

(Total No. of printed pages : 20)

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Sr. No. 10301 (PG-EE-2015) Code **A**  
Subject : PHYSICS  
Time : 1¼ Hours Max. Marks : 100 Total Questions : 100  
Roll No. \_\_\_\_\_ (in figure) \_\_\_\_\_ (in words)  
Name : \_\_\_\_\_ Father's Name : \_\_\_\_\_  
Mother's Name \_\_\_\_\_ Date of Examination \_\_\_\_\_

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*Awan*  
Head  
Department of Physics  
M.D. University, Rohtak

Question No.	Questions
1.	For a conservative system, generalized force (1) has necessarily the dimensions of force (2) is a dimensionless quantity (3) can not have dimensions of force (4) may have dimensions of torque
2.	Mutual interaction forces between two particles can change (1) the linear momentum but not the kinetic energy (2) the kinetic energy but not the linear momentum (3) the linear momentum as well as kinetic energy (4) neither the linear momentum nor the kinetic energy
3.	If the Lagrangian does not depend on time explicitly (1) the Hamiltonian is constant (2) the Hamiltonian can not be constant (3) the kinetic energy is constant (4) the potential energy is constant
4.	The eccentricity (e) of the orbit of a satellite having maximum and minimum velocities as $v_1$ and $v_2$ is (1) $\frac{v_1}{v_2}$ (2) $\frac{v_2}{v_1}$ (3) $\frac{v_1 - v_2}{v_1 + v_2}$ (4) $\frac{v_1 + v_2}{v_1 - v_2}$
5.	For a one dimensional oscillator, the representative point in two dimensional phase space traces (1) an ellipse (2) a parabola (3) a hyperbola (4) always a straight line

Answer

Question No.	Questions
6.	<p>For a particle at rest in a rotating frame, the pseudo force acting on it is</p> <p>(1) zero (2) only centrifugal force</p> <p>(3) only coriolis force (4) both centrifugal and coriolis force</p>
7.	<p>If constraint forces do work and total mechanical energy is not conserved then constraints are named as</p> <p>(1) bilateral constraint (2) unilateral constraint</p> <p>(3) dissipative constraint (4) regenerative constraint</p>
8.	<p>A force <math>\vec{F} = -\vec{\nabla} u</math> is said to be conservative if</p> <p>(1) grade F is zero (2) <math>\text{div } F</math> is zero</p> <p>(3) <math>\text{Curl } F</math> is zero (4) none of three before</p>
9.	<p>Which of the following is not an explicit function of time</p> <p>(1) velocity (2) momentum</p> <p>(3) acceleration (4) potential energy</p>
10.	<p>If external torque on a system is zero, then its angular velocity</p> <p>(1) remains unchanged only if moment of inertia changes</p> <p>(2) changes only if moment of inertia remains unchanged</p> <p>(3) remains unchanged only if moment of inertia remains fixed</p> <p>(4) none of the three before</p>
11.	<p>A pair is constrained to move along the inner surface of a hemisphere, then the number of degrees of freedom of the particle is</p> <p>(1) one (2) two</p> <p>(3) four (4) three</p>

PG-EE-2015 (Physics)-Code-A

(2)

*[Signature]*  
 Head  
 Department of Physics  
 M.D. University, Rohtak

Head  
 Department of Physics  
 M.D. University, Rohtak

Question No.	Questions
12.	For a conservative system, the potential energy is (1) coordinate and velocity dependent (2) coordinate dependent and velocity independent (3) coordinate independent and velocity dependent (4) coordinate and velocity independent
13.	The distance time graph of a particle at time $t$ makes an angle $45^\circ$ with respect to time axis. After one second, it makes angle $60^\circ$ w.r.t. to time axis, what is the acceleration of the particle (1) $\sqrt{3} - 1$ unit (2) $\sqrt{3} + 1$ unit (3) $\sqrt{3}$ unit (4) 1 unit
14.	A ball kept in a box (closed), moves in the box colliding with the walls. If the box is kept on a smooth surface, the centre of mass of the (1) box remains constant (2) box and the ball system remains constant (3) ball remains constant (4) ball relative to the box remains constant
15.	Centre of mass of a semicircular plate of radius $R$ , the density of which linearly varies with distance being $d$ at the centre to $2d$ at the circumference is (1) $\frac{3R}{\pi}$ from the centre (2) $\frac{4R}{3\pi}$ from the centre (3) $\frac{5R}{\pi}$ from the centre (4) $\frac{7R}{5\pi}$ from the centre
16.	A uniform rod is placed vertically on a smooth surface and then released. Then (1) the centre of rod follows a straight line path (2) the centre of mass follows circular path (3) the instantaneous axis is passing through the point of contact (4) all the three before

Question No.	Questions
17.	<p>In case of a radioactive decay, if the parent nucleus is initially at rest, then after decay, the centre of mass will</p> <p>(1) move on a straight line      (2) move in a circle (3) remain at rest                      (4) follow a parabolic path</p>
18.	<p>Two pendulums of length <math>l_1</math> and <math>l_2</math> start vibrating. If at some instant, the two are in mean position in the same phase, then after how many vibrations of the shorter pendulum, the two will be in phase in the mean position [<math>l_1 &gt; l_2</math>; <math>l_1 = 121</math> cm. <math>l_2 = 100</math> cm.]</p> <p>(1) 11                                      (2) 10 (3) 9                                        (4) 8</p>
19.	<p>A solid copper sphere suspended from a massless spring has a time period of 4 second. The sphere is completely immersed in a liquid having density 0.125 times that of the brass. If the sphere remains in the liquid during oscillations, the time period will be</p> <p>(1) 4 second                              (2) 2 second (3) 3 second                              (4) 4.75 second</p>
20.	<p>A particle moves along y axis represented as <math>y = 3 + 4 \cos \omega t</math>. The motion of the particle is</p> <p>(1) not S.H.M                              (2) Oscillatory but not S.H.M (3) S.H.M                                    (4) rotatory</p>
21.	<p>The spring constant k of a wire of length L, having an area of cross-section A, Young's modulus Y behaving as a spring is</p> <p>(1) <math>\frac{YA}{L}</math>                                      (2) <math>\frac{YA}{2L}</math> (3) <math>\frac{2YA}{L}</math>                                      (4) <math>\frac{YL}{A}</math></p>

Question No.	Questions
22.	The dimensions of Poisson's ratio are (1) $[M^{\circ} L^{\circ} T^{\circ}]$ (2) $[M L^{-1} T^{-2}]$ (3) $[M L^2 T^{-4}]$ (4) $[M L^2 T^{-3}]$
23.	The temperature at which the phase transition occurs depends upon (1) pressure (2) volume (3) density (4) mass
24.	The temperature of $H_2$ at which the rms velocity of its molecules is seven times the rms velocity of the nitrogen molecules at 300 k is (1) 2100 k (2) 1700 k (3) 1350 k (4) 1050 k
25.	How many cylinders of hydrogen at atmospheric pressure are required to fill a balloon of volume $500 \text{ m}^3$ , if the hydrogen is stored in cylinders of $0.05 \text{ m}^3$ at an absolute pressure of $15 \times 10^5 \text{ Pa}$ ? (1) 700 (2) 675 (3) 605 (4) 710
26.	If the temperature of 3 moles of helium gas is increased by 2k, then the change in internal energy of the gas is (1) 70.0 J (2) 68.2 J (3) 74.8 J (4) 78.2 J
27.	One mole of a gas isobarically heated by 40 k receives heat 1.162 kJ. The ratio of specific heats of the gas is (1) 1.7 (2) 1.4 (3) 1.3 (4) 1.5

Question No.	Questions
28.	<p>A carnot engine first operates between 200°C and 0°C and then between 0°C and 200°C. The ratio of efficiencies <math>\left(\frac{\eta_2}{\eta_1}\right)</math> in two cases is</p> <p>(1) 1 : 15 (2) 1 : 1 (3) 1 : 2 (4) 1.73 : 1</p>
29.	<p>The propagation of heat in air takes place by</p> <p>(1) conduction (2) convection (3) radiation (4) all the three before</p>
30.	<p>The ratio of rate of radiation of energy by two spheres of same material having radii <math>r</math> and <math>4r</math> and temperature <math>2T_0</math> and <math>T_0</math> respectively is</p> <p>(1) 1 : 1 (2) 1 : 2 (3) 2 : 1 (4) 3 : 1</p>
31.	<p>The shortest height of a vertical mirror required to see the entire image of a man, will be</p> <p>(1) <math>\frac{1}{3}</math> of man's height (2) <math>\frac{1}{2}</math> of man's height (3) <math>\frac{2}{3}</math> of man's height (4) equal to man's height</p>
32.	<p>If 'C' is the velocity of light in vacuum, then the time taken by the light to travel through a glass plate of thickness 't' and refractive index '<math>\mu</math>' is</p> <p>(1) <math>\frac{t}{\mu C}</math> (2) <math>t\mu C</math> (3) <math>\frac{\mu t}{C}</math> (4) <math>\frac{tC}{\mu}</math></p>

Question No.	Questions
33.	<p>A thin prism of angle <math>6^\circ</math> made of glass of refractive index 1.5 is combined with another prism of glass with <math>\mu = 1.75</math> so as to produce dispersion without deviation. The angle of second prism is</p> <p>(1) <math>7^\circ</math> (2) <math>4.67^\circ</math>  (3) <math>9^\circ</math> (4) <math>5^\circ</math></p>
34.	<p>A simple microscope consists of a concave lens of power <math>-10</math> D and a convex lens of power <math>+20</math> D in contact. If the image formed is at infinity, then the magnifying power (<math>D = 25</math> cm) is</p> <p>(1) 2.5 (2) 3.5  (3) 2.0 (4) 3.0</p>
35.	<p>A symmetric double convex lens is cut in two equal parts along its diameter. If the power of original lens was 4D, the power of divided lens will be</p> <p>(1) 2 D (2) 3 D  (3) 4 D (4) 5 D</p>
36.	<p>If the resolution limit of the eye is 1 minute and at a distance <math>x</math> km from the eye, two persons stand with a lateral separation of 3 meters, then value of <math>x</math> for which the two persons can be resolved by naked eye is</p> <p>(1) 10 km (2) 15 km  (3) 20 km (4) 30 km</p>
37.	<p>If the Young's double slite experiment is performed in water, then</p> <p>(1) the fringe width decreases (2) the fringe width increases  (3) the fringe width does not change (4) there will be no fringes</p>
38.	<p>If <math>n</math> coherent sources of intensity <math>I_0</math> are super imposed at a point, the intensity of the point is</p> <p>(1) <math>n I_0</math> (2) <math>n^2 I_0</math>  (3) <math>n^3 I_0</math> (4) <math>I_0/n</math></p>



Question No.	Questions
39.	<p>In Fresnel's biprism experiment, the distance between biprism and screen is 4 m. The angle of the prism is <math>2 \times 10^{-3}</math> radian and the refractive index of glass of the biprism is 1.5. The fringe width observed on the screen is <math>15 \times 10^{-4}</math> m. The number of fringes on the screen is</p> <p>(1) 3 (2) 2 (3) 6 (4) 8</p>
40.	<p>If <math>\sigma</math> is surface charge density and <math>\epsilon</math> is electric permittivity, the dimensions of <math>\frac{\sigma}{\epsilon}</math> are same as</p> <p>(1) electric force (2) electric field intensity (3) pressure (4) charge</p>
41.	<p>A small element <math>\ell</math> is cut from a circular ring of radius 'a' and <math>\lambda</math> charge per unit length. The net electric field at the centre of the ring will be</p> <p>(1) zero (2) <math>\frac{\lambda \ell}{4\pi\epsilon_0 a^2}</math> (3) <math>\infty</math> (4) <math>\frac{\lambda}{4\epsilon\pi\ell}</math></p>
42.	<p>An electron is projected with a velocity of <math>10^7</math> m/s at an angle <math>30^\circ</math> with the horizontal in a region of uniform electric field of 5000 N/C vertically upwards. The maximum distance covered in vertical direction above initial level will be</p> <p>(1) 14.2 mm (2) 15 mm (3) 12.6 mm (4) 14.2 cm</p>
43.	<p>A surface <math>S = 10 \hat{j}</math> is kept in an electric field <math>E = 2 \hat{i} + 4 \hat{j} + 7 \hat{k}</math>. The electric flux through the surface will be</p> <p>(1) 40 units (2) 50 units (3) 30 units (4) 20 units</p> <p style="text-align: right;"><i>Anam Shau</i></p>

Question No.	Questions
44.	Two drops of water each with a charge of $3 \times 10^{-9}$ C having surface potential 500 V form a single drop. The surface potential of the new drop is (1) 794 V (2) 1000 V (3) 250 V (4) 750 V
45.	The electric field intensity at a point at a distance 20 cm on a line making an angle $45^\circ$ with the axis of a dipole of moment $10$ C - m is (1) $1.77 \times 10^{13}$ V/m (2) $0.177 \times 10^{13}$ V/m (3) $17.7 \times 10^{13}$ V/m (4) $177 \times 10^{13}$ V/m
46.	Two capacitors A and B having capacitance $10 \mu\text{F}$ and $20 \mu\text{F}$ respectively are connected in series with a 12 V battery. The ratio of charges on A and B is (1) 0.5 : 1 (2) 1 : 1 (3) 2 : 1 (4) 1 : 1.5
47.	The force acting upon a charged particle kept between the plates of a charged capacitor is F. If one of the plates of the capacitor is removed, force acting on the same particle will be (1) 0 (2) $F/2$ (3) F (4) 2F
48.	A $5^\circ\text{C}$ rise in temperature is observed in a conductor when current is passed through it. If the current is doubled, the rise in temperature will be approximately (1) $20^\circ\text{C}$ (2) $16^\circ\text{C}$ (3) $12^\circ\text{C}$ (4) $10^\circ\text{C}$

Question No.	Questions
49.	<p>A current 0.5 A flows through a resistance <math>2 \Omega</math> connected across a cell. The current changes to 0.25 A as resistance is increased to <math>5 \Omega</math>. The emf of the cell is</p> <p>(1) 1 V (2) 1.5 V (3) 2 V (4) 2.5 V</p>
50.	<p>Two heater coils of same material are connected in parallel across the mains and the length and diameter of one coil is double that of the other. Which one will produce more heat</p> <p>(1) thinner coil (2) thicker coil (3) both will produce same amount of heat (4) can't predict</p>
51.	<p>If a charged particle moving in a uniform magnetic field loses 4% of its kinetic energy, radius of curvature of its path changes by</p> <p>(1) 2% (2) 4% (3) 10% (4) 7.5%</p>
52.	<p>A length <math>\ell</math> of a wire is bent to form a circular coil of some turns. A current <math>I</math> is passed through it and it is placed in a magnetic field <math>B</math>. The maximum torque acting on the coil is</p> <p>(1) <math>1 B \ell^2</math> (2) <math>4 \pi I B \ell^2</math> (3) <math>I \ell^2 B / 4\pi</math> (4) zero</p>
53.	<p>An atom is paramagnetic if it has</p> <p>(1) an electric dipole moment (2) no magnetic moment (3) a magnetic moment (4) no electric dipole moment</p>
54.	<p>The couple acting on a magnet of length 10 cm and pole strength 15 Am kept in a field <math>B = 2 \times 10^{-5} \text{ T}</math> at an angle of <math>30^\circ</math> is</p> <p>(1) <math>1.5 \times 10^{-5} \text{ Nm}</math> (2) <math>1.5 \times 10^{-3} \text{ Nm}</math> (3) <math>1.5 \times 10^{-2} \text{ Nm}</math> (4) <math>1.5 \times 10^{-6} \text{ Nm}</math></p>

Question No.	Questions
55.	<p>A fan blade of length <math>\frac{1}{\sqrt{\pi}}</math> meter rotates with a frequency 5 cycles/sec perpendicular to a magnetic field 10 tesla. The potential difference between the centre and end of the blade is</p> <p>(1) - 50 V                      (2) + 50 V  (3) - 2.0 V                      (4) + 0.02 V</p>
56.	<p>The self inductance of an air core solenoid of 80 cm length and 500 turns each of circular cross-section with 2 cm diameter is</p> <p>(1) 150.6 <math>\mu</math>H                      (2) 162.2 <math>\mu</math>H  (3) 123.3 <math>\mu</math>H                      (4) 102.5 <math>\mu</math>H</p>
57.	<p>An a.c. source <math>V = 100 \sin 100 \pi t</math> is connected to a resistor of 20 <math>\Omega</math>. The rms value of current through the resistor is</p> <p>(1) 10 A                      (2) <math>\frac{10}{\sqrt{2}}</math> A  (3) <math>\frac{5}{\sqrt{2}}</math> A                      (4) <math>\frac{7}{\sqrt{2}}</math> A</p>
58.	<p>A voltage signal is represented as <math>V = 220 \sqrt{2} \cos (50\pi) t</math>. How many times will the current be zero in one second</p> <p>(1) 50                      (2) 100  (3) 33                      (4) 67</p>
59.	<p>The reactance of a capacitor (10 pF) connected across a d.c. source is</p> <p>(1) zero                      (2) infinity  (3) <math>10^4 \Omega</math>                      (4) <math>10^7 \Omega</math></p>

*Arun*  
Head

Question No.	Questions
60.	<p>The electric field 'E' and the magnetic field 'B' in an electromagnetic wave are</p> <p>(1) parallel to each other                      (2) inclined at an angle of <math>45^\circ</math></p> <p>(3) perpendicular to each other              (4) opposite to each other</p>
61.	<p>The average power per unit area at a distance of 2 m from a small bulb emitting 20 W of EM radiations uniformly in all directions is</p> <p>(1) <math>0.69 \text{ W/m}^2</math>                                      (2) <math>0.56 \text{ W/m}^2</math></p> <p>(3) <math>0.78 \text{ W/m}^2</math>                                      (4) <math>0.39 \text{ W/m}^2</math></p>
62.	<p>The ratio of wavelengths associated with a proton and an alpha particle accelerated through same potential is</p> <p>(1) 2    (2) <math>\sqrt{2}</math></p> <p>(3) 4    (4) <math>\frac{1}{2}\sqrt{2}</math></p>
63.	<p>The momentum of a photon with energy equal to rest energy of an electron is</p> <p>(1) zero    (2) <math>2.73 \times 10^{-2} \text{ kg ms}^{-1}</math></p> <p>(3) <math>1.99 \times 10^{-24} \text{ kg ms}^{-1}</math>                      (4) infinite</p>
64.	<p>The graph between frequency of incident light and the stopping potential is</p> <p>(1) parabola    (2) straight line</p> <p>(3) hyperbola    (4) circle</p>
65.	<p>A ruby laser produces radiations of 662.6 nm pulses of duration <math>10^{-9}</math> sec. If the energy/pulse is 0.39 J, the numbr of photons produced are</p> <p>(1) <math>1.3 \times 10^9</math>    (2) <math>1.3 \times 10^{18}</math></p> <p>(3) <math>1.3 \times 10^{27}</math>    (4) <math>3.9 \times 10^{18}</math></p>

Question No.	Questions
66.	<p>At its closest approach, the distance between Mars and the Earth is 60 million km. How long will it take to send a radio message from a space probe of Mars to Earth in this situation ?</p> <p>(1) 5 sec (2) 200 sec (3) 0.2 sec (4) 500 sec</p>
67.	<p>How many different wavelengths may be observed in the spectrum from a hydrogen sample if the atoms are excited to third excited state</p> <p>(1) 3 (2) 4 (3) 5 (4) 6</p>
68.	<p>For a single ionised helium atom, the longest wavelength in ground state will absorb</p> <p>(1) <math>912 \text{ \AA}^\circ</math> (2) <math>304 \text{ \AA}^\circ</math> (3) <math>606 \text{ \AA}^\circ</math> (4) <math>1216 \text{ \AA}^\circ</math></p>
69.	<p>z component of an orbital angular momentum is <math>\frac{h}{\pi}</math>, its magnetic quantum number is</p> <p>(1) 1 (2) 2 (3) -1 (4) 0</p>
70.	<p>If the uncertainty in the position of a particle is equal to its de-Broglie wavelength, the minimum uncertainty in the velocity would be</p> <p>(1) <math>\frac{1}{4\pi}</math> (2) <math>\frac{v}{4\pi}</math> (3) <math>\frac{v}{4\pi m}</math> (4) <math>\frac{mv}{4\pi}</math></p>

*Answer*  
Head  
Department of Physics  
M.D. University, Rohtak

Department of Physics  
M.D. University, Rohtak

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71.	<p>If the binding energy/nucleon in <math>\text{Li}^7</math> and <math>\text{He}^4</math> nuclei are 5.60 MeV and 7.06 MeV respectively, the energy of the reaction</p> $\text{Li}^7 + p \rightarrow 2\text{He}^4$ <p>will be</p> <p>(1) 19.6 MeV                              (2) 2.4 MeV  (3) 8.4 MeV                                 (4) 17.28 MeV</p>
72.	<p>The count rate of a radioactive nuclei falls from 992 counts/minute to 62 counts/minute in 10 hour. The half-life of the element is</p> <p>(1) 1 hour                                      (2) 2.5 hours  (3) 5 hours                                     (4) 6 hours</p>
73.	<p>The nucleus <math>^{242}\text{Pu}_{94}</math> decays to <math>^{206}\text{Pb}_{82}</math> by emitting</p> <p>(1) 9 <math>\alpha</math> and 12 <math>\beta</math> particles              (2) 6 <math>\alpha</math> and 9 <math>\beta</math> particles  (3) 9 <math>\alpha</math> and 6 <math>\beta</math> particles                (4) 6 <math>\alpha</math> and 12 <math>\beta</math> particles</p>
74.	<p>On an atomic scale, which of the following polarisation is important ?</p> <p>(1) electronic only                          (2) ionic only  (3) orientational only                        (4) both ionic and orientational</p>
75.	<p>At a frequency less than the plasma frequency, the collision losses cause</p> <p>(1) total internal reflection  (2) wave attenuation  (3) partial reflection  (4) both attenuation and partial reflection</p>





Question No.	Questions
81.	When only s-wave scattering takes place, then the ratio of total scattering quantum-mechanically to the cross-section classically for the same radius is (1) 2 (2) 4 (3) $\frac{1}{2}$ (4) $\frac{1}{4}$
82.	The Stern-Gerlach experiment proves the existence of (1) electronic charge (2) electronic dipole moment (3) electronic spin (4) electron mass
83.	For the wavefunction $\psi_n = A \sin \frac{n\pi x}{a}$ confined to $0 < x < a$ , the value of normalization constant is (1) $\sqrt{\frac{2}{a}}$ (2) $\sqrt{\frac{a}{2}}$ (3) $\frac{2}{a}$ (4) $\frac{a}{2}$
84.	Entropy of the universe tends to be (1) minimum (2) zero (3) constant (4) increasing always
85.	The internal energy of an isolated system (1) remains constant (2) is zero (3) infinite (4) none of the three before

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86.	The number of degrees of freedom of a gas is $F$ , then the value of $\gamma$ is (1) $1 + \frac{2}{F}$ (2) $\frac{2}{F}$ (3) $\frac{F}{2} + 1$ (4) zero
87.	The work done when a gram-molecule of a gas expands isothermally at $27^\circ\text{C}$ to double its original volume is $[R = 8.3 \text{ J k}^{-1} \text{ mole}^{-1}]$ (1) 725.8 Joule (2) 1725.8 Joule (3) -725.8 Joule (4) zero
88.	In quantum statistics, the value of occupation index is (1) equal to 1 (2) equal to or greater than 1 (3) equal to or less than 1 (4) less than 1
89.	The specific heat of saturated steam is always (1) positive (2) zero (3) negative (4) infinite
90.	The unit of entropy is (1) $\text{J k}$ (2) $\text{J k}^{-1}$ (3) $\text{J}$ (4) $\text{N m}^{-2}$
91.	As the interatomic distance in a solid increases, the width of an allowed energy band (1) increases (2) decreases (3) is unchanged (4) first increases then decreases

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92.	<p>The atomic packing factor for a bcc metal structure is</p> <p>(1) 0.68 (2) 0.74</p> <p>(3) 0.50 (4) 1.00</p>
93.	<p>Which of following reveal crystallographic structure of a solid ?</p> <p>(1) <math>\alpha</math>-rays (2) <math>\beta</math> rays</p> <p>(3) <math>\gamma</math> rays (4) X rays</p>
94.	<p>The 1<sup>st</sup> brillouin zone of simple cubic lattice is</p> <p>(1) rhombic decahedron (2) truncated octahedron</p> <p>(3) parallelopiped (4) cube</p>
95.	<p>Bipolar logic families employ</p> <p>(1) junction field effect transistor (2) p-n junctions</p> <p>(3) n-p-n transistors (4) MOSFETs</p>
96.	<p>A Schottky transistor when used as a switch switches between</p> <p>(1) cut-off and saturation regions</p> <p>(2) cut-off and active regions</p> <p>(3) active and saturation regions</p> <p>(4) different operating points in active region</p>
97.	<p>The most commonly used configuration of a transistor as a switch is</p> <p>(1) CB (2) CC</p> <p>(3) CE (4) CB or CC</p>

Question No.	Questions
98.	Which of the following diodes is used for fastest switching (1) p-n junction                      (2) Schottky (3) Vacuum                              (4) Zener
99.	The time required to go from ON to OFF in a p-n junction diode is equal to (1) zero                                      (2) switching time (3) transition time                      (4) storage time
100.	In case of a MOSFET, the gate current (1) is negligibly small (2) increases with increase in drain voltage (3) decreases with decrease in drain voltage (4) is dependent on drain current

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(PG-EE-2015)

Sr. No. 10230

Subject : PHYSICS

Code

**B**

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. \_\_\_\_\_ (in figure) \_\_\_\_\_ (in words)

Name : \_\_\_\_\_ Father's Name : \_\_\_\_\_

Mother's Name \_\_\_\_\_ Date of Examination \_\_\_\_\_

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*Anwar*  
Head  
Department of Physics  
M.D. University, Rohtak

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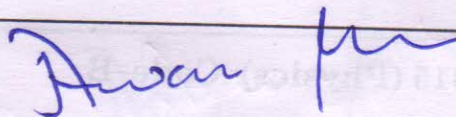
Question No.	Questions
1.	<p>A pair is constrained to move along the inner surface of a hemisphere, then the number of degrees of freedom of the particle is</p> <p>(1) one (2) two (3) four (4) three</p>
2.	<p>For a conservative system, the potential energy is</p> <p>(1) coordinate and velocity dependent (2) coordinate dependent and velocity independent (3) coordinate independent and velocity dependent (4) coordinate and velocity independent</p>
3.	<p>The distance time graph of a particle at time <math>t</math> makes an angle <math>45^\circ</math> with respect to time axis. After one second, it makes angle <math>60^\circ</math> w.r.t. to time axis, what is the acceleration of the particle</p> <p>(1) <math>\sqrt{3} - 1</math> unit (2) <math>\sqrt{3} + 1</math> unit (3) <math>\sqrt{3}</math> unit (4) 1 unit</p>
4.	<p>A ball kept in a box (closed), moves in the box colliding with the walls. If the box is kept on a smooth surface, the centre of mass of the</p> <p>(1) box remains constant (2) box and the ball system remains constant (3) ball remains constant (4) ball relative to the box remains constant</p>
5.	<p>Centre of mass of a semicircular plate of radius <math>R</math>, the density of which linearly varies with distance being <math>d</math> at the centre to <math>2d</math> at the circumference is</p> <p>(1) <math>\frac{3R}{\pi}</math> from the centre (2) <math>\frac{4R}{3\pi}</math> from the centre (3) <math>\frac{5R}{\pi}</math> from the centre (4) <math>\frac{7R}{5\pi}</math> from the centre</p>

Question No.	Questions
6.	<p>A uniform rod is placed vertically on a smooth surface and then released. Then</p> <p>(1) the centre of rod follows a straight line path            (2) the centre of mass follows circular path            (3) the instantaneous axis is passing through the point of contact            (4) all the three before</p>
7.	<p>In case of a radioactive decay, if the parent nucleus is initially at rest, then after decay, the centre of mass will</p> <p>(1) move on a straight line      (2) move in a circle            (3) remain at rest                      (4) follow a parabolic path</p>
8.	<p>Two pendulums of length <math>l_1</math> and <math>l_2</math> start vibrating. If at some instant, the two are in mean position in the same phase, then after how many vibrations of the shorter pendulum, the two will be in phase in the mean position [<math>l_1 &gt; l_2</math>; <math>l_1 = 121</math> cm. <math>l_2 = 100</math> cm.]</p> <p>(1) 11                                      (2) 10            (3) 9                                        (4) 8</p>
9.	<p>A solid copper sphere suspended from a massless spring has a time period of 4 second. The sphere is completely immersed in a liquid having density 0.125 times that the brass. If the sphere remains in the liquid during oscillations, the time period will be</p> <p>(1) 4 second                              (2) 2 second            (3) 3 second                              (4) 4.75 second</p>
10.	<p>A particle moves along y axis represented as <math>y = 3 + 4 \cos wt</math>. The motion of the particle is</p> <p>(1) not S.H.M                              (2) Oscillatory but not S.H.M            (3) S.H.M                                    (4) rotatory</p>

Question No.	Questions
11.	As the interatomic distance in a solid increases, the width of an allowed energy band (1) increases (2) decreases (3) is unchanged (4) first increases then decreases
12.	The atomic packing factor for a bcc metal structure is (1) 0.68 (2) 0.74 (3) 0.50 (4) 1.00
13.	Which of following reveal crystallographic structure of a solid ? (1) $\alpha$ -rays (2) $\beta$ rays (3) $\gamma$ rays (4) X rays
14.	The 1 <sup>st</sup> brillouin zone of simple cubic lattice is (1) rhombic decahedron (2) truncated octahedron (3) parallelopiped (4) cube
15.	Bipolar logic families employ (1) junction field effect transistor (2) p-n junctions (3) n-p-n transistors (4) MOSFETs
16.	A Schottky transistor when used as a switch switches between (1) cut-off and saturation regions (2) cut-off and active regions (3) active and saturation regions (4) different operating points in active region

PG-EE-2015 (Physics)-Code-B

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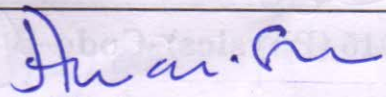


Question No.	Questions
17.	The most commonly used configuration of a transistor as a switch is (1) CB (2) CC (3) CE (4) CB or CC
18.	Which of the following diodes is used for fastest switching (1) p-n junction (2) Schottky (3) Vacuum (4) Zener
19.	The time required to go from ON to OFF in a p-n junction diode is equal to (1) zero (2) switching time (3) transition time (4) storage time
20.	In case of a MOSFET, the gate current (1) is negligibly small (2) increases with increase in drain voltage (3) decreases with decrease in drain voltage (4) is dependent on drain current
21.	If the binding energy/nucleon in $\text{Li}^7$ and $\text{He}^4$ nuclei are 5.60 MeV and 7.06 MeV respectively, the energy of the reaction $\text{Li}^7 + p \rightarrow 2\text{He}^4$ will be (1) 19.6 MeV (2) 2.4 MeV (3) 8.4 MeV (4) 17.28 MeV

Question No.	Questions
22.	The count rate of a radioactive nuclei falls from 992 counts/minute to 62 counts/minute in 10 hour. The half-life of the element is (1) 1 hour (2) 2.5 hours (3) 5 hours (4) 6 hours
23.	The nucleus $^{242}\text{Pu}_{94}$ decays to $^{206}\text{Pb}_{82}$ by emitting (1) 9 $\alpha$ and 12 $\beta$ particles (2) 6 $\alpha$ and 9 $\beta$ particles (3) 9 $\alpha$ and 6 $\beta$ particles (4) 6 $\alpha$ and 12 $\beta$ particles
24.	On an atomic scale, which of the following polarisation is important ? (1) electronic only (2) ionic only (3) orientational only (4) both ionic and orientational
25.	At a frequency less than the plasma frequency, the collision losses cause (1) total internal reflection (2) wave attenuation (3) partial reflection (4) both attenuation and partial reflection
26.	The minimum energy possessed by a particle confined to a one dimensional box of length L is (1) 0 (2) $\frac{h^2}{(8\pi^2 m L^2)}$ (3) $\frac{h^2}{(8\pi^2 m L^2)}$ (4) $\frac{mv^2}{2L}$

Question No.	Questions
27.	<p>The width of the spectral line resulting when an atom in an excited state of life time <math>10^{-8}</math> sec. returns to the ground state is</p> <p>(1) <math>0.33 \text{ m}^{-1}</math> (2) <math>0.33 \text{ cm}^{-1}</math>  (3) <math>33 \text{ m}^{-1}</math> (4) <math>33 \text{ cm}^{-1}</math></p>
28.	<p>The expected value of P for the wave function <math>\psi(x) = \sqrt{\frac{2}{L}} \sin \frac{\pi x}{L}</math>; <math>0 &lt; x &lt; L</math> is</p> <p>(1) 0 (2) <math>\frac{1}{2}</math>  (3) 1 (4) infinity</p>
29.	<p>The particles described by anti symmetric wavefunctions obey</p> <p>(1) Maxwell Boltzmann Statistics (2) Bose-Einstein Statistics  (3) Fermi-Dirac Statistics (4) All the three before</p>
30.	<p>Born approximation can be used</p> <p>(1) only within very low energy limits  (2) only within high energy limits  (3) in both very low as well as high energy limits  (4) none of the three before</p>
31.	<p>If a charged particle moving in a uniform magnetic field loses 4% of its kinetic energy, radius of curvature of its path changes by</p> <p>(1) 2% (2) 4%  (3) 10% (4) 7.5%</p>

Question No.	Questions
32.	<p>A length <math>\ell</math> of a wire is bent to form a circular coil of some turns. A current <math>I</math> is passed through it and it is placed in a magnetic field <math>B</math>. The maximum torque acting on the coil is</p> <p>(1) <math>1 B \ell^2</math> (2) <math>4 \pi I B \ell^2</math> (3) <math>I \ell^2 B / 4\pi</math> (4) zero</p>
33.	<p>An atom is paramagnetic if it has</p> <p>(1) an electric dipole moment (2) no magnetic moment (3) a magnetic moment (4) no electric dipole moment</p>
34.	<p>The couple acting on a magnet of length 10 cm and pole strength 15 Am kept in a field <math>B = 2 \times 10^{-5}</math> T at an angle of <math>30^\circ</math> is</p> <p>(1) <math>1.5 \times 10^{-5}</math> Nm (2) <math>1.5 \times 10^{-3}</math> Nm (3) <math>1.5 \times 10^{-2}</math> Nm (4) <math>1.5 \times 10^{-6}</math> Nm</p>
35.	<p>A fan blade of length <math>\frac{1}{\sqrt{\pi}}</math> meter rotates with a frequency 5 cycles/sec perpendicular to a magnetic field 10 tesla. The potential difference between the centre and end of the blade is</p> <p>(1) <math>-50</math> V (2) <math>+50</math> V (3) <math>-2.0</math> V (4) <math>+0.02</math> V</p>
36.	<p>The self inductance of an air core solenoid of 80 cm length and 500 turns each of circular cross-section with 2 cm diameter is</p> <p>(1) <math>150.6 \mu\text{H}</math> (2) <math>162.2 \mu\text{H}</math> (3) <math>123.3 \mu\text{H}</math> (4) <math>102.5 \mu\text{H}</math></p>

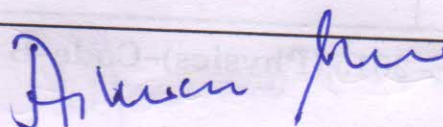


Question No.	Questions
37.	An a.c. source $V = 100 \sin 100 \pi t$ is connected to a resistor of $20 \Omega$ . The rms value of current through the resistor is (1) 10 A (2) $\frac{10}{\sqrt{2}}$ A (3) $\frac{5}{\sqrt{2}}$ A (4) $\frac{7}{\sqrt{2}}$ A
38.	A voltage signal is represented as $V = 220 \sqrt{2} \cos (50\pi) t$ . How many times will the current be zero in one-second (1) 50 (2) 100 (3) 33 (4) 67
39.	The reactance of a capacitor ( $10 \text{ pF}$ ) connected across a d.c. source is (1) zero (2) infinity (3) $10^4 \Omega$ (4) $10^7 \Omega$
40.	The electric field 'E' and the magnetic field 'B' in an electromagnetic wave are (1) parallel to each other (2) inclined at an angle of $45^\circ$ (3) perpendicular to each other (4) opposite to each other
41.	The shortest height of a vertical mirror required to see the entire image of a man, will be (1) $\frac{1}{3}$ of man's height (2) $\frac{1}{2}$ of man's height (3) $\frac{2}{3}$ of man's height (4) equal to man's height

Question No.	Questions
42.	<p>If 'C' is the velocity of light in vacuum, then the time taken by the light to travel through a glass plate of thickness 't' and refractive index '<math>\mu</math>' is</p> <p>(1) <math>\frac{t}{\mu C}</math> (2) <math>t\mu C</math>  (3) <math>\frac{\mu t}{C}</math> (4) <math>\frac{tC}{\mu}</math></p>
43.	<p>A thin prism of angle <math>6^\circ</math> made of glass of refractive index 1.5 is combined with another prism of glass with <math>\mu = 1.75</math> so as to produce dispersion without deviation. The angle of second prism is</p> <p>(1) <math>7^\circ</math> (2) <math>4.67^\circ</math>  (3) <math>9^\circ</math> (4) <math>5^\circ</math></p>
44.	<p>A simple microscope consists of a concave lens of power <math>-10</math> D and a convex lens of power <math>+20</math> D in contact. If the image formed is at infinity, then the magnifying power (<math>D = 25</math> cm) is</p> <p>(1) 2.5 (2) 3.5  (3) 2.0 (4) 3.0</p>
45.	<p>A symmetric double convex lens is cut in two equal parts along its diameter. If the power of original lens was 4D, the power of divided lens will be</p> <p>(1) 2 D (2) 3 D  (3) 4 D (4) 5 D</p>
46.	<p>If the resolution limit of the eye is 1 minute and at a distance x km from the eye, two persons stand with a lateral separation of 3 meters, then value of x for which the two persons can be resolved by naked eye is</p> <p>(1) 10 km (2) 15 km  (3) 20 km (4) 30 km</p>

Question No.	Questions
47.	If the Young's double slit experiment is performed in water, then (1) the fringe width decreases      (2) the fringe width increases (3) the fringe width does not change      (4) there will be no fringes
48.	If $n$ coherent sources of intensity $I_0$ are super imposed at a point, the intensity of the point is (1) $n I_0$ (2) $n^2 I_0$ (3) $n^3 I_0$ (4) $I_0/n$
49.	In Fresnel's biprism experiment, the distance between biprism and screen is 4 m. The angle of the prism is $2 \times 10^{-3}$ radian and the refractive index of glass of the biprism is 1.5. The fringe width observed on the screen is $15 \times 10^{-4}$ m. The number of fringes on the screen is (1) 3      (2) 2 (3) 6      (4) 8
50.	If $\sigma$ is surface charge density and $\epsilon$ is electric permittivity, the dimensions of $\sigma/\epsilon$ are same as (1) electric force      (2) electric field intensity (3) pressure      (4) charge
51.	The spring constant $k$ of a wire of length $L$ , having an area of cross-section $A$ , Young's modulus $Y$ behaving as a spring is (1) $\frac{YA}{L}$ (2) $\frac{YA}{2L}$ (3) $\frac{2YA}{L}$ (4) $\frac{YL}{A}$

Question No.	Questions
52.	The dimensions of Poisson's ratio are (1) $[M^0 L^0 T^0]$ (2) $[M L^{-1} T^{-2}]$ (3) $[M L^2 T^{-1}]$ (4) $[M L^2 T^{-3}]$
53.	The temperature at which the phase transition occurs depends upon (1) pressure (2) volume (3) density (4) mass
54.	The temperature of $H_2$ at which the rms velocity of its molecules is seven times the rms velocity of the nitrogen molecules at 300 k is (1) 2100 k (2) 1700 k (3) 1350 k (4) 1050 k
55.	How many cylinders of hydrogen at atmospheric pressure are required to fill a balloon of volume $500 \text{ m}^3$ , if the hydrogen is stored in cylinders of $0.05 \text{ m}^3$ at an absolute pressure of $15 \times 10^5 \text{ Pa}$ ? (1) 700 (2) 675 (3) 605 (4) 710
56.	If the temperature of 3 moles of helium gas is increased by 2k, then the change in internal energy of the gas is (1) 70.0 J (2) 68.2 J (3) 74.8 J (4) 78.2 J
57.	One mole of a gas isobarically heated by 40 k receives heat 1.162 kJ. The ratio of specific heats of the gas is (1) 1.7 (2) 1.4 (3) 1.3 (4) 1.5





Question No.	Questions
58.	A carnot engine first operates between $200^{\circ}\text{C}$ and $0^{\circ}\text{C}$ and then between $0^{\circ}\text{C}$ and $200^{\circ}\text{C}$ . The ratio of efficiencies $\left(\frac{\eta_2}{\eta_1}\right)$ in two cases is (1) 1 : 15                                  (2) 1 : 1 (3) 1 : 2                                      (4) 1.73 : 1
59.	The propagation of heat in air takes place by (1) conduction                                  (2) convection (3) radiation                                    (4) all the three before
60.	The ratio of rate of radiation of energy by two spheres of same material having radii $r$ and $4r$ and temperature $2T_0$ and $T_0$ respectively is (1) 1 : 1                                        (2) 1 : 2 (3) 2 : 1                                        (4) 3 : 1
61.	A small element $\ell$ is cut from a circular ring of radius 'a' and $\lambda$ charge per unit length. The net electric field at the centre of the ring will be (1) zero                                         (2) $\frac{\lambda \ell}{4\pi\epsilon_0 a^2}$ (3) $\infty$ (4) $\frac{\lambda}{4\epsilon\pi \ell}$
62.	An electron is projected with a velocity of $10^7$ m/s at an angle $30^{\circ}$ with the horizontal in a region of uniform electric field of $5000$ N/C vertically upwards. The maximum distance covered in vertical direction above initial level will be (1) 14.2 mm                                  (2) 15 mm (3) 12.6 mm                                  (4) 14.2 cm

Question No.	Questions
63.	<p>A surface <math>S = 10 \hat{j}</math> is kept in an electric field <math>E = 2 \hat{i} + 4 \hat{j} + 7 \hat{k}</math>. The electric flux through the surface will be</p> <p>(1) 40 units (2) 50 units (3) 30 units (4) 20 units</p>
64.	<p>Two drops of water each with a charge of <math>3 \times 10^{-9}</math> C having surface potential 500 V form a single drop. The surface potential of the new drop is</p> <p>(1) 794 V (2) 1000 V (3) 250 V (4) 750 V</p>
65.	<p>The electric field intensity at a point at a distance 20 cm on a line making an angle <math>45^\circ</math> with the axis of a dipole of moment 10 C – m is</p> <p>(1) <math>1.77 \times 10^{13}</math> V/m (2) <math>0.177 \times 10^{13}</math> V/m (3) <math>17.7 \times 10^{13}</math> V/m (4) <math>177 \times 10^{13}</math> V/m</p>
66.	<p>Two capacitors A and B having capacitance <math>10 \mu\text{F}</math> and <math>20 \mu\text{F}</math> respectively are connected in series with a 12 V battery. The ratio of charges on A and B is</p> <p>(1) 0.5 : 1 (2) 1 : 1 (3) 2 : 1 (4) 1 : 1.5</p>
67.	<p>The force acting upon a charged particle kept between the plates of a charged capacitor is F. If one of the plates of the capacitor is removed, force acting on the same particle will be</p> <p>(1) 0 (2) <math>\frac{F}{2}</math> (3) F (4) 2F</p>

Question No.	Questions
68.	<p>A <math>5^{\circ}\text{C}</math> rise in temperature is observed in a conductor when current is passed through it. If the current is doubled, the rise in temperature will be approximately</p> <p>(1) <math>20^{\circ}\text{C}</math> (2) <math>16^{\circ}\text{C}</math>  (3) <math>12^{\circ}\text{C}</math> (4) <math>10^{\circ}\text{C}</math></p>
69.	<p>A current <math>0.5\text{ A}</math> flows through a resistance <math>2\ \Omega</math> connected across a cell. The current changes to <math>0.25\text{ A}</math> as resistance is increased to <math>5\ \Omega</math>. The emf of the cell is</p> <p>(1) <math>1\text{ V}</math> (2) <math>1.5\text{ V}</math>  (3) <math>2\text{ V}</math> (4) <math>2.5\text{ V}</math></p>
70.	<p>Two heater coils of same material are connected in parallel across the mains and the length and diameter of one coil is double that of the other. Which one will produce more heat</p> <p>(1) thinner coil (2) thicker coil  (3) both will produce same amount of heat (4) can't predict</p>
71.	<p>The average power per unit area at a distance of <math>2\text{ m}</math> from a small bulb emitting <math>20\text{ W}</math> of EM radiations uniformly in all directions is</p> <p>(1) <math>0.69\text{ W/m}^2</math> (2) <math>0.56\text{ W/m}^2</math>  (3) <math>0.78\text{ W/m}^2</math> (4) <math>0.39\text{ W/m}^2</math></p>
72.	<p>The ratio of wavelengths associated with a proton and an alpha particle accelerated through same potential is</p> <p>(1) <math>2</math> (2) <math>\sqrt{2}</math>  (3) <math>4</math> (4) <math>\frac{1}{2}\sqrt{2}</math></p>

Question No.	Questions
73.	<p>The momentum of a photon with energy equal to rest energy of an electron is</p> <p>(1) zero (2) <math>2.73 \times 10^{-2} \text{ kg ms}^{-1}</math></p> <p>(3) <math>1.99 \times 10^{-24} \text{ kg ms}^{-1}</math> (4) infinite</p>
74.	<p>The graph between frequency of incident light and the stopping potential is</p> <p>(1) parabola (2) straight line</p> <p>(3) hyperbola (4) circle</p>
75.	<p>A ruby laser produces radiations of 662.6 nm pulses of duration <math>10^{-9}</math> sec. If the energy/pulse is 0.39 J, the numbr of photons produced are</p> <p>(1) <math>1.3 \times 10^9</math> (2) <math>1.3 \times 10^{18}</math></p> <p>(3) <math>1.3 \times 10^{27}</math> (4) <math>3.9 \times 10^{18}</math></p>
76.	<p>At its closest approach, the distance between Mars and the Earth is 60 million km. How long will it take to send a radio message from a space probe of Mars to Earth in this situation ?</p> <p>(1) 5 sec (2) 200 sec</p> <p>(3) 0.2 sec (4) 500 sec</p>
77.	<p>How many different wavelengths may be observed in the spectrum from a hydrogen sample if the atoms are excited to third excited state</p> <p>(1) 3 (2) 4</p> <p>(3) 5 (4) 6</p>
78.	<p>For a single ionised helium atom, the longest wavelength in ground state will absorb</p> <p>(1) <math>912 \text{ \AA}</math> (2) <math>304 \text{ \AA}</math></p> <p>(3) <math>606 \text{ \AA}</math> (4) <math>1216 \text{ \AA}</math></p>

Question No.	Questions
79.	<p>z component of an orbital angular momentum is <math>\frac{h}{\pi}</math>, its magnetic quantum number is</p> <p>(1) 1 (2) 2 (3) -1 (4) 0</p>
80.	<p>If the uncertainty in the position of a particle is equal to its de-Broglie wavelength, the minimum uncertainty in the velocity would be</p> <p>(1) <math>\frac{1}{4\pi}</math> (2) <math>\frac{v}{4\pi}</math> (3) <math>\frac{v}{4\pi m}</math> (4) <math>\frac{mv}{4\pi}</math></p>
81.	<p>For a conservative system, generalized force</p> <p>(1) has necessarily the dimensions of force (2) is a dimensionless quantity (3) can not have dimensions of force (4) may have dimensions of torque</p>
82.	<p>Mutual interaction forces between two particles can change</p> <p>(1) the linear momentum but not the kinetic energy (2) the kinetic energy but not the linear momentum (3) the linear momentum as well as kinetic energy (4) neither the linear momentum nor the kinetic energy</p>
83.	<p>If the Lagrangian does not depend on time explicitly</p> <p>(1) the Hamiltonian is constant (2) the Hamiltonian can not be constant (3) the kinetic energy is constant (4) the potential energy is constant</p>

Question No.	Questions
84.	<p>The eccentricity (<math>e</math>) of the orbit of a satellite having maximum and minimum velocities as <math>v_1</math> and <math>v_2</math> is</p> <p>(1) <math>\frac{v_1}{v_2}</math> (2) <math>\frac{v_2}{v_1}</math></p> <p>(3) <math>\frac{v_1 - v_2}{v_1 + v_2}</math> (4) <math>\frac{v_1 + v_2}{v_1 - v_2}</math></p>
85.	<p>For a one dimensional oscillator, the representative point in two dimensional phase space traces</p> <p>(1) an ellipse (2) a parabola</p> <p>(3) a hyperbola (4) always a straight line</p>
86.	<p>For a particle at rest in a rotating frame, the pseudo force acting on it in is</p> <p>(1) zero (2) only centrifugal force</p> <p>(3) only coriolis force (4) both centrifugal and coriolis force</p>
87.	<p>If constraint forces do work and total mechanical energy is not conserved then constraints are named as</p> <p>(1) bilateral constraint (2) unilateral constraint</p> <p>(3) dissipative constraint (4) regenerative constraint</p>
88.	<p>A force <math>\vec{F} = -\vec{\nabla} u</math> is said to be conservative if</p> <p>(1) grade <math>F</math> is zero (2) <math>\text{div } F</math> is zero</p> <p>(3) <math>\text{Curl } F</math> is zero (4) none of three before</p>
89.	<p>Which of the following is not an explicit function of time</p> <p>(1) velocity (2) momentum</p> <p>(3) acceleration (4) potential energy</p>

Question No.	Questions
90.	If external torque on a system is zero, then its angular velocity (1) remains unchanged only if moment of inertia changes (2) changes only if moment of inertia remains unchanged (3) remains unchanged only if moment of inertia remains fixed (4) none of the three before
91.	When only s-wave scattering takes place, then the ratio of total scattering quantum-mechanically to the cross-section classically for the same radius is (1) 2 (2) 4 (3) $\frac{1}{2}$ (4) $\frac{1}{4}$
92.	The Stern-Gerlach experiment proves the existence of (1) electronic charge (2) electronic dipole moment (3) electronic spin (4) electron mass
93.	For the wavefunction $\psi_n = A \sin \frac{n \pi x}{a}$ confined to $0 < x < a$ , the value of normalization constant is (1) $\sqrt{\frac{2}{a}}$ (2) $\sqrt{\frac{a}{2}}$ (3) $\frac{2}{a}$ (4) $\frac{a}{2}$
94.	Entropy of the universe tends to be (1) minimum (2) zero (3) constant (4) increasing always

Question No.	Questions
95.	<p>The internal energy of an isolated system</p> <p>(1) remains constant                      (2) is zero</p> <p>(3) infinite                                      (4) none of the three before</p>
96.	<p>The number of degrees of freedom of a gas is <math>F</math>, then the value of <math>\gamma</math> is</p> <p>(1) <math>1 + \frac{2}{F}</math>                                      (2) <math>\frac{2}{F}</math></p> <p>(3) <math>\frac{F}{2} + 1</math>                                      (4) zero</p>
97.	<p>The work done when a gram-molecule of a gas expands isothermally at <math>27^\circ\text{C}</math> to double its original volume is      [<math>R = 8.3 \text{ J k}^{-1} \text{ mole}^{-1}</math>]</p> <p>(1) 725.8 Joule                                      (2) 1725.8 Joule</p> <p>(3) -725.8 Joule                                      (4) zero</p>
98.	<p>In quantum statistics, the value of occupation index is</p> <p>(1) equal to 1                                      (2) equal to or greater than 1</p> <p>(3) equal to or less than 1                      (4) less than 1</p>
99.	<p>The specific heat of saturated steam is always</p> <p>(1) positive                                      (2) zero</p> <p>(3) negative                                      (4) infinite</p>
100.	<p>The unit of entropy is</p> <p>(1) <math>\text{J k}</math>                                      (2) <math>\text{J k}^{-1}</math></p> <p>(3) <math>\text{J}</math>    (4) <math>\text{N m}^{-2}</math></p>



(Total No. of printed pages : 20)

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10235

(PG-EE-2015)

Sr. No. \_\_\_\_\_

Subject : PHYSICS

Code

C

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. \_\_\_\_\_ (in figure) \_\_\_\_\_ (in words)

Name : \_\_\_\_\_ Father's Name : \_\_\_\_\_

Mother's Name \_\_\_\_\_ Date of Examination \_\_\_\_\_

(Signature of the candidate)

(Signature of the Invigilator)

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1. All questions are compulsory.
2. The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such candidate will not be evaluated.
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Head  
Department of Physics  
M. D. University, Rohtak



Question No.	Questions
1.	<p>A small element <math>\ell</math> is cut from a circular ring of radius 'a' and <math>\lambda</math> charge per unit length. The net electric field at the centre of the ring will be</p> <p>(1) zero (2) <math>\frac{\lambda \ell}{4 \pi \epsilon_0 a^2}</math></p> <p>(3) <math>\infty</math> (4) <math>\frac{\lambda}{4 \pi \epsilon_0 \ell}</math></p>
2.	<p>An electron is projected with a velocity of <math>10^7</math> m/s at an angle <math>30^\circ</math> with the horizontal in a region of uniform electric field of 5000 N/C vertically upwards. The maximum distance covered in vertical direction above initial level will be</p> <p>(1) 14.2 mm (2) 15 mm</p> <p>(3) 12.6 mm (4) 14.2 cm</p>
3.	<p>A surface <math>S = 10 \hat{j}</math> is kept in an electric field <math>E = 2 \hat{i} + 4 \hat{j} + 7 \hat{k}</math>. The electric flux through the surface will be</p> <p>(1) 40 units (2) 50 units</p> <p>(3) 30 units (4) 20 units</p>
4.	<p>Two drops of water each with a charge of <math>3 \times 10^{-9}</math> C having surface potential 500 V form a single drop. The surface potential of the new drop is</p> <p>(1) 794 V (2) 1000 V</p> <p>(3) 250 V (4) 750 V</p>
5.	<p>The electric field intensity at a point at a distance 20 cm on a line making an angle <math>45^\circ</math> with the axis of a dipole of moment 10 C - m is</p> <p>(1) <math>1.77 \times 10^{13}</math> V/m (2) <math>0.177 \times 10^{13}</math> V/m</p> <p>(3) <math>17.7 \times 10^{13}</math> V/m (4) <math>177 \times 10^{13}</math> V/m</p>

Question No.	Questions
6.	<p>Two capacitors A and B having capacitance <math>10 \mu\text{F}</math> and <math>20 \mu\text{F}</math> respectively are connected in series with a <math>12 \text{ V}</math> battery. The ratio of charges on A and B is</p> <p>(1) <math>0.5 : 1</math> (2) <math>1 : 1</math>  (3) <math>2 : 1</math> (4) <math>1 : 1.5</math></p>
7.	<p>The force acting upon a charged particle kept between the plates of a charged capacitor is <math>F</math>. If one of the plates of the capacitor is removed, force acting on the same particle will be</p> <p>(1) <math>0</math> (2) <math>F/2</math>  (3) <math>F</math> (4) <math>2F</math></p>
8.	<p>A <math>5^\circ\text{C}</math> rise in temperature is observed in a conductor when current is passed through it. If the current is doubled, the rise in temperature will be approximately</p> <p>(1) <math>20^\circ\text{C}</math> (2) <math>16^\circ\text{C}</math>  (3) <math>12^\circ\text{C}</math> (4) <math>10^\circ\text{C}</math></p>
9.	<p>A current <math>0.5 \text{ A}</math> flows through a resistance <math>2 \Omega</math> connected across a cell. The current changes to <math>0.25 \text{ A}</math> as resistance is increased to <math>5 \Omega</math>. The emf of the cell is</p> <p>(1) <math>1 \text{ V}</math> (2) <math>1.5 \text{ V}</math>  (3) <math>2 \text{ V}</math> (4) <math>2.5 \text{ V}</math></p>
10.	<p>Two heater coils of same material are connected in parallel across the mains and the length and diameter of one coil is double that of the other. Which one will produce more heat</p> <p>(1) thinner coil (2) thicker coil  (3) both will produce same amount of heat (4) can't predict</p>

Question No.	Questions
11.	<p>The spring constant <math>k</math> of a wire of length <math>L</math>, having an area of cross-section <math>A</math>, Young's modulus <math>Y</math> behaving as a spring is</p> <p>(1) <math>\frac{YA}{L}</math> (2) <math>\frac{YA}{2L}</math></p> <p>(3) <math>\frac{2YA}{L}</math> (4) <math>\frac{YL}{A}</math></p>
12.	<p>The dimensions of Poisson's ratio are</p> <p>(1) <math>[M^0 L^0 T^0]</math> (2) <math>[M L^{-1} T^{-2}]</math></p> <p>(3) <math>[M L^2 T^{-1}]</math> (4) <math>[M L^2 T^{-3}]</math></p>
13.	<p>The temperature at which the phase transition occurs depends upon</p> <p>(1) pressure (2) volume</p> <p>(3) density (4) mass</p>
14.	<p>The temperature of <math>H_2</math> at which the rms velocity of its molecules is seven times the rms velocity of the nitrogen molecules at 300 k is</p> <p>(1) 2100 k (2) 1700 k</p> <p>(3) 1350 k (4) 1050 k</p>
15.	<p>How many cylinders of hydrogen at atmospheric pressure are required to fill a balloon of volume <math>500 \text{ m}^3</math>, if the hydrogen is stored in cylinders of <math>0.05 \text{ m}^3</math> at an absolute pressure of <math>15 \times 10^5 \text{ Pa}</math> ?</p> <p>(1) 700 (2) 675</p> <p>(3) 605 (4) 710</p>
16.	<p>If the temperature of 3 moles of helium gas is increased by <math>2\text{k}</math>, then the change in internal energy of the gas is</p> <p>(1) 70.0 J (2) 68.2 J</p> <p>(3) 74.8 J (4) 78.2 J</p>

Question No.	Questions
17.	One mole of a gas isobarically heated by 40 k receives heat 1.162 kJ. The ratio of specific heats of the gas is (1) 1.7 (2) 1.4 (3) 1.3 (4) 1.5
18.	A carnot engine first operates between 200°C and 0°C and then between 0°C and 200°C. The ratio of efficiencies $\left(\frac{\eta_2}{\eta_1}\right)$ in two cases is (1) 1 : 15 (2) 1 : 1 (3) 1 : 2 (4) 1.73 : 1
19.	The propagation of heat in air takes place by (1) conduction (2) convection (3) radiation (4) all the three before
20.	The ratio of rate of radiation of energy by two spheres of same material having radii r and 4r and temperature $2T_0$ and $T_0$ respectively is (1) 1 : 1 (2) 1 : 2 (3) 2 : 1 (4) 3 : 1
21.	For a conservative system, generalized force (1) has necessarily the dimensions of force (2) is a dimensionless quantity (3) can not have dimensions of force (4) may have dimensions of torque

Question No.	Questions
22.	Mutual interaction forces between two particles can change (1) the linear momentum but not the kinetic energy (2) the kinetic energy but not the linear momentum (3) the linear momentum as well as kinetic energy (4) neither the linear momentum nor the kinetic energy
23.	If the Lagrangian does not depend on time explicitly (1) the Hamiltonian is constant (2) the Hamiltonian can not be constant (3) the kinetic energy is constant (4) the potential energy is constant
24.	The eccentricity ( $e$ ) of the orbit of a satellite having maximum and minimum velocities as $v_1$ and $v_2$ is (1) $\frac{v_1}{v_2}$ (2) $\frac{v_2}{v_1}$ (3) $\frac{v_1 - v_2}{v_1 + v_2}$ (4) $\frac{v_1 + v_2}{v_1 - v_2}$
25.	For a one dimensional oscillator, the representative point in two dimensional phase space traces (1) an ellipse (2) a parabola (3) a hyperbola (4) always a straight line
26.	For a particle at rest in a rotating frame, the pseudo force acting on it is (1) zero (2) only centrifugal force (3) only coriolis force (4) both centrifugal and coriolis force

Question No.	Questions
27.	If constraint forces do work and total mechanical energy is not conserved then constraints are named as (1) bilateral constraint                      (2) unilateral constraint (3) dissipative constraint                    (4) regenerative constraint
28.	A force $\vec{F} = -\vec{\nabla} u$ is said to be conservative if (1) grade F is zero                              (2) div F is zero (3) Curl F is zero                                (4) none of three before
29.	Which of the following is not an explicit function of time (1) velocity                                        (2) momentum (3) acceleration                                 (4) potential energy
30.	If external torque on a system is zero, then its angular velocity (1) remains unchanged only if moment of inertia changes (2) changes only if moment of inertia remains unchanged (3) remains unchanged only if moment of inertia remains fixed (4) none of the three before
31.	As the interatomic distance in a solid increases, the width of an allowed energy band (1) increases                                      (2) decreases (3) is unchanged                                (4) first increases then decreases
32.	The atomic packing factor for a bcc metal structure is (1) 0.68    (2) 0.74 (3) 0.50    (4) 1.00

Question No.	Questions
33.	Which of following reveal crystallographic structure of a solid ? (1) $\alpha$ -rays (2) $\beta$ rays (3) $\gamma$ rays (4) X rays
34.	The 1 <sup>st</sup> brillouin zone of simple cubic lattice is (1) rhombic decahedron (2) truncated octahedron (3) parallelopiped (4) cube
35.	Bipolar logic families employ (1) junction field effect transistor (2) p-n junctions (3) n-p-n transistors (4) MOSFETs
36.	A Schottky transistor when used as a switch switches between (1) cut-off and saturation regions (2) cut-off and active regions (3) active and saturation regions (4) different operating points in active region
37.	The most commonly used configuration of a transistor as a switch is (1) CB (2) CC (3) CE (4) CB or CC
38.	Which of the following diodes is used for fastest switching (1) p-n junction (2) Schottky (3) Vacuum (4) Zener



Question No.	Questions
39.	<p>The time required to go from ON to OFF in a p-n junction diode is equal to</p> <p>(1) zero (2) switching time (3) transition time (4) storage time</p>
40.	<p>In case of a MOSFET, the gate current</p> <p>(1) is negligibly small (2) increases with increase in drain voltage (3) decreases with decrease in drain voltage (4) is dependent on drain current</p>
41.	<p>The average power per unit area at a distance of 2 m from a small bulb emitting 20 W of EM radiations uniformly in all directions is</p> <p>(1) 0.69 W/m<sup>2</sup> (2) 0.56 W/m<sup>2</sup> (3) 0.78 W/m<sup>2</sup> (4) 0.39 W/m<sup>2</sup></p>
42.	<p>The ratio of wavelengths associated with a proton and an alpha particle accelerated through same potential is</p> <p>(1) 2 (2) <math>\sqrt{2}</math> (3) 4 (4) <math>\frac{1}{2\sqrt{2}}</math></p>
43.	<p>The momentum of a photon with energy equal to rest energy of an electron is</p> <p>(1) zero (2) <math>2.73 \times 10^{-24} \text{ kg ms}^{-1}</math> (3) <math>1.99 \times 10^{-24} \text{ kg ms}^{-1}</math> (4) infinite</p>

PG-EE-2015 (Physics)-Code-C

Department of Physics  
M.D. University, Rohtak

(8)

Head  
Department of Physics  
M.D. University, Rohtak

Question No.	Questions
44.	<p>The graph between frequency of incident light and the stopping potential is</p> <p>(1) parabola (2) straight line</p> <p>(3) hyperbola (4) circle</p>
45.	<p>A ruby laser produces radiations of 662.6 nm pulses of duration <math>10^{-9}</math> sec. If the energy/pulse is 0.39 J, the numbr of photons produced are</p> <p>(1) <math>1.3 \times 10^9</math> (2) <math>1.3 \times 10^{18}</math></p> <p>(3) <math>1.3 \times 10^{27}</math> (4) <math>3.9 \times 10^{18}</math></p>
46.	<p>At its closest approach, the distance between Mars and the Earth is 60 million km. How long will it take to send a radio message from a space probe of Mars to Earth in this situation ?</p> <p>(1) 5 sec (2) 200 sec</p> <p>(3) 0.2 sec (4) 500 sec</p>
47.	<p>How many different wavelengths may be observed in the spectrum from a hydrogen sample if the atoms are excited to third excited state</p> <p>(1) 3 (2) 4</p> <p>(3) 5 (4) 6</p>
48.	<p>For a single ionised helium atom, the longest wavelength in ground state will absorb</p> <p>(1) <math>912 \text{ \AA}</math> (2) <math>304 \text{ \AA}</math></p> <p>(3) <math>606 \text{ \AA}</math> (4) <math>1216 \text{ \AA}</math></p>

Question No.	Questions	Question No.
49.	<p>z component of an orbital angular momentum is <math>\frac{h}{\pi}</math>, its magnetic quantum number is</p> <p>(1) 1 (2) 2 (3) -1 (4) 0</p>	
50.	<p>If the uncertainty in the position of a particle is equal to its de-Broglie wavelength, the minimum uncertainty in the velocity would be</p> <p>(1) <math>\frac{1}{4\pi}</math> (2) <math>\frac{v}{4\pi}</math> (3) <math>\frac{v}{4\pi m}</math> (4) <math>\frac{mv}{4\pi}</math></p>	
51.	<p>The shortest height of a vertical mirror required to see the entire image of a man, will be</p> <p>(1) <math>\frac{1}{3}</math> of man's height (2) <math>\frac{1}{2}</math> of man's height (3) <math>\frac{2}{3}</math> of man's height (4) equal to man's height</p>	
52.	<p>If 'C' is the velocity of light in vacuum, then the time taken by the light to travel through a glass plate of thickness 't' and refractive index '<math>\mu</math>' is</p> <p>(1) <math>\frac{t}{\mu C}</math> (2) <math>t\mu C</math> (3) <math>\frac{\mu t}{C}</math> (4) <math>\frac{tC}{\mu}</math></p>	

Question No.	Questions
53.	<p>A thin prism of angle <math>6^\circ</math> made of glass of refractive index 1.5 is combined with another prism of glass with <math>\mu = 1.75</math> so as to produce dispersion without deviation. The angle of second prism is</p> <p>(1) <math>7^\circ</math> (2) <math>4.67^\circ</math>  (3) <math>9^\circ</math> (4) <math>5^\circ</math></p>
54.	<p>A simple microscope consists of a concave lens of power <math>-10</math> D and a convex lens of power <math>+20</math> D in contact. If the image formed is at infinity, then the magnifying power (<math>D = 25</math> cm) is</p> <p>(1) 2.5 (2) 3.5  (3) 2.0 (4) 3.0</p>
55.	<p>A symmetric double convex lens is cut in two equal parts along its diameter. If the power of original lens was 4D, the power of divided lens will be</p> <p>(1) 2 D (2) 3 D  (3) 4 D (4) 5 D</p>
56.	<p>If the resolution limit of the eye is 1 minute and at a distance <math>x</math> km from the eye, two persons stand with a lateral separation of 3 meters, then value of <math>x</math> for which the two persons can be resolved by naked eye is</p> <p>(1) 10 km (2) 15 km  (3) 20 km (4) 30 km</p>
57.	<p>If the Young's double slite experiment is performed in water, then</p> <p>(1) the fringe width decreases (2) the fringe width increases  (3) the fringe width does not change (4) there will be no fringes</p>
58.	<p>If <math>n</math> coherent sources of intensity <math>I_0</math> are super imposed at a point, the intensity of the point is</p> <p>(1) <math>n I_0</math> (2) <math>n^2 I_0</math>  (3) <math>n^3 I_0</math> (4) <math>I_0/n</math></p>

Question No.	Questions
59.	<p>In Fresnel's biprism experiment, the distance between biprism and screen is 4 m. The angle of the prism is <math>2 \times 10^{-3}</math> radian and the refractive index of glass of the biprism is 1.5. The fringe width observed on the screen is <math>15 \times 10^{-4}</math> m. The number of fringes on the screen is</p> <p>(1) 3 (2) 2 (3) 6 (4) 8</p>
60.	<p>If <math>\sigma</math> is surface charge density and <math>\epsilon</math> is electric permittivity, the dimensions of <math>\frac{\sigma}{\epsilon}</math> are same as</p> <p>(1) electric force (2) electric field intensity (3) pressure (4) charge</p>
61.	<p>If the binding energy/nucleon in <math>\text{Li}^7</math> and <math>\text{He}^4</math> nuclei are 5.60 MeV and 7.06 MeV respectively, the energy of the reaction <math>\text{Li}^7 + \text{p} \rightarrow 2\text{He}^4</math> will be</p> <p>(1) 19.6 MeV (2) 2.4 MeV (3) 8.4 MeV (4) 17.28 MeV</p>
62.	<p>The count rate of a radioactive nuclei falls from 992 counts/minute to 62 counts/minute in 10 hour. The half-life of the element is</p> <p>(1) 1 hour (2) 2.5 hours (3) 5 hours (4) 6 hours</p>
63.	<p>The nucleus <math>^{242}\text{Pu}_{94}</math> decays to <math>^{206}\text{Pb}_{82}</math> by emitting</p> <p>(1) 9 <math>\alpha</math> and 12 <math>\beta</math> particles (2) 6 <math>\alpha</math> and 9 <math>\beta</math> particles (3) 9 <math>\alpha</math> and 6 <math>\beta</math> particles (4) 6 <math>\alpha</math> and 12 <math>\beta</math> particles</p>

Question No.	Questions
64.	On an atomic scale, which of the following polarisation is important ? (1) electronic only                      (2) ionic only (3) orientational only                    (4) both ionic and orientational
65.	At a frequency less than the plasma frequency, the collision losses cause (1) total internal reflection (2) wave attenuation (3) partial reflection (4) both attenuation and partial reflection
66.	The minimum energy possessed by a particle confined to a one dimensional box of length L is (1) 0    (2) $\frac{h^2}{(8\pi^2 mL^2)}$ (3) $\frac{\hbar^2}{(8\pi^2 mL^2)}$ (4) $\frac{mv^2}{2L}$
67.	The width of the spectral line resulting when an atom in an excited state of life time $10^{-8}$ sec. returns to the ground state is (1) $0.33 \text{ m}^{-1}$ (2) $0.33 \text{ cm}^{-1}$ (3) $33 \text{ m}^{-1}$ (4) $33 \text{ cm}^{-1}$
68.	The expected value of P for the wave function $\psi(x) = \sqrt{\frac{2}{L}} \sin \frac{\pi x}{L}$ ; $0 < x < L$ is (1) 0    (2) $\frac{1}{2}$ (3) 1    (4) infinity <div style="text-align: right; margin-top: 10px;"><i>Awan</i></div>

Question No.	Questions
69.	The particles described by anti symmetric wavefunctions obey (1) Maxwell Boltzmann Statistics      (2) Bose-Einstein Statistics (3) Fermi-Dirac Statistics              (4) All the three before
70.	Born approximation can be used (1) only within very low energy limits (2) only within high energy limits (3) in both very low as well as high energy limits (4) none of the three before
71.	When only s-wave scattering takes place, then the ratio of total scattering quantum-mechanically to the cross-section classically for the same radius is (1) 2    (2) 4 (3) $\frac{1}{2}$ (4) $\frac{1}{4}$
72.	The Stern-Gerlach experiment proves the existance of (1) electronic charge                      (2) electronic depole moment (3) electronic spin                        (4) electron mass
73.	For the wavefunction $\psi_n = A \sin \frac{n \pi x}{a}$ confined to $0 < x < a$ , the value of normalization constant is (1) $\sqrt{\frac{2}{a}}$ (2) $\sqrt{\frac{a}{2}}$ (3) $\frac{2}{a}$ (4) $\frac{a}{2}$

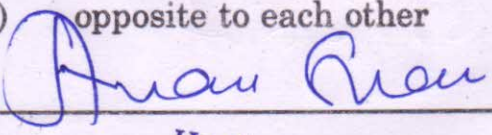
Question No.	Questions
74.	Entropy of the universe tends to be (1) minimum (2) zero (3) constant (4) increasing always
75.	The internal energy of an isolated system (1) remains constant (2) is zero (3) infinite (4) none of the three before
76.	The number of degrees of freedom of a gas is $F$ , then the value of $\gamma$ is (1) $1 + \frac{2}{F}$ (2) $\frac{2}{F}$ (3) $\frac{F}{2} + 1$ (4) zero
77.	The work done when a gram-molecule of a gas expands isothermally at $27^\circ\text{C}$ to double its original volume is $[R = 8.3 \text{ J k}^{-1} \text{ mole}^{-1}]$ (1) 725.8 Joule (2) 1725.8 Joule (3) -725.8 Joule (4) zero
78.	In quantum statistics, the value of occupation index is (1) equal to 1 (2) equal to or greater than 1 (3) equal to or less than 1 (4) less than 1
79.	The specific heat of saturated steam is always (1) positive (2) zero (3) negative (4) infinite





Question No.	Questions
85.	<p>Centre of mass of a semicircular plate of radius <math>R</math>, the density of which linearly varies with distance being <math>d</math> at the centre to <math>2d</math> at the circumference is</p> <p>(1) <math>\frac{3R}{\pi}</math> from the centre      (2) <math>\frac{4R}{3\pi}</math> from the centre  (3) <math>\frac{5R}{\pi}</math> from the centre      (4) <math>\frac{7R}{5\pi}</math> from the centre</p>
86.	<p>A uniform rod is placed vertically on a smooth surface and then released. Then</p> <p>(1) the centre of rod follows a straight line path  (2) the centre of mass follows circular path  (3) the instantaneous axis is passing through the point of contact  (4) all the three before</p>
87.	<p>In case of a radioactive decay, if the parent nucleus is initially at rest, then after decay, the centre of mass will</p> <p>(1) move on a straight line      (2) move in a circle  (3) remain at rest      (4) follow a parabolic path</p>
88.	<p>Two pendulums of length <math>\ell_1</math> and <math>\ell_2</math> start vibrating. If at some instant, the two are in mean position in the same phase, then after how many vibrations of the shorter pendulum, the two will be in phase in the mean position [<math>\ell_1 &gt; \ell_2</math>; <math>\ell_1 = 121</math> cm. <math>\ell_2 = 100</math> cm.]</p> <p>(1) 11      (2) 10  (3) 9      (4) 8</p>
89.	<p>A solid copper sphere suspended from a massless spring has a time period of 4 second. The sphere is completely immersed in a liquid having density 0.125 times that of the brass. If the sphere remains in the liquid during oscillations, the time period will be</p> <p>(1) 4 second      (2) 2 second  (3) 3 second      (4) 4.75 second</p>

Question No.	Questions
90.	<p>A particle moves along y axis represented as <math>y = 3 + 4 \cos \omega t</math>. The motion of the particle is</p> <p>(1) not S.H.M (2) Oscillatory but not S.H.M (3) S.H.M (4) rotatory</p>
91.	<p>If a charged particle moving in a uniform magnetic field loses 4% of its kinetic energy, radius of curvature of its path changes by</p> <p>(1) 2% (2) 4% (3) 10% (4) 7.5%</p>
92.	<p>A length <math>\ell</math> of a wire is bent to form a circular coil of some turns. A current <math>I</math> is passed through it and it is placed in a magnetic field <math>B</math>. The maximum torque acting on the coil is</p> <p>(1) <math>1 B \ell^2</math> (2) <math>4 \pi I B \ell^2</math> (3) <math>I \ell^2 B / 4\pi</math> (4) zero</p>
93.	<p>An atom is paramagnetic if it has</p> <p>(1) an electric dipole moment (2) no magnetic moment (3) a magnetic moment (4) no electric dipole moment</p>
94.	<p>The couple acting on a magnet of length 10 cm and pole strength 15 Am kept in a field <math>B = 2 \times 10^{-5} \text{ T}</math> at an angle of <math>30^\circ</math> is</p> <p>(1) <math>1.5 \times 10^{-5} \text{ Nm}</math> (2) <math>1.5 \times 10^{-3} \text{ Nm}</math> (3) <math>1.5 \times 10^{-2} \text{ Nm}</math> (4) <math>1.5 \times 10^{-6} \text{ Nm}</math></p>
95.	<p>A fan blade of length <math>\frac{1}{\sqrt{\pi}}</math> meter rotates with a frequency 5 cycles/sec perpendicular to a magnetic field 10 tesla. The potential difference between the centre and end of the blade is</p> <p>(1) <math>-50 \text{ V}</math> (2) <math>+50 \text{ V}</math> (3) <math>-2.0 \text{ V}</math> (4) <math>+0.02 \text{ V}</math></p>

Question No.	Questions
96.	<p>The self inductance of an air core solenoid of 80 cm length and 500 turns each of circular cross-section with 2 cm diameter is</p> <p>(1) 150.6 <math>\mu\text{H}</math> (2) 162.2 <math>\mu\text{H}</math>  (3) 123.3 <math>\mu\text{H}</math> (4) 102.5 <math>\mu\text{H}</math></p>
97.	<p>An a.c. source <math>V = 100 \sin 100 \pi t</math> is connected to a resistor of <math>20 \Omega</math>. The rms value of current through the resistor is</p> <p>(1) 10 A (2) <math>\frac{10}{\sqrt{2}}</math> A  (3) <math>\frac{5}{\sqrt{2}}</math> A (4) <math>\frac{7}{\sqrt{2}}</math> A</p>
98.	<p>A voltage signal is represented as <math>V = 220 \sqrt{2} \cos (50\pi) t</math>. How many times will the current be zero in one second</p> <p>(1) 50 (2) 100  (3) 33 (4) 67</p>
99.	<p>The reactance of a capacitor (10 pF) connected across a d.c. source is</p> <p>(1) zero (2) infinity  (3) <math>10^4 \Omega</math> (4) <math>10^7 \Omega</math></p>
100.	<p>The electric field 'E' and the magnetic field 'B' in an electromagnetic wave are</p> <p>(1) parallel to each other (2) inclined at an angle of <math>45^\circ</math>  (3) perpendicular to each other (4) opposite to each other</p> <p></p>

(Total No. of printed pages : 20)

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10328 (PG-EE-2015)

Sr. No. \_\_\_\_\_

Subject : PHYSICS

Code

**D**

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. \_\_\_\_\_ (in figure) \_\_\_\_\_ (in words)

Name : \_\_\_\_\_ Father's Name : \_\_\_\_\_

Mother's Name \_\_\_\_\_ Date of Examination \_\_\_\_\_

(Signature of the candidate)

(Signature of the Invigilator)

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5. **There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
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Head  
Department of Physics  
M.D. University, Rehtak



Question No.	Questions
1.	<p>If the binding energy/nucleon in <math>\text{Li}^7</math> and <math>\text{He}^4</math> nuclei are 5.60 MeV and 7.06 MeV respectively, the energy of the reaction</p> $\text{Li}^7 + \text{p} \rightarrow 2\text{He}^4$ will be <p>(1) 19.6 MeV                      (2) 2.4 MeV            (3) 8.4 MeV                      (4) 17.28 MeV</p>
2.	<p>The count rate of a radioactive nuclei falls from 992 counts/minute to 62 counts/minute in 10 hour. The half-life of the element is</p> <p>(1) 1 hour                              (2) 2.5 hours            (3) 5 hours                             (4) 6 hours</p>
3.	<p>The nucleus <math>^{242}\text{Pu}_{94}</math> decays to <math>^{206}\text{Pb}_{82}</math> by emitting</p> <p>(1) 9 <math>\alpha</math> and 12 <math>\beta</math> particles              (2) 6 <math>\alpha</math> and 9 <math>\beta</math> particles            (3) 9 <math>\alpha</math> and 6 <math>\beta</math> particles              (4) 6 <math>\alpha</math> and 12 <math>\beta</math> particles</p>
4.	<p>On an atomic scale, which of the following polarisation is important ?</p> <p>(1) electronic only                      (2) ionic only            (3) orientational only                  (4) both ionic and orientational</p>
5.	<p>At a frequency less than the plasma frequency, the collision losses cause</p> <p>(1) total internal reflection            (2) wave attenuation            (3) partial reflection            (4) both attenuation and partial reflection</p>

Question No.	Questions
6.	<p>The minimum energy possessed by a particle confined to a one dimensional box of length L is</p> <p>(1) 0 (2) <math>\frac{h^2}{(8\pi^2 m L^2)}</math></p> <p>(3) <math>\frac{\hbar^2}{(8\pi^2 m L^2)}</math> (4) <math>\frac{mv^2}{2L}</math></p>
7.	<p>The width of the spectral line resulting when an atom in an excited state of life time <math>10^{-8}</math> sec. returns to the ground state is</p> <p>(1) <math>0.33 \text{ m}^{-1}</math> (2) <math>0.33 \text{ cm}^{-1}</math></p> <p>(3) <math>33 \text{ m}^{-1}</math> (4) <math>33 \text{ cm}^{-1}</math></p>
8.	<p>The expected value of P for the wave function <math>\psi(x) = \sqrt{\frac{2}{L}} \sin \frac{\pi x}{L}</math>; <math>0 &lt; x &lt; L</math> is</p> <p>(1) 0 (2) <math>\frac{1}{2}</math></p> <p>(3) 1 (4) infinity</p>
9.	<p>The particles described by anti symmetric wavefunctions obey</p> <p>(1) Maxwell Boltzmann Statistics (2) Bose-Einstein Statistics</p> <p>(3) Fermi-Dirac Statistics (4) All the three before</p>
10.	<p>Born approximation can be used</p> <p>(1) only within very low energy limits</p> <p>(2) only within high energy limits</p> <p>(3) in both very low as well as high energy limits</p> <p>(4) none of the three before</p>

Question No.	Questions
11.	<p>If a charged particle moving in a uniform magnetic field loses 4% of its kinetic energy, radius of curvature of its path changes by</p> <p>(1) 2% (2) 4% (3) 10% (4) 7.5%</p>
12.	<p>A length <math>\ell</math> of a wire is bent to form a circular coil of some turns. A current <math>I</math> is passed through it and it is placed in a magnetic field <math>B</math>. The maximum torque acting on the coil is</p> <p>(1) <math>1 B \ell^2</math> (2) <math>4 \pi I B \ell^2</math> (3) <math>I \ell^2 B / 4\pi</math> (4) zero</p>
13.	<p>An atom is paramagnetic if it has</p> <p>(1) an electric dipole moment (2) no magnetic moment (3) a magnetic moment (4) no electric dipole moment</p>
14.	<p>The couple acting on a magnet of length 10 cm and pole strength 15 Am kept in a field <math>B = 2 \times 10^{-5}</math> T at an angle of <math>30^\circ</math> is</p> <p>(1) <math>1.5 \times 10^{-5}</math> Nm (2) <math>1.5 \times 10^{-3}</math> Nm (3) <math>1.5 \times 10^{-2}</math> Nm (4) <math>1.5 \times 10^{-6}</math> Nm</p>
15.	<p>A fan blade of length <math>\frac{1}{\sqrt{\pi}}</math> meter rotates with a frequency 5 cycles/sec perpendicular to a magnetic field 10 tesla. The potential difference between the centre and end of the blade is</p> <p>(1) <math>-50</math> V (2) <math>+50</math> V (3) <math>-2.0</math> V (4) <math>+0.02</math> V</p>
16.	<p>The self inductance of an air core solenoid of 80 cm length and 500 turns each of circular cross-section with 2 cm diameter is</p> <p>(1) <math>150.6 \mu\text{H}</math> (2) <math>162.2 \mu\text{H}</math> (3) <math>123.3 \mu\text{H}</math> (4) <math>102.5 \mu\text{H}</math></p>



Question No.	Questions
17.	An a.c. source $V = 100 \sin 100 \pi t$ is connected to a resistor of $20 \Omega$ . The rms value of current through the resistor is (1) 10 A (2) $\frac{10}{\sqrt{2}}$ A (3) $\frac{5}{\sqrt{2}}$ A (4) $\frac{7}{\sqrt{2}}$ A
18.	A voltage signal is represented as $V = 220 \sqrt{2} \cos(50\pi) t$ . How many times will the current be zero in one second (1) 50 (2) 100 (3) 33 (4) 67
19.	The reactance of a capacitor (10 pF) connected across a d.c. source is (1) zero (2) infinity (3) $10^4 \Omega$ (4) $10^7 \Omega$
20.	The electric field 'E' and the magnetic field 'B' in an electromagnetic wave are (1) parallel to each other (2) inclined at an angle of $45^\circ$ (3) perpendicular to each other (4) opposite to each other
21.	The shortest height of a vertical mirror required to see the entire image of a man, will be (1) $\frac{1}{3}$ of man's height (2) $\frac{1}{2}$ of man's height (3) $\frac{2}{3}$ of man's height (4) equal to man's height

Question No.	Questions
22.	<p>If 'C' is the velocity of light in vacuum, then the time taken by the light to travel through a glass plate of thickness 't' and refractive index 'μ' is</p> <p>(1) <math>\frac{t}{\mu C}</math> (2) <math>t\mu C</math></p> <p>(3) <math>\frac{\mu t}{C}</math> (4) <math>\frac{tC}{\mu}</math></p>
23.	<p>A thin prism of angle <math>6^\circ</math> made of glass of refractive index 1.5 is combined with another prism of glass with <math>\mu = 1.75</math> so as to produce dispersion without deviation. The angle of second prism is</p> <p>(1) <math>7^\circ</math> (2) <math>4.67^\circ</math></p> <p>(3) <math>9^\circ</math> (4) <math>5^\circ</math></p>
24.	<p>A simple microscope consists of a concave lens of power <math>-10</math> D and a convex lens of power <math>+20</math> D in contact. If the image formed is at infinity, then the magnifying power (<math>D = 25</math> cm) is</p> <p>(1) 2.5 (2) 3.5</p> <p>(3) 2.0 (4) 3.0</p>
25.	<p>A symmetric double convex lens is cut in two equal parts along its diameter. If the power of original lens was 4D, the power of divided lens will be</p> <p>(1) 2 D (2) 3 D</p> <p>(3) 4 D (4) 5 D</p>
26.	<p>If the resolution limit of the eye is 1 minute and at a distance x km from the eye, two persons stand with a lateral separation of 3 meters, then value of x for which the two persons can be resolved by naked eye is</p> <p>(1) 10 km (2) 15 km</p> <p>(3) 20 km (4) 30 km</p>

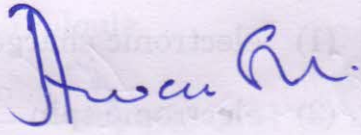
Question No.	Questions
27.	<p>If the Young's double slite experiment is performed in water, then</p> <p>(1) the fringe width decreases      (2) the fringe width increases</p> <p>(3) the fringe width does not change      (4) there will be no fringes</p>
28.	<p>If <math>n</math> coherent sources of intensity <math>I_0</math> are super imposed at a point, the intensity of the point is</p> <p>(1) <math>n I_0</math>      (2) <math>n^2 I_0</math></p> <p>(3) <math>n^3 I_0</math>      (4) <math>I_0/n</math></p>
29.	<p>In Fresel's biprism experiment, the distance between biprism and screen is 4 m. The angle of the prism is <math>2 \times 10^{-3}</math> radian and the refractive index of glass of the biprism is 1.5. The fringe width observed on the screen is <math>15 \times 10^{-4}</math> m. The number of fringes on the screen is</p> <p>(1) 3      (2) 2</p> <p>(3) 6      (4) 8</p>
30.	<p>If <math>\sigma</math> is surface charge density and <math>\epsilon</math> is electric permittivity, the dimensions of <math>\sigma/\epsilon</math> are same as</p> <p>(1) electric force      (2) electric field intensity</p> <p>(3) pressure      (4) charge</p>
31.	<p>A pair is constrained to move along the inner surface of a hemisphere, then the number of degrees of freedom of the particle is</p> <p>(1) one      (2) two</p> <p>(3) four      (4) three</p>

Question No.	Questions
32.	For a conservative system, the potential energy is (1) coordinate and velocity dependent (2) coordinate dependent and velocity independent (3) coordinate independent and velocity dependent (4) coordinate and velocity independent
33.	The distance time graph of a particle at time $t$ makes an angle $45^\circ$ with respect to time axis. After one second, it makes angle $60^\circ$ w.r.t. to time axis, what is the acceleration of the particle (1) $\sqrt{3} - 1$ unit (2) $\sqrt{3} + 1$ unit (3) $\sqrt{3}$ unit (4) 1 unit
34.	A ball kept in a box (closed), moves in the box colliding with the walls. If the box is kept on a smooth surface, the centre of mass of the (1) box remains constant (2) box and the ball system remains constant (3) ball remains constant (4) ball relative to the box remains constant
35.	Centre of mass of a semicircular plate of radius $R$ , the density of which linearly varies with distance being $d$ at the centre to $2d$ at the circumference is (1) $\frac{3R}{\pi}$ from the centre (2) $\frac{4R}{3\pi}$ from the centre (3) $\frac{5R}{\pi}$ from the centre (4) $\frac{7R}{5\pi}$ from the centre
36.	A uniform rod is placed vertically on a smooth surface and then released. Then (1) the centre of rod follows a straight line path (2) the centre of mass follows circular path (3) the instantaneous axis is passing through the point of contact (4) all the three before

Question No.	Questions
37.	<p>In case of a radioactive decay, if the parent nucleus is initially at rest, then after decay, the centre of mass will</p> <p>(1) move on a straight line      (2) move in a circle (3) remain at rest                      (4) follow a parabolic path</p>
38.	<p>Two pendulums of length <math>\ell_1</math> and <math>\ell_2</math> start vibrating. If at some instant, the two are in mean position in the same phase, then after how many vibrations of the shorter pendulum, the two will be in phase in the mean position [<math>\ell_1 &gt; \ell_2</math>; <math>\ell_1 = 121</math> cm. <math>\ell_2 = 100</math> cm.]</p> <p>(1) 11                                      (2) 10 (3) 9                                        (4) 8</p>
39.	<p>A solid copper sphere suspended from a massless spring has a time period of 4 second. The sphere is completely immersed in a liquid having density 0.125 times that of the brass. If the sphere remains in the liquid during oscillations, the time period will be</p> <p>(1) 4 second                              (2) 2 second (3) 3 second                              (4) 4.75 second</p>
40.	<p>A particle moves along y axis represented as <math>y = 3 + 4 \cos \omega t</math>. The motion of the particle is</p> <p>(1) not S.H.M                              (2) Oscillatory but not S.H.M (3) S.H.M                                    (4) rotatory</p>
41.	<p>As the interatomic distance in a solid increases, the width of an allowed energy band</p> <p>(1) increases                              (2) decreases (3) is unchanged                        (4) first increases then decreases</p>

Question No.	Questions
42.	The atomic packing factor for a bcc metal structure is (1) 0.68                      (2) 0.74 (3) 0.50                      (4) 1.00
43.	Which of following reveal crystallographic structure of a solid ? (1) $\alpha$ -rays                      (2) $\beta$ rays (3) $\gamma$ rays                      (4) X rays
44.	The 1 <sup>st</sup> brillouin zone of simple cubic lattice is (1) rhombic decahedron                      (2) truncated octahedron (3) parallelepiped                      (4) cube
45.	Bipolar logic families employ (1) junction field effect transistor                      (2) p-n junctions (3) n-p-n transistors                      (4) MOSFETs
46.	A Schottky transistor when used as a switch switches between (1) cut-off and saturation regions (2) cut-off and active regions (3) active and saturation regions (4) different operating points in active region
47.	The most commonly used configuration of a transistor as a switch is (1) CB                      (2) CC (3) CE                      (4) CB or CC

Question No.	Questions
48.	Which of the following diodes is used for fastest switching (1) p-n junction (2) Schottky (3) Vacuum (4) Zener
49.	The time required to go from ON to OFF in a p-n junction diode is equal to (1) zero (2) switching time (3) transition time (4) storage time
50.	In case of a MOSFET, the gate current (1) is negligibly small (2) increases with increase in drain voltage (3) decreases with decrease in drain voltage (4) is dependent on drain current
51.	The average power per unit area at a distance of 2 m from a small bulb emitting 20 W of EM radiations uniformly in all directions is (1) $0.69 \text{ W/m}^2$ (2) $0.56 \text{ W/m}^2$ (3) $0.78 \text{ W/m}^2$ (4) $0.39 \text{ W/m}^2$
52.	The ratio of wavelengths associated with a proton and an alpha particle accelerated through same potential is (1) 2 (2) $\sqrt{2}$ (3) 4 (4) $\frac{1}{2\sqrt{2}}$

Question No.	Questions
53.	<p>The momentum of a photon with energy equal to rest energy of an electron is</p> <p>(1) zero (2) <math>2.73 \times 10^{-2} \text{ kg ms}^{-1}</math> (3) <math>1.99 \times 10^{-24} \text{ kg ms}^{-1}</math> (4) infinite</p>
54.	<p>The graph between frequency of incident light and the stopping potential is</p> <p>(1) parabola (2) straight line (3) hyperbola (4) circle</p>
55.	<p>A ruby laser produces radiations of 662.6 nm pulses of duration <math>10^{-9}</math> sec. If the energy/pulse is 0.39 J, the number of photons produced are</p> <p>(1) <math>1.3 \times 10^9</math> (2) <math>1.3 \times 10^{18}</math> (3) <math>1.3 \times 10^{27}</math> (4) <math>3.9 \times 10^{18}</math></p>
56.	<p>At its closest approach, the distance between Mars and the Earth is 60 million km. How long will it take to send a radio message from a space probe of Mars to Earth in this situation ?</p> <p>(1) 5 sec (2) 200 sec (3) 0.2 sec (4) 500 sec</p>
57.	<p>How many different wavelengths may be observed in the spectrum from a hydrogen sample if the atoms are excited to third excited state</p> <p>(1) 3 (2) 4 (3) 5 (4) 6</p> 



Question No.	Questions
58.	For a single ionised helium atom, the longest wavelength in ground state will absorb (1) $912 \text{ \AA}^\circ$ (2) $304 \text{ \AA}^\circ$ (3) $606 \text{ \AA}^\circ$ (4) $1216 \text{ \AA}^\circ$
59.	z component of an orbital angular momentum is $\frac{h}{\pi}$ , its magnetic quantum number is (1) 1 (2) 2 (3) -1 (4) 0
60.	If the uncertainty in the position of a particle is equal to its de-Broglie wavelength, the minimum uncertainty in the velocity would be (1) $\frac{1}{4\pi}$ (2) $\frac{v}{4\pi}$ (3) $\frac{v}{4\pi m}$ (4) $\frac{mv}{4\pi}$
61.	When only s-wave scattering takes place, then the ratio of total scattering quantum-mechanically to the cross-section classically for the same radius is (1) 2 (2) 4 (3) $\frac{1}{2}$ (4) $\frac{1}{4}$
62.	The Stern-Gerlach experiment proves the existence of (1) electronic charge (2) electronic dipole moment (3) electronic spin (4) electron mass

Question No.	Questions
63.	For the wavefunction $\psi_n = A \sin \frac{n \pi x}{a}$ confined to $0 < x < a$ , the value of normalization constant is (1) $\sqrt{\frac{2}{a}}$ (2) $\sqrt{\frac{a}{2}}$ (3) $\frac{2}{a}$ (4) $\frac{a}{2}$
64.	Entropy of the universe tends to be (1) minimum (2) zero (3) constant (4) increasing always
65.	The internal energy of an isolated system (1) remains constant (2) is zero (3) infinite (4) none of the three before
66.	The number of degrees of freedom of a gas is F, then the value of $\gamma$ is (1) $1 + \frac{2}{F}$ (2) $\frac{2}{F}$ (3) $\frac{F}{2} + 1$ (4) zero
67.	The work done when a gram-molecule of a gas expands isothermally at $27^\circ\text{C}$ to double its original volume is $[R = 8.3 \text{ J k}^{-1} \text{ mole}^{-1}]$ (1) 725.8 Joule (2) 1725.8 Joule (3) -725.8 Joule (4) zero

Question No.	Questions
68.	In quantum statistics, the value of occupation index is (1) equal to 1 (2) equal to or greater than 1 (3) equal to or less than 1 (4) less than 1
69.	The specific heat of saturated steam is always (1) positive (2) zero (3) negative (4) infinite
70.	The unit of entropy is (1) J k (2) J k <sup>-1</sup> (3) J (4) N m <sup>-2</sup>
71.	A small element $\ell$ is cut from a circular ring of radius 'a' and $\lambda$ charge per unit length. The net electric field at the centre of the ring will be (1) zero (2) $\frac{\lambda \ell}{4\pi\epsilon_0 a^2}$ (3) $\infty$ (4) $\frac{\lambda}{4\pi\epsilon_0}$
72.	An electron is projected with a velocity of $10^7$ m/s at an angle $30^\circ$ with the horizontal in a region of uniform electric field of 5000 N/C vertically upwards. The maximum distance covered in vertical direction above initial level will be (1) 14.2 mm (2) 15 mm (3) 12.6 mm (4) 14.2 cm
73.	A surface $S = 10 \hat{j}$ is kept in an electric field $E = 2 \hat{i} + 4 \hat{j} + 7 \hat{k}$ . The electric flux through the surface will be (1) 40 units (2) 50 units (3) 30 units (4) 20 units

Question No.	Questions
74.	Two drops of water each with a charge of $3 \times 10^{-9}$ C having surface potential 500 V form a single drop. The surface potential of the new drop is (1) 794 V (2) 1000 V (3) 250 V (4) 750 V
75.	The electric field intensity at a point at a distance 20 cm on a line making an angle $45^\circ$ with the axis of a dipole of moment $10 \text{ C - m}$ is (1) $1.77 \times 10^{13} \text{ V/m}$ (2) $0.177 \times 10^{13} \text{ V/m}$ (3) $17.7 \times 10^{13} \text{ V/m}$ (4) $177 \times 10^{13} \text{ V/m}$
76.	Two capacitors A and B having capacitance $10 \mu\text{F}$ and $20 \mu\text{F}$ respectively are connected in series with a 12 V battery. The ratio of charges on A and B is (1) 0.5 : 1 (2) 1 : 1 (3) 2 : 1 (4) 1 : 1.5
77.	The force acting upon a charged particle kept between the plates of a charged capacitor is F. If one of the plates of the capacitor is removed, force acting on the same particle will be (1) 0 (2) $\frac{F}{2}$ (3) F (4) 2F
78.	A $5^\circ\text{C}$ rise in temperature is observed in a conductor when current is passed through it. If the current is doubled, the rise in temperature will be approximately (1) $20^\circ\text{C}$ (2) $16^\circ\text{C}$ (3) $12^\circ\text{C}$ (4) $10^\circ\text{C}$

Question No.	Questions
79.	A current 0.5 A flows through a resistance $2 \Omega$ connected across a cell. The current changes to 0.25 A as resistance is increased to $5 \Omega$ . The emf of the cell is (1) 1 V (2) 1.5 V (3) 2 V (4) 2.5 V
80.	Two heater coils of same material are connected in parallel across the mains and the length and diameter of one coil is double that of the other. Which one will produce more heat (1) thinner coil (2) thicker coil (3) both will produce same amount of heat (4) can't predict
81.	The spring constant $k$ of a wire of length $L$ , having an area of cross-section $A$ , Young's modulus $Y$ behaving as a spring is (1) $\frac{YA}{L}$ (2) $\frac{YA}{2L}$ (3) $\frac{2YA}{L}$ (4) $\frac{YL}{A}$
82.	The dimensions of Poisson's ratio are (1) $[M^0 L^0 T^0]$ (2) $[M L^{-1} T^{-2}]$ (3) $[M L^2 T^{-1}]$ (4) $[M L^2 T^{-3}]$
83.	The temperature at which the phase transition occurs depends upon (1) pressure (2) volume (3) density (4) mass
84.	The temperature of $H_2$ at which the rms velocity of its molecules is seven times the rms velocity of the nitrogen molecules at 300 k is (1) 2100 k (2) 1700 k (3) 1350 k (4) 1050 k

Question No.	Questions
85.	<p>How many cylinders of hydrogen at atmospheric pressure are required to fill a balloon of volume <math>500 \text{ m}^3</math>, if the hydrogen is stored in cylinders of <math>0.05 \text{ m}^3</math> at an absolute pressure of <math>15 \times 10^5 \text{ Pa}</math> ?</p> <p>(1) 700 (2) 675 (3) 605 (4) 710</p>
86.	<p>If the temperature of 3 moles of helium gas is increased by <math>2 \text{ k}</math>, then the change in internal energy of the gas is</p> <p>(1) <math>70.0 \text{ J}</math> (2) <math>68.2 \text{ J}</math> (3) <math>74.8 \text{ J}</math> (4) <math>78.2 \text{ J}</math></p>
87.	<p>One mole of a gas isobarically heated by <math>40 \text{ k}</math> receives heat <math>1.162 \text{ kJ}</math>. The ratio of specific heats of the gas is</p> <p>(1) 1.7 (2) 1.4 (3) 1.3 (4) 1.5</p>
88.	<p>A carnot engine first operates between <math>200^\circ\text{C}</math> and <math>0^\circ\text{C}</math> and then between <math>0^\circ\text{C}</math> and <math>200^\circ\text{C}</math>. The ratio of efficiencies <math>\left(\frac{\eta_2}{\eta_1}\right)</math> in two cases is</p> <p>(1) 1 : 15 (2) 1 : 1 (3) 1 : 2 (4) 1.73 : 1</p>
89.	<p>The propagation of heat in air takes place by</p> <p>(1) conduction (2) convection (3) radiation (4) all the three before</p>
90.	<p>The ratio of rate of radiation of energy by two spheres of same material having radii <math>r</math> and <math>4r</math> and temperature <math>2T_0</math> and <math>T_0</math> respectively is</p> <p>(1) 1 : 1 (2) 1 : 2 (3) 2 : 1 (4) 3 : 1</p> <p style="text-align: right;"><i>Arun Kumar</i></p>

Question No.	Questions
91.	For a conservative system, generalized force (1) has necessarily the dimensions of force (2) is a dimensionless quantity (3) can not have dimensions of force (4) may have dimensions of torque
92.	Mutual interaction forces between two particles can change (1) the linear momentum but not the kinetic energy (2) the kinetic energy but not the linear momentum (3) the linear momentum as well as kinetic energy (4) neither the linear momentum nor the kinetic energy
93.	If the Lagrangian does not depend on time explicitly (1) the Hamiltonian is constant (2) the Hamiltonian can not be constant (3) the kinetic energy is constant (4) the potential energy is constant
94.	The eccentricity ( $e$ ) of the orbit of a satellite having maximum and minimum velocities as $v_1$ and $v_2$ is (1) $\frac{v_1}{v_2}$ (2) $\frac{v_2}{v_1}$ (3) $\frac{v_1 - v_2}{v_1 + v_2}$ (4) $\frac{v_1 + v_2}{v_1 - v_2}$
95.	For a one dimensional oscillator, the representative point in two dimensional phase space traces (1) an ellipse                                      (2) a parabola (3) a hyperbola                                    (4) always a straight line

Question No.	Questions
96.	For a particle at rest in a rotating frame, the pseudo force acting on it is (1) zero    (2) only centrifugal force (3) only coriolis force                        (4) both centrifugal and coriolis force
97.	If constraint forces do work and total mechanical energy is not conserved then constraints are named as (1) bilateral constraint                        (2) unilateral constraint (3) dissipative constraint                      (4) regenerative constraint
98.	A force $\vec{F} = -\vec{\nabla} u$ is said to be conservative if (1) grade F is zero                                (2) div F is zero (3) Curl F is zero                                 (4) none of three before
99.	Which of the following is not an explicit function of time (1) velocity    (2) momentum (3) acceleration                                    (4) potential energy
100.	If external torque on a system is zero, then its angular velocity (1) remains unchanged only if moment of inertia changes (2) changes only if moment of inertia remains unchanged (3) remains unchanged only if moment of inertia remains fixed (4) none of the three before

*Anwar Ali*



Answer Keys  
M.Sc. (Physics)

S.No.	A	B	C	D
1	4	2✓	2	4
2	2	2✓	1	2
3	1	1✓	1	3
4	4	2✓	1	1
5	1	4✓	1	3
6	2	1✓	2	2
7	3	3✓	2	1
8	3	1✓	1	1
9	4	1✓	2	3
10	3	3✓	2	2
11	2	2✓	1	1
12	2	1✓	1	3
13	1	4✓	1	1
14	2	4✓	4	1
15	4	3✓	2	1
16	1	2✓	3	3
17	3	3✓	2	3
18	1	3✓	4	1
19	1	2✓	4	2
20	3	1✓	1	3
21	1	4✓	4	2
22	1	2✓	2	3
23	1	3✓	1	2
24	4	1✓	4	1
25	2	3✓	1	3
26	3	2✓	2	1
27	2	1✓	3	1
28	4	1✓	3	2
29	4	3✓	4	3
30	1	2✓	3	2
31	2	1✓	2	2
32	3	3✓	1	2
33	2	1✓	4	1
34	1	1✓	4	2
35	3	1✓	3	4
36	1	3✓	2	1

*Answer Key*

Head  
Department of Physics  
M.D. University, Rohtak


37	1	3✓	3	3
38	2	1✓	3	1
39	3	2✓	2	1
40	2	3✓	1	3
41	2	2✓	4	2
42	1	3✓	1	1
43	1	2✓	2	4
44	1	1✓	2	4
45	1	3✓	2	3
46	2	1✓	2	2
47	2	1✓	4	3
48	1	2✓	2	3
49	2	3✓	2	2
50	2	2✓	2	1
51	1	1✓	2	4
52	3	1✓	3	1
53	1	1✓	2	2
54	1	4✓	1	2
55	1	2✓	3	2
56	3	3✓	1	2
57	3	2✓	1	4
58	1	4✓	2	2
59	2	4✓	3	2
60	3	1✓	2	2
61	4	2✓	4	2
62	1	1✓	2	3
63	2	1✓	3	1
64	2	1✓	1	4
65	2	1✓	3	1
66	2	2✓	2	1
67	4	2✓	1	2
68	2	1✓	1	2
69	2	2✓	3	3
70	2	2✓	2	2
71	4	4✓	2	2
72	2	1✓	3	1
73	3	2✓	1	1

*Anwar Khan*

Head  
Department of Physics  
M.D. University, Rohtak

74	1	2 ✓	4	1
75	3	2 ✓	1	1
76	2	2 ✓	1	2
77	1	4 ✓	2	2
78	1	2 ✓	2	1
79	3	2 ✓	3	2
80	2	2 ✓	2	2
81	2	4 ✓	2	1
82	3	2 ✓	2	1
83	1	1 ✓	1	1
84	4	4 ✓	2	4
85	1	1 ✓	4	2
86	1	2 ✓	1	3
87	2	3 ✓	3	2
88	2	3 ✓	1	4
89	3	4 ✓	1	4
90	2	3 ✓	3	1
91	2	2 ✓	1	4
92	1	3 ✓	3	2
93	4	1 ✓	1	1
94	4	4 ✓	1	4
95	3	1 ✓	1	1
96	2	1 ✓	3	2
97	3	2 ✓	3	3
98	3	2 ✓	1	3
99	2	3 ✓	2	4
100	1	2 ✓	3	3

  
 Sajjan

  
 Head  
 Department of Physics  
 M.D. University, Rohtak