C</math>) depends on isotopic mass (M) as-</p> <ol style="list-style-type: none"> <li>1. <math>T_C \propto M</math></li> <li>2. <math>T_C \propto M^{1/2}</math></li> <li>3. <math>T_C \propto M^{-1/2}</math></li> <li>4. <math>T_C \propto M^{-1}</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |

| Objective Question |        |                                                                                                                                                                                                                                                      |     |      |
|--------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 69                 | 990069 | <p>The ferromagnetic Curie temperature of iron (Fe) is the order of :</p> <ol style="list-style-type: none"> <li>1. 631 K</li> <li>2. 925 K</li> <li>3. 1043 K</li> <li>4. 1430 K</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |

| Objective Question |        |  |     |      |
|--------------------|--------|--|-----|------|
| 70                 | 990070 |  | 4.0 | 0.00 |

|  |  |                                                                                      |  |  |
|--|--|--------------------------------------------------------------------------------------|--|--|
|  |  | In germanium (Ge) diode, the reverse saturation current is generally of the order of |  |  |
|  |  | 1. 1 A                                                                               |  |  |
|  |  | 2. 1 mA                                                                              |  |  |
|  |  | 3. 1 $\mu$ A                                                                         |  |  |
|  |  | 4. 1 nA                                                                              |  |  |
|  |  | A1 : 1                                                                               |  |  |
|  |  | A2 : 2                                                                               |  |  |
|  |  | A3 : 3                                                                               |  |  |
|  |  | A4 : 4                                                                               |  |  |

## Objective Question

|    |        |                                                                                                             |     |      |
|----|--------|-------------------------------------------------------------------------------------------------------------|-----|------|
| 71 | 990071 | The Q-value of $^{212}\text{Po}$ alpha decay is 5.80 MeV. What is the maximum energy of the alpha particle? | 4.0 | 0.00 |
|    |        | 1. 0.11                                                                                                     |     |      |
|    |        | 2. 1.11                                                                                                     |     |      |
|    |        | 3. 4.69                                                                                                     |     |      |
|    |        | 4. 5.69                                                                                                     |     |      |
|    |        | A1 : 1                                                                                                      |     |      |
|    |        | A2 : 2                                                                                                      |     |      |
|    |        | A3 : 3                                                                                                      |     |      |
|    |        | A4 : 4                                                                                                      |     |      |

## Objective Question

|    |        |                                                             |     |      |
|----|--------|-------------------------------------------------------------|-----|------|
| 72 | 990072 | Which of the following pair is an example of Mirror Nuclei? | 4.0 | 0.00 |
|    |        | 1. $^{12}\text{C}$ and $^{13}\text{C}$ .                    |     |      |
|    |        | 2. $^{238}\text{U}$ and $^{232}\text{Th}$                   |     |      |
|    |        | 3. $^{13}\text{C}$ and $^{13}\text{N}$                      |     |      |
|    |        | 4. $^{40}\text{Ca}$ and $^{40}\text{K}$                     |     |      |
|    |        | A1 : 1                                                      |     |      |
|    |        | A2 : 2                                                      |     |      |
|    |        | A3 : 3                                                      |     |      |
|    |        | A4 : 4                                                      |     |      |

## Objective Question

|    |        |  |     |      |
|----|--------|--|-----|------|
| 73 | 990073 |  | 4.0 | 0.00 |
|----|--------|--|-----|------|

|  |  |                                                                                                                                                                                                                                                                                  |  |  |
|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|  |  | <p>In nuclear fission of the heavy nuclei, the most probable mass of the heavy fission fragment is close to</p> <ol style="list-style-type: none"> <li>1. 160</li> <li>2. 140</li> <li>3. 120</li> <li>4. 100</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> |  |  |
|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                     |     |      |
|----|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 74 | 990074 | <p>In Sun, the energy released by proton-proton cycle (in MeV) is approximately equal to -</p> <ol style="list-style-type: none"> <li>1. 23.7</li> <li>2. 26.7</li> <li>3. 33.7</li> <li>4. 39.7</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |      |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 75 | 990075 | <p>In <math>^{60}\text{Co}</math> radioactive decay, two gamma-rays having energies 1.332 MeV and 1.172 MeV are emitted.</p> <p>Consider the following statements:</p> <p><b>Statement I :</b> <math>^{60}\text{Co}</math> radioactive decay is an example of beta-plus decay.</p> <p><b>Statement II :</b> Dominant multipole character of both gamma-rays is E2 (Electric Quadrupole).</p> <p><b>Statement III :</b> The first excited state of the daughter nucleus emits 1.332 MeV gamma-ray.</p> <p><b>Statement IV :</b> The first excited state of the daughter nucleus emits 1.172 MeV gamma-ray.</p> <p>In the light of above statements, choose the <i>correct</i> answer from the options given below</p> <ol style="list-style-type: none"> <li>1. Both, Statement I and Statement IV are true</li> <li>2. Both, Statement II and Statement III are true</li> <li>3. Statement I is true but Statement II is false</li> <li>4. Statement III is false but Statement IV is true</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> | 4.0 | 0.00 |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
|--------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
|                    |        | A4 : 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |      |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
| 76                 | 990076 | <p>The Carnot's heat engine undergoes following processes during its complete cycle.</p> <p>I. Isothermal expansion.<br/>           II. Isothermal compression<br/>           III. Adiabatic expansion<br/>           IV. Adiabatic compression</p> <p>In the light of above processes, the <i>correct</i> order of the these process in Carnot's heat engine is</p> <p>1. I-II-III-IV<br/>           2. I-IV-III-II<br/>           3. I-III-II-IV<br/>           4. I-III-IV-II</p> <p>A1 : 1<br/>           A2 : 2<br/>           A3 : 3<br/>           A4 : 4</p> | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
| 77                 | 990077 | <p>The Clausius-Clapeyron equation is</p> <p>1. <math>dP/dt = T/L(V_2 - V_1)</math><br/>           2. <math>dP/dt = L/T(V_2 - V_1)</math><br/>           3. <math>dP/dt = T/L(V_2 + V_1)</math><br/>           4. <math>dP/dt = L/T(V_2 + V_1)</math></p> <p>A1 : 1<br/>           A2 : 2<br/>           A3 : 3<br/>           A4 : 4</p>                                                                                                                                                                                                                            | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
| 78                 | 990078 | <p>The baryon number and strangeness of particle X in strong interactions <math>p + p \rightarrow p + X + \Sigma^0</math> are, respectively, given by-</p> <p>1. B=1, S=0<br/>           2. B=1, S=-1<br/>           3. B=0, S=1<br/>           4. B=0, S=0</p> <p>A1 : 1<br/>           A2 : 2</p>                                                                                                                                                                                                                                                                  | 4.0 | 0.00 |

|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
|--------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
|                    |        | A3 : 3                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |      |
|                    |        | A4 : 4                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |      |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
| 79                 | 990079 | <p>The number of possible ways to distribute three fermions in four energy levels are given by -</p> <ol style="list-style-type: none"> <li>2</li> <li>4</li> <li>8</li> <li>16</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p>                                                                                                                                                                                                                   | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
| 80                 | 990080 | <p>Which one of the following relations gives the correct expression of Gibb's free energy?</p> <p>(where F is Helmholtz free energy and other symbols have usual meaning.)</p> <ol style="list-style-type: none"> <li><math>G = F - PV</math></li> <li><math>G = F + PV</math></li> <li><math>G = H + TV</math></li> <li><math>G = U - TS</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p>                                                 | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
| 81                 | 990081 | <p>Consider the following systems-</p> <p>(A) Conservative system</p> <p>(B) Non conservative system</p> <p>(C) System under non central force</p> <p>(D) System under velocity dependent potential</p> <p>If Hamiltonian represents the total energy of the system, then it is TRUE for which type of system(s)?</p> <ol style="list-style-type: none"> <li>(A) Only</li> <li>(A) and (B) Only</li> <li>(C) and (D) Only</li> <li>(D) Only</li> </ol> <p>A1 : 1</p> | 4.0 | 0.00 |

A2 : 2

A3 : 3

A4 : 4

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |      |
|----|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 82 | 990082 | <p>Consider a particle of mass <math>m</math> which is free to move along a line and is attached to a spring whose other end is fixed at a point A. This point A is at a distance <math>l</math> from the line. Let <math>2F</math> is the force required to extend the spring of length <math>l</math>. What will be the frequency of small oscillations of the particle?</p> <p>1. <math>\omega = 0</math></p> <p>2. <math>\omega = \sqrt{\frac{F}{ml}}</math></p> <p>3. <math>\omega = \sqrt{\frac{2F}{ml}}</math></p> <p>4. <math>\omega = \sqrt{\frac{F}{2ml}}</math></p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
|----|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 83 | 990083 | <p>What is the general expression of Lagrangian of a particle of mass <math>m</math>, moving freely in space, in cylindrical coordinates <math>(r, \phi, z)</math> ?</p> <p>1. <math>L = \frac{1}{2}m(\dot{r}^2 + r^2\dot{\phi}^2 + \dot{z}^2)</math></p> <p>2. <math>L = \frac{1}{2}m(\dot{r}^2 + r^2\dot{\phi}^2 + z^2)</math></p> <p>3. <math>L = \frac{1}{2}m(\dot{r}^2 + \dot{r}^2\dot{\phi}^2 + \dot{z}^2)</math></p> <p>4. <math>L = \frac{1}{2}m(\dot{r}^2 + r^2\dot{\phi}^2 + \dot{z}^2)</math></p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |  |     |      |
|----|--------|--|-----|------|
| 84 | 990084 |  | 4.0 | 0.00 |
|----|--------|--|-----|------|

Considering the Lagrangian of a particle in cylindrical coordinates  $(r, \phi, z)$  which is moving freely in space, find the third component of angular momentum ( $M_z$ ) for it?

1.  $M_z = \frac{\partial L}{\partial \phi}$

2.  $M_z = \frac{\partial L}{\partial z}$

3.  $M_z = \frac{\partial L}{\partial \phi}$

4.  $M_z = -\frac{\partial L}{\partial z}$

A1 : 1

A2 : 2

A3 : 3

A4 : 4

#### Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |      |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 85 | 990085 | <p>A plane electromagnetic wave propagating in the x-direction has a wavelength of 5 mm. The electric field is in the y-direction and its maximum magnitude is <math>30 \text{ Vm}^{-1}</math>. What is the equation of electric field as a function of x and t?</p> <p>1. <math>(30 \text{ Vm}^{-1}) \sin \left[ \frac{2\pi}{5 \text{ mm}} (ct - x) \right]</math></p> <p>2. <math>(30 \text{ Vm}^{-1}) \cos \left[ \frac{2\pi}{5 \text{ mm}} (ct - x) \right]</math></p> <p>3. <math>(30 \text{ Vm}^{-1}) \sin \left[ \frac{2\pi}{5 \text{ mm}} (ct + x) \right]</math></p> <p>4. <math>\left( \frac{1}{30} \text{ Vm}^{-1} \right) \sin \left[ \frac{2\pi}{5 \text{ mm}} (ct - x) \right]</math></p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

#### Objective Question

|    |        |                                                                                                                                                                                                              |     |      |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 86 | 990086 | <p>If a coordinate becomes cyclic, the Hamiltonian would reduce the number of variables in new formulation by-</p> <p>1. 1</p> <p>2. 0</p> <p>3. 2</p> <p>4. 3</p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> | 4.0 | 0.00 |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

A4 : 4

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |      |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 87 | 990087 | <p>The Maxwell's equations in terms of scalar and vector potentials under Coulomb gauge with <math>\nabla \cdot \vec{A} = 0</math> are given by-</p> <ol style="list-style-type: none"> <li>1. <math>\nabla^2 \vec{A} = -\mu_0 \vec{J}_T, \nabla^2 \phi = \frac{\rho}{\epsilon_0}</math></li> <li>2. <math>\nabla^2 \vec{A} = -\mu_0 \vec{J}_T, \nabla^2 \phi = -\frac{\rho}{\epsilon_0}</math></li> <li>3. <math>\nabla^2 \vec{A} = \mu_0 \vec{J}_T, \nabla^2 \phi = -\frac{\rho}{\epsilon_0}</math></li> <li>4. <math>\nabla^2 \vec{A} = \mu_0 \vec{J}_T, \nabla^2 \phi = \frac{\rho}{\epsilon_0}</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                          |     |      |
|----|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 88 | 990088 | <p>The amplitude of electric and magnetic fields are related to each other by the relation-</p> <ol style="list-style-type: none"> <li>1. <math>E_0 B_0 = c</math></li> <li>2. <math>B_0 = c^2 E_0</math></li> <li>3. <math>E_0 = c B_0</math></li> <li>4. <math>E_0 B_0 = c^2</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                               |     |      |
|----|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 89 | 990089 | <p>A free electron is placed in the path of a plane electromagnetic wave. The electron will start moving-</p> <ol style="list-style-type: none"> <li>1. Along the electric field</li> <li>2. Along the direction of propagation of the wave</li> <li>3. Along the magnetic field</li> <li>4. In a plane containing magnetic field and direction of propagation of wave</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> | 4.0 | 0.00 |
|----|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

|                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |      |
|--------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
|                    |        | A3 : 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |      |
|                    |        | A4 : 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |      |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |      |
| 90                 | 990090 | <p>Three point charges <math>q</math>, <math>q</math> and <math>-2q</math> are located at <math>(0, -a, a)</math>, <math>(0, a, a)</math> and <math>(0, 0, -a)</math>, respectively. The net dipole moment of this charge distribution is -</p> <ol style="list-style-type: none"> <li>1. <math>2aq\hat{k}</math></li> <li>2. <math>2aq\hat{j}</math></li> <li>3. <math>-4aq\hat{i}</math></li> <li>4. <math>4aq\hat{k}</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |      |
| 91                 | 990091 | <p>The electric field intensity on the surface of a charged conductor is-</p> <ol style="list-style-type: none"> <li>1. zero.</li> <li>2. directed normally to the surface.</li> <li>3. directed tangentially to the surface.</li> <li>4. directed along <math>45^\circ</math> to the surface.</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p>                                                                                                                                 | 4.0 | 0.00 |
| Objective Question |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |      |
| 92                 | 990092 | <p>The proper length of a space vehicle is <math>l_0</math>. According to an observer on earth, the length of this space vehicle is 25% of its proper length. The speed of the space vehicle to the observer on earth is-</p> <ol style="list-style-type: none"> <li>1. <math>c\sqrt{3}/2</math></li> <li>2. <math>c\sqrt{\frac{3}{2}}</math></li> <li>3. <math>0.968\ c</math></li> <li>4. <math>0.77\ c</math></li> </ol> <p>A1 : 1</p> <p>A2 : 2</p>                                           | 4.0 | 0.00 |

A3 : 3

A4 : 4

## Objective Question

93 990093

4.0

0.00

The wavefunction of a particle is given by  $\psi = \frac{1}{\sqrt{2}}\phi_0 + i\phi_1$ , where  $\phi_0$  and  $\phi_1$  are the normalized eigenfunctions with energies  $E_0$  and  $E_1$  corresponding to the ground state and first excited state, respectively. The expectation value of the Hamiltonian in the state  $\psi$  is

1.  $\frac{E_0 + 2E_1}{3}$

2.  $\frac{E_0 + \sqrt{2}E_1}{\sqrt{3}}$

3.  $\frac{E_0 - 2E_1}{3}$

4.  $\frac{E_0}{2} + E_1$

A1 : 1

A2 : 2

A3 : 3

A4 : 4

## Objective Question

94 990094

4.0

0.00

Consider the normalized wavefunction  $\phi = a_1\psi_{11} + a_2\psi_{10} + a_3\psi_{1-1}$ , where  $\psi_{lm}$  is a simultaneous normalized eigenfunction of the angular momentum operators  $L^2$  and  $L_z$  with eigen values  $l(l+1)\hbar^2$  and  $m\hbar$  respectively. If  $\phi$  is an eigenfunction of the operator  $L_x$  with eigen value  $\hbar$ , then

1.  $a_1 = a_3 = \frac{1}{2}, a_2 = \frac{1}{\sqrt{2}}$

2.  $a_1 = -a_3 = \frac{1}{2}, a_2 = \frac{1}{\sqrt{2}}$

3.  $a_1 = a_2 = a_3 = \frac{1}{\sqrt{2}}$

4.  $a_1 = a_3 = \frac{1}{2}, a_2 = -\frac{1}{\sqrt{2}}$

A1 : 1

A2 : 2

A3 : 3

A4 : 4

## Objective Question

95 990095

4.0

0.00

The pole of the function  $f(z) = \cot z$  at  $z = 0$  is

1. a removable singularity.
2. an essential singularity.
3. a simple pole.
4. a second order pole.

A1 : 1

A2 : 2

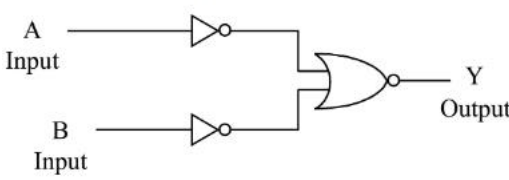
A3 : 3

A4 : 4

#### Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |      |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 96 | 990096 | <p>Consider the following statements about FETs in comparison to BJTs:</p> <p>A. They have high input impedance<br/> B. The current flows due to majority carriers.<br/> C. They have low input resistance.<br/> D. The current flows due to minority carriers.</p> <p>The CORRECT statements are</p> <ol style="list-style-type: none"> <li>1. A and D only</li> <li>2. B and C only</li> <li>3. C and D only</li> <li>4. A and B only</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

#### Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                                             |     |      |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 97 | 990097 | <p>In the circuit shown given below:</p>  <p>What will be the value of Y for A=0, B=0 and A=1, B=1?</p> <ol style="list-style-type: none"> <li>1. 1 and 1, respectively.</li> <li>2. 0 and 0, respectively.</li> <li>3. 0 and 1, respectively.</li> <li>4. 1 and 0, respectively.</li> </ol> <p>A1 : 1</p> <p>A2 : 2</p> | 4.0 | 0.00 |
|----|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

|  |  |        |  |  |
|--|--|--------|--|--|
|  |  | A3 : 3 |  |  |
|  |  | A4 : 4 |  |  |

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                               |     |      |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 98 | 990098 | <p>Zener diode is used as the main component in the dc power supply for</p> <p>(A) Filtration of DC components</p> <p>(B) Voltage Regulation</p> <p>(C) Impedance matching</p> <p>(D) Amplification</p> <p>Which one is TRUE?</p> <p>1. (A) and (B) only</p> <p>2. (B) only</p> <p>3. (A) and (C) only</p> <p>4. (C) and (D) only</p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|    |        |                                                                                                                                                                                                                                                                                                                                                                                      |     |      |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| 99 | 990099 | <p>Depletion capacitance in a diode depends on</p> <p>(A) Applied voltage</p> <p>(B) Junction built-in potential</p> <p>(C) Current through junction</p> <p>(D) Doping profile across the junction</p> <p>1. (A) and (B) only</p> <p>2. (A) and (C) only</p> <p>3. (A), (B) and (D) only</p> <p>4. (B), (C) and (D) only</p> <p>A1 : 1</p> <p>A2 : 2</p> <p>A3 : 3</p> <p>A4 : 4</p> | 4.0 | 0.00 |
|----|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|

## Objective Question

|     |        |  |     |      |
|-----|--------|--|-----|------|
| 100 | 990100 |  | 4.0 | 0.00 |
|-----|--------|--|-----|------|

An OP-AMP have an output of 5 V (peak to peak) with 100 kHz frequency. What will be the slew rate (in V/ $\mu$ .sec) of this signal?

1. 0

2. 1

3. 2

4. 4

A1 : 1

A2 : 2

A3 : 3

A4 : 4