Date: 17 May 2014 **PG-QS-02** **Session:** I

Entrance Test for the programs: M.Sc. in Physics (CU Kerala)/Physics (CU Raj.)/Physics (CU Haryana)/Applied Physics (CU Jharkhand).

City: ..... Hall Ticket Number:

Examination Centre: ..... Application Number:

Candidate of Name: .....

Signature..... Booklet Number:

INSTRUCTIONS TO CANDIDATES

1. Do not open the Question Booklet until the Hall Superintendent gives the signal for the commencement of the examination.
2. Write your Name, your Hall Ticket Number, Application Number and the Name of your Examination Centre (as found in the HALL TICKET) and sign in the space provided above. **Do not write or mark anything anywhere on the Question booklet.**
3. If you write anything or put any mark on any part of the Question booklet or Answer Sheet (OMR), except for the space allotted for the relevant entries, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
4. After the commencement of the examination, open the Question Booklet. If the Question Booklet or the Answer Sheet or both are not in good condition, then ask for immediate replacement. No replacement will be made 5 minutes after the commencement of the examination.
5. In the ANSWER SHEET (OMR) fill up / shade the required entries (Examination Centre, Hall Ticket Number, Application Number, Programs etc in the space provided) using an HB pencil.
6. The Question Booklet consists of two parts; Part A and Part B. **Part A** contains 35 questions from English, General Awareness / General Knowledge and Reasoning & Analytical Skills. **Part B** contains 65 questions from the subject knowledge. Attempt all the 100 Questions.
7. All questions are in Multiple Choice Question (MCQ) pattern. The blank space at the end of the question paper may be used for Rough Work.
8. All questions carry equal marks. Each correct answer carries 1 mark. No NEGATIVE marks for wrong answers.
9. Shade with HB Pencil one of the four ovals against each question number in the Answer Sheet, which according to you correspond to the correct answer.
10. If you want to change any answer, erase the Pencil shading thoroughly and shade the new oval clearly. Only one oval for each question should remain finally shaded. **Answers with multiple shading will be considered as wrong answer.**
11. Use the answer Sheet carefully. No spare Answer Sheet will be given.
12. At the end of the examination, when the Hall Superintendent announces 'Stop Writing', you must stop answering **immediately** and place the Answer Sheet inside the Question Booklet (s) and be ready to handover the material.
13. When you have completed answering, stand up and remain in your place. The Hall Superintendent will come to you and collect your Question Booklet and Answer Sheet. Under no circumstances should any of these articles be taken out of the Examination Hall. No candidate shall leave the Hall until these articles are collected.
14. No candidate can leave the Hall during the first 30 minutes and the last 15 minutes of the examination.
15. No candidate can re-enter the Hall after leaving.
16. Calculators (non-programmable) are ALLOWED. Tables or any other calculating devices, mobiles, pagers, Booklets, Papers etc. are strictly prohibited for this examination.

PART - A

1. She hardly ever does her work, _____?

   A) is she? B) doesn't she? C) isn't she? D) does she?

2. 'You must see this exhibition!' said all my friends. Transform into indirect speech.

   A) All my friends requested me to see that exhibition.
   B) All my friends strongly advised me to see that exhibition
   C) All my friends saw that exhibition
   D) All my friends compelled me to see that exhibition

3. I resented _____ unjustly accused and asked him _____.

   A) X, to apologise B) being, to apologise
   C) being, apology D) being, for apologising

4. Her life might have been saved if_____.

   A) you were a little alert B) you had been a little alert
   C) she was a little alert D) she will be a little alert

5. He said he was _____ employee of _____ gas company and had come to read _____ meter.

   A) an, the, the B) a, the, the C) an, a, the D) an, the, a

6. Shut the door, please,' expresses:

   A) a polite request B) suggestion C) order D) intention

7. Point out the elements in the sentence: 'She sells sea shells on the sea shore'?

   A) SVOA B) SVOC C) SVOiOd D) SVC

8. While writing about our education and experience in our resume or CV, we should start writing the year:

   A) in decreasing order (latest to the first)
   B) in increasing order (first to the present one)
   C) in any order
   D) none of the above

9. His _____ to the scam was rather pointed.

   A) allusion B). illusion C) delusion D) confusion

10. I _____, _____ and _____ before leaving for work.

A) dressed, ate, washed B) washed, dressed, ate.
C) ate, dressed, washed D) dressed, washed, ate

11. She didn't tell _____ about her plans.

A) nobody B) someone C) somebody D) anybody

12. One who loves and collects books:

A) Bibliophile B) Bibliopole C) Bibliomaniac D) Biblioclast

13. Buddhist literature is an important source for ancient Indian history. Which one of the followings falls into the category of Buddhist literature?

A) Agam Literature B)Sangam Literature C) Pitakas D) Upanishads

14. 'Silsila' was an integral part of which religious movement?

A) Sikhism B) Buddhism C) Sufism D) Jainism

15. Which planet of our solar system is considered as the 'Earth's twin' due to its close proximity in size, mass and density to Earth?

A) Mars B) Venus C) Pluto D) Neptune

16. During the summers which region in the North Hemisphere is called the 'Land of the Midnight Sun'?

A) The Equator B) Region above the Antarctic Circle
C) Region above the Arctic Circle D) Region between the Equator and Tropic

17. Of the various types of mountains found, Himalayas are

A) Fold Mountains B)Volcanic Mountains
C) Block Mountains D)Residual Mountains

18. Who was associated with 'Bhoodan Movement'?

A) Vinoba Bhave B) Mahatma Gandhi C) M. N. Roy D) J. L. Nehru

19. Who has given the slogan, "Swaraj is my birthright"?

A) Lokmanya Tilak B) Bipin Chandra Pal
C) Lala Lajpat Rai D) Mahatma Gandhi

20. Afghanistan was included as a member of SAARC in the year:

A) 2005 B) 2006 C) 2007 D) 2008

21. What is the minimum distance for clear vision?

A) 10 cm B) 20 cm C) 25 cm D) infinite

22. The frequency of alternating current for home appliances is

A) 60 Hz B) 100 Hz C) 220 Hz D) 50 Hz

23. Operation flood in India known for

A) Flood outbreak B) Milk Production
C) Sugarcane production D) Kargil war

24. El Niño effect is defined as

A) Prolonged warming in the Pacific Ocean sea surface temperatures
B) Heavy snow fall
C) High temperature in tropical region
D) All the above

25. Choose the correct alternative in place of question mark, 1, 5, 13, 25, 41, ?

A) 51 B) 57 C) 61 D) 63

26. Choose the correct option in place of question mark, Laugh : Joy :: Weep : ?

A) Sad B) Grief C) Punishment D) Remorse

27. Choose the odd one out

A) Pint B) Ton C) Liter D) Gallon

28. If SUMMER is coded as RUNNER, the code for WINTER will be

A) WALKER B) VIOUER C) SUITER D) SUFFER

29. Pointing towards a person in the photograph Hemant said, “He is the only son of the father of my sister’s brother”. How is that person related to Hemant?

A) Cousin B) Brother C) Father D) Son

30. Which of the following words will come third in the English dictionary

A) Faithfully B) Follow C) False D) Fall

31. If day after tomorrow is Saturday, what day was three days before yesterday?

A) Saturday B) Sunday C) Monday D) Thursday

32. If (i) A is taller than B, (ii) C is shorter than A, (iii) D is taller than E but shorter than B, then who among them is the tallest?

A) A B) B C) D D) E

33. On dividing a certain number by 342 we get 47 as reminder. If the same number is divided by 18, what will be the remainder?

A) 47 B) 11 C) 23 D) 22

34. The value of $\frac{(12)^3 \, x \, 6^4}{432}$ is

A) 5184 B) 216 C) 864 D) 5814

35. Find the remainder when 2^{31} is divided by 5.

A) 1 B) 2 C) 3 D) 4

You may use the following values for the physical constants.

Speed of light in vacuum	$c = 3.0\times10^{8}$ m/s
Planck's constant	$h = 6.626\times10^{-34}$ Joule-sec.
Electron mass	$m_e = 9.1\times10^{-31}$ kg
Proton mass	$m_p = 1.6726\times10^{-27}$ kg
Neutron mass	$m_p = 1.6749\times10^{-27}$ kg
Electron charge (magnitude)	$e = 1.6\times10^{-19}$ Coulomb
Avogadro's number	$N_a = 6.022\times10^{23}$ mol^{-1}
Atomic mass unit	1 amu = 1.66×10^{-27} kg = 931.5 MeV
Permeability of free space	$\mu_o = 4\pi \times 10^{-7}$ Hm^{-1}
Permittivity of free space	$\varepsilon_o = 8.85\times10^{-12}$ Farad m^{-1}
Boltzmann constant	$k_B = 1.38\times10^{-23}$ J/K
C_p / C_v for monoatomic gas	$\gamma = 5/3$

1 eV = 1.6×10^{-19} Joule

1 Watt = 0.2390 Calorie/sec

1 Calorie = 4.184 Joule

$\int_{-\infty}^{\infty} x^n e^{-\alpha x^m}\, dx = \frac{1}{2}\frac{\Gamma(\frac{n+1}{m})}{\alpha^{(n+1)/m}}$, where n and m are positive integers.

Lande g factor is 2 for electron

Bohr magneton for electron is 9.273 x 10 $^{-24}$ JT^{-1}

Part B

36. Find the positions of the maximum and minimum of the function $x^3 - 3x + 3$

A) Min. at $x = -1$, max. at $x = +1$

B) Min. at $x = -\,{}^{1}/_{2}$, max. at $x = +\,{}^{1}/_{2}$

C) Max. at $x = -1$, min. at $x = -1$

D) Max. at $x = +\,{}^{1}/_{2}$, min. at $x = -\,{}^{1}/_{2}$

37. Integration of $\int_0^{\pi/2} sin^5 x\, dx$ is

A) $\frac{22}{15}$ B) $\frac{15}{22}$ C) $\frac{5}{2}$ D) $\frac{2}{5}$

38. The energy stored by an ideal inductor is in the form of ……

A) Electric field energy

B) Magnetic field energy

C) Heat energy

D) Electrostatic potential energy

39. Which of the following equations implies that magnetic monopole does not exist?

A) $\nabla \cdot \overline{E} = \frac{\rho}{\varepsilon_0}$ B) $\nabla \times \overline{E} = \bar{0}$ C) $\nabla \cdot \overline{\mathrm{B}} = 0$ D) $\nabla \times \overline{\mathrm{B}} = \mu_0 \bar{\mathrm{J}}$

40. A beam of X-rays is scattered by electrons at rest. If the wavelength of the x-rays scattered at 60° to the beam is $0.035A^{\circ}$, the energy of the incoming X-rays is

A) 1.2×10^5 eV

B) 2.3×10^5 eV

C) 5.4×10^5 eV

D) 3.5×10^5 eV

41. The de Broglie wavelength of a free electron with energy 6.0 eV and another free electron with energy of 200 MeV are, respectively,:

A) 5 Å; 6.2 fm

B) 5fm; 6.2Å

C) 3Å; 2.5 fm

D) 7Å, 9.0fm

42. A bus moving at a speed of 20 m/s beings to slow at a constant rate of 3.0 m/s., each second. Before stopping, it will cover a distance of

A) 80 m B) 72 m C) 67 m D) 56 m

43. A particle is moving under central force about a fixed center of force. In such a case which of the following statements is true?

A) The motion of a particle is always on a circular path.
B) Its angular momentum is conserved.
C) Its kinetic energy remains constant.
D) Its total energy remains constant.

44. An ideal fluid flows through a horizontal pipe having diameter that varies along its length. The sum of kinetic energy and pressure per unit volume at different sections of the pipe

A) decreases as the pipe diameter increases
B) increases as the pipe diameter increases
C) decreases as the pipe diameter decreases
D) remains unchanged as the pipe diameter changes.

45. A string has a linear density of 525g/m and is stretched with a tension of 45 N. For a travelling wave whose frequency ν is 120 Hz and amplitude 8.5 mm, the average rate of energy transported is

A) 10 W B) 100 W C) 0.01 W D) 0.1 W

46. An open-ended cardboard tube has a length of 67 cm. Upon sonically exciting the tube, the fundamental frequency one would get to hear at the other end will be (speed of sound = 343m/s)

A) 128 Hz B) 256 Hz C) 64 Hz D) 512 Hz

47. In which of the following decays, the atomic number decreases

A) β^+ decay B) β^- decay C) γ decay D) ν decay

48. Heavy water (D_2O) is used in thermal neutron reactors as a moderator for

A) reducing the rate of release of fission energy
B) moderating the temperature of the core of the nuclear reactor
C) acting as intermediate absorbers of the neutrons
D) slowing down fast fission neutrons to thermal energy.

49. C_p *and* C_v denote the molar specific heats of a gas at constant pressure and at constant volume respectively. C_p/C_v= 5/3 and C_p - C_v = R, then C_v is equal to

A) 0.5 R B) 2.5 R C) 1.5 R D) 0.66 R

50. The molar mass of gas molecules is denoted by m and ρ is the density of gas and N_a is the Avogadro's number. Then number density of gas molecules confined in box of volume V is given by ----.

A) $m/(\rho N_a)$ B) $\rho N_a/m$ C) $\rho /N_a m$ D) $\rho N_a m$

51. Spherical aberration in a thin lens can be reduced by ----
A) Using a monochromatic light
B) Using a circular annular mask over the lens
C) Increasing the size of the lens
D) Using a doublet combination

52. Consider two sinusoidal waves with the same amplitude 'a'. According to the principle of superposition, the resultant amplitude 'A' is --------- if the phase difference between the two waves is equal to $0, 2\pi, 4\pi, 6\pi \ldots$.
A) 2a B) $2\sqrt{a}$ C) $a\sqrt{2}$ D) $4a^2$

53. A plane intercepts at a, b/2, 3c in a simple cubic unit cell. The Miller indices of the plane will be

A) (132) B) (261) C) (361) D) (123)

54. A simple cubic lattice consists of eight identical spheres of radius R in close contact placed at the corners of the cube. What fraction of the total volume of the cube is actually occupied?

A) 52.3 % B) 75 % C) 25.5 % D) 90 %

55. The shape of the orbital is determined by the ---------
A) Principal quantum number
B) Spin quantum number
C) Azimuthal quantum number
D) Magnetic quantum number

56. For a given value of orbital quantum number 'l', the magnetic quantum number m_s can assume the following values.
A) $(2l+1)$ B) $2(2l+1)$ C) $2l\,(2l+1)$ D) $2l\,(l+1)$

57. In OP-AMP zero crossing detector,
A) Output of comparator is zero
B) $-V_{CC} = 0$
C) Reference voltage is zero
D) $+ V_{CC} = 0$

58. FET is _____ operated device.

A) Voltage B) Current C) Temperature D) Wattage

59. Higher the Q factor of a series LCR circuit,
A) Greater is the band width
B) Narrower is the pass band
C) Broader is the resonance
D) Lower is the impedence

60. The Poisson's equation in CGS Gaussian system is
A) $\nabla^2 V = -\frac{\rho}{\varepsilon_0}$.
B) $\nabla^2 V = -4\pi\rho$
C) $\nabla^2 V = -4\pi\sigma$
D) $\nabla^2 V = 0$

61. The value of $Z = i^{-2i}$ is given by

A) $1 + i$ B) $e^{(\pi+4n\pi)}$ C) $e^{(\pi-4n\pi)}$ D) $e^{4n\pi}$

where $n = 0,1,2, \ldots \ldots$

62. The value integral of $x^2 + y^2 + z^2$ over rectangular parallelopiped bounded by the six surfaces $x = \pm a$, $y = \pm b$ and $z = \pm c$ is given by

A) $\frac{2abc}{3}\,[a^2 + b^2 + c^2]$ B) $\frac{1}{3}\,(a^3 + b^3 + c^3)$

C) $\frac{2}{3}\,(a^2 + b^2 + c^2)$ D) $\frac{8abc}{3}\,[a^2 + b^2 + c^2]$

63. The quantity $\frac{|\overline{E}||\overline{B}|}{\mu_0}$ has the dimensions of …….
A) energy B) power
C) energy/area D) power /area

64. A Certain wave function for a particle moving on the X axis is given by

$$\Psi(x,\mathrm{t}) = \mathrm{AR}(x)\mathrm{e}^{\frac{\mathrm{iS(x)}}{\hbar}}\,\mathrm{e}^{-\mathrm{i}\omega\mathrm{t}}$$

Where A is complex constant while both R(x) and S(x) are real function of x. The probability current density $j_x(x,t)$ associated with the wave function is

A) $j_x(x,t) = \frac{A^2}{m} R^2(x) \frac{d^2S(x)}{dx^2}$

B)) $j_x(x,t) = |A|^2 \frac{R^2(x)}{m} \frac{dS(x)}{dx}$

C) $j_x(x,t) = \frac{|A|^2}{m} \frac{dR(x)}{dx}$

D) $j_x(x,t) = 0$

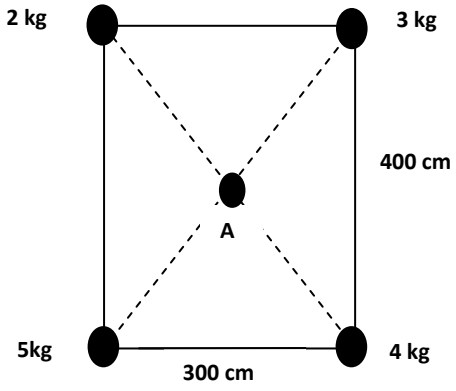
65. A body is located at a distance from the earth along a line towards the Sun such that the gravitational pull is balanced by the Sun's gravitational pull. Then this distance from is earth is

(Given Ms = 3.25 $\times$ 10^5Me, where Ms and Me are masses of the Sun and the earth, distance between the Sun and earth 9.3 $\times$ 10^7 km)

A) 1.6 $\times$ 10^7 km B) 1.6 $\times$ 10^6 km

C) 1.6 $\times$ 10^5 km D) 1.6 $\times$ 10^4 km

66. The moment of inertia of a system comprised of four masses placed at corners of a rectangle (as shown in figure) about the axis passing through point A and perpendicular to the plane of paper is



A) 3.5 Kg.$m^{2.}$ B) 0.35 Kg. m^2 C) 350 Kg. m^2 D) 35 Kg. m^2

67. Two submarines "A" and "B" are under water and approaching each other head on. Sub "A" with its speed 12 m/s sends out a 1550 Hz SONAR, wave that travels at 1522 m/s, this wave gets reflected back from sub "B" with speed 8m/s, and reaches Sub "A". The frequency of the wave received back will be (Apply Doppler effect)

A) 1570 Hz B) 1550 Hz C) 1590 Hz D) 1522 Hz

68. Calculate the Q-value in the following decays

$$O^{19} \rightarrow F^{19} + e + \bar{\nu}$$

(Given : O^{19} = 19.003576amu, F^{19} = 18.998403amu)

A) 4.511 MeV B) 4.816 MeV C) 4.22 MeV D) 4.621 MeV

69. A system consists of N_1 molecules of *type* 1 and N_2 molecules of *type* 2 confined within a box of volume *V*. The molecules are supposed to interact very weakly so that they constitute an ideal gas mixture. The total number of states Ω *(E)* in the range between *E* and *E+dE* are proportional to volume as:

A) $(N_1 + N_2)\ V$ B) V^{N1+N2} C) $V^{N1} + V^{N2}$ D) V^{N1-N2}

70. If a temperature of the ideal Black Body is increased to twice the initial value, the change in entropy of the Black Body would be ------- times the initial entropy.

A) 4 B) 5 C) 7 D) 9

71. A converging lens has a focal length of 25 cms. Its power in Diopters is -----

A) 4.0D B) 0.04D C) 2.0D D) 0.02D

72. Which of the following properties of solids is not dependant on the crystal structure?

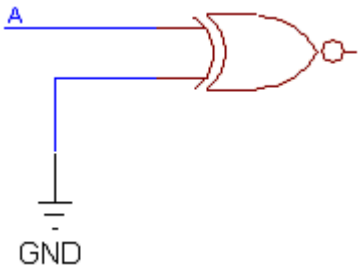
A) Isotropy B) Anisotropy

C) Sharp melting point D)Symmetry

73. The shortest wavelength observed in Paschen series of hydrogen spectra is ---------.

A) 7800 Å B) 7349 Å C) 9546 Å D) 8201 Å

74. The output of the logic gate in figure is



A) 0 B) 1 C) A D) $\bar{A}$

75. The magnitude of electric displacement or electric induction depends on-

A) The applied field alone
B) The dielectric polarization
C) The applied field as well as dielectric polarization
D) None of these.

76. Find the distance from the point P with coordinates $(1,2,3)$ to the plane which contains the points A,B and C with coordinates $(0,1,0)$, $(2,3,1)$ and $(5,7,2)$

A) $\frac{5}{3}$ B) $\frac{3}{5}$ C) $-\frac{5}{3}$ D) $-\frac{3}{5}$

77. The particular solution of the differential equation

$$\frac{dy}{dx} = \frac{2xy^2 + x}{x^2y - y}$$

with the given boundary condition $y = 0$ when $x = \sqrt{2}$ is given by

A) $2y^2 + 1 = (x^2 - 1)^2$ B) $y^2 = (x^2 - 1)^2$
C) $x^2 = 2y^2 + 1$ D) $x^2 - 1 = 2y^2 + 1$

78. Point charge q is placed at the origin of a cartesians coordinate system. The flux of the electric field that passes through a square described by the vertices (0,0,1), (1,0,1), (1,1,1) and (0,1,1) is ……

A) Zero B) $\frac{q}{\epsilon_0}$ C) $\frac{q}{6\epsilon_0}$ D) $\frac{q}{24\epsilon_0}$

79. A spaceship moves towards you at the speed of c/3. The spaceship emits a beam of light in your direction. As measured in your frame of reference, the speed of the light emitted by the spaceship is …….

A) $\frac{4c}{3}$ B) c C) $\frac{2c}{3}$ D) $\frac{c}{3}$

80. A certain quantum mechanical system bears the wave function

$$\Psi(\vec{r}) = A\, e^{-\alpha r}\, r\, \cos\theta$$

For such a system measurements corresponding to the operators L^2 and L_z are made. The result would be

A) L^2 measurement : result = $2\hbar^2$ with 100% certainty and L_z measurement : $0\hbar$ (= zero) with 100% certainty.

B) L^2 measurement : result = $1\hbar^2$ with 50% probability and L_z measurement : $-1\hbar \; or \; +1\hbar$ with probabilities $\frac{1}{2}$ each.

C) L^2 measurement : result = $0\ \hbar^2$ (= zero) with 50% probability while L_z measurement would give $1\hbar$ with 100% certainty.

D) All, L^2 measurement would yield the value zero; with 100% certainty L_z as well will give the value $2\hbar^2$ with 100% certainty.

81. An electron is in the ground state of Tritium for which the nucleus consists of a proton and two neutrons. A radioactive nuclear reaction suddenly occurs in which the Tritium nucleus gets converted into an isotope of Helium. The probability that the electron remains in the ground state of "He" will be

A) $\frac{64}{729}$ B) $\frac{128}{729}$ C) $\frac{512}{729}$ D) $\frac{256}{729}$

82. A satellite is in elliptical orbit about the earth. At pen gee it has an altitude of 1100 km and at apogee its altitude is 4100 km. The major axis of the orbit is

A) 10400 km B) 18000 km C) 11600 km D) 5200 km

83. A mass M moves with speed V in x direction. It explodes into two pieces that go off at angles θ_1 and θ_2 respectively. The magnitudes of the momenta of the two pieces are

(Here P = MV = momentum of the mass M)

A) $P_1 = \frac{P\ \sin\theta_2}{\sin(\theta_1+\theta_2)}$ and $P_2 = \frac{P\ \sin\theta_1}{\sin(\theta_1+\theta_2)}$

B) $P_1 = \frac{P\ \cos\theta_2}{\sin(\theta_1+\theta_2)}$ and $P_2 = \frac{P\ \cos\theta_1}{\sin(\theta_1+\theta_2)}$

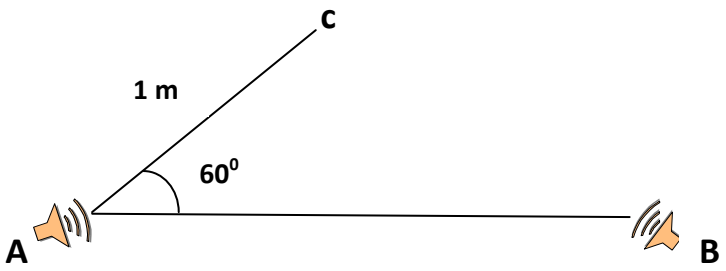
C) $P_1 = \frac{P\ \sin\theta_2}{\cos(\theta_1+\theta_2)}$ and $P_2 = \frac{P\ \sin\theta_1}{\cos(\theta_1+\theta_2)}$

D) $P_1 = \frac{P\ \cos\theta_2}{\cos(\theta_1+\theta_2)}$ and $P_2 = \frac{P\ \cos\theta_1}{\cos(\theta_1+\theta_2)}$

84. Two identical springs with same spring constant "k" are stretched to length $l >> l_0$, their unstretched length lie in the x direction and have mass m between them. The other end of either spring ends up in rigid support
The ratio of the natural frequency for small oscillations in the x direction to that in the y direction will be

A) $\left(1-\frac{l_0}{l}\right)^{-1/2}$ B) $\frac{l_0}{l}$ C) $\sqrt{\frac{l_0}{l}}$ D) $\left(1-\frac{l_0}{l}\right)^{1/2}$

85. The drawing shows loud speakers A and Band a point C, where a listener is positioned.
Both speakers vibrate in phase and are playing a 68.6 Hz tone. The speed of sound = 343 m/s. The closest to speaker A the speaker can be located so that no sound is heard is



A) 2.00 m B) 0.59 m C) 2.89 m D) 3.89 m

86. A thin circular ring of man "m" and radius "R" is supported by a nail in a vertical plane in uniform vertical gravity. The period of small oscillations of the ring is

A) $\sqrt{\frac{R}{g}}$

B) $\pi\sqrt{\frac{R}{g}}$

C) $2\pi\sqrt{\frac{R}{g}}$

D) $2\pi\sqrt{\frac{2R}{g}}$

87. The theory governing combinations of quarks based on quantum electrodynamics is called

A) Baryon theory
B) Quantum chromo dynamics
C) Meson theory
D) Lepton theory

88. The activity of a radioactive sample falls from 600 $s^{-1}$to 500 s^{-1} in 40 minutes. Calculate its half life.

A) 152 minutes
B) 170 minutes
C) 120 minutes
D) 192 minutes

89. A gas of molecules has mass *m* each is in thermal equilibrium at absolute temperature *T*. Root mean square (r.m.s) speed, average speed and most probable speeds i.e. $v_{rms}: \bar{v}: \tilde{v}$ are in proportion

A) $\sqrt{kT/m}\left[\sqrt{3}: \sqrt{8/\pi}: \sqrt{2}\right]$
B) $\sqrt{kT/m}\left[\sqrt{2}: \sqrt{8/\pi}: \sqrt{3}\right]$
C) $\sqrt{kT/m}\left[\sqrt{3}: \sqrt{8}/\pi: \sqrt{5}\right]$
D) $\sqrt{kT/m}\left[\sqrt{3}: \sqrt{\pi/8}: \sqrt{2}\right]$

90. The system is maintained at equilibrium temperature of 300 *K*. What is the amount of heat (in eV) needed to increase number of accessible states to10^8?

A) 0.5 eV
B) 1 eV
C) 2 eV
D) 1.5 e

91. One beam of coherent light travels path P_1 in arriving at point Q and another coherent beam (from same source) travels path P_2 in arriving at the same point. If these two beams are to interfere destructively, the path difference $P_1 - P_2$ must be equal to --------

A) zero
B) an odd number of half-wavelengths
C) a whole number of wavelengths
D) a whole number of half-wavelengths

92. A student prepared a Young's double slit by drawing two parallel lines (with a separation less than a millimeter) on a smoked glass plate. [For smoking, the plate was held above the flame of a kerosene lamp]. Accidentally he used two different pins to draw the lines so that the widths of the slits (regions from where smoke was removed by the pin) were in the ratio 4:1. What will be the ratio of the intensity at the interference maximum to that at the interference minimum?

A) 4:1
B) 2:1
C) 3:1
D) 9:1

93. In metals according to the classical theory the electrical conductivity is related to mass of electron 'm', charge 'e', its concentration 'n', and collision time 'τ' by the relation

A) mneτ B) me τ/m C) ne^2 τ/m D) ne^2 τ^2/m

94. If the overlap of electronic wave functions centered on neighboring atoms, in a crystal, is small, the effective mass of the electron 'm*'

A) will be very large as compared to mass of the free electron

B) will be negative

C) will be very small as compared to mass of free electron

D) will be equal to the mass of free electron

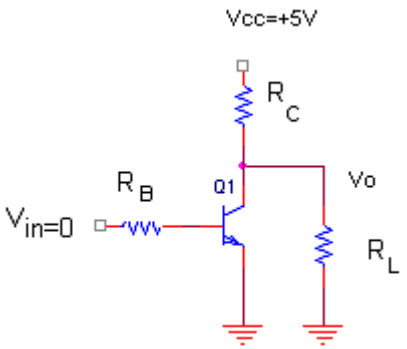
95. The "Normal" and "Anomalous" Zeeman effect are observed when ----------.
(Note: S` is the total spin angular momentum due to the coupling of individual spin angular momentum)

A) S` = 0 and S` ≠ 0 respectively B) S` = 0 and S` = 0 respectively
C) S` ≠ 0 and S` = 0 respectively D) S` ≠ 0 and S` ≠ 0 respectively

96. The total number of 'd' electrons in Fe^{2+} (Atomic No. of Fe is 26) is not equal to that of the total number of -------

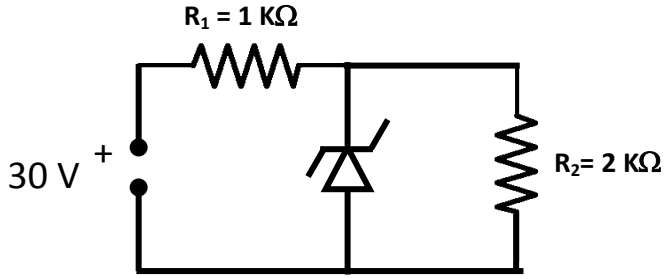
A) *p* - electrons in Ne (Atomic No. 10)
B) *d* – electrons in Fe atom
C) *p*- electrons in Cl^- ion (Atomic no. of Cl is 17)
D) *s* – electrons of Mg (Atomic no. of Mg is 12)

97. The circuit shown in the figure ,if R_L=R_C=1kΩ then the value of Vo will be



A) 4.55V B) 2.5V C) 1V D) Zero

98. In the given circuit the current through resistor R_2 (2 kΩ) is _____.



A) 2mA B) 15 mA C) 10 mA D) 6 mA

99. The radius R of a loop carrying a current I is doubled, R→2R while the current is halved I→I/2. The magnetic moment M of the current loop is then –

A) M B) 2M C) M/2 D) 4M

100. Let the time dependence of an electromagnetic wave be represented as $e^{-j\omega t}$. A wave is represented as f (z) = $ce^{-j\ \beta z}$ This wave represents-

A) Forward travelling wave
B) Backward travelling wave
C) Standing wave
D) Longitudinal wave