COMBINED COMPETITIVE (PRELIMINARY) EXAMINATION, 2010

Serial No.

PHYSICS
Code No. 16

A

Time Allowed : Two Hours

Maximum Marks : 300

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC, IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.

2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C OR D** AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE RESPONSE SHEET.

3. You, have to enter your Roll Number on this Test Booklet in the Box provided alongside. *Do NOT* write *anything* else on the Test Booklet.

   Your Roll No.

4. This Booklet contains 120 items (questions). Each item comprises *four* responses (answers). You will select *one* response which you want to mark on the Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each item.

5. In case you find any discrepancy in this test booklet in any question(s) or the Responses, a written representation explaining the details of such alleged discrepancy, be submitted within three days, indicating the Question No(s) and the Test Booklet Series, in which the discrepancy is alleged. Representation not received within time shall not be entertained at all.

6. You have to mark all your responses ONLY on the separate Response Sheet provided. *See directions in the Response Sheet.*

7. All items carry equal marks. Attempt ALL items. Your total marks will depend only on the number of correct responses marked by you in the Response Sheet.

8. Before you proceed to mark in the Response Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Response Sheet as per instructions sent to you with your Admit Card and Instructions.

9. While writing Centre, Subject and Roll No. on the top of the Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN"**.

10. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator only the Response Sheet. You are permitted to take away with you the Test Booklet.

ROUGH WORK

1. Dimensions of self inductance is :
   (A) $MLT^{-2}A^{-3}$
   (B) $ML^2T^{-1}A^{-2}$
   (C) $ML^2T^{-2}A^{-2}$
   (D) $MLT^{-2}A^0$

2. When the momentum of a body increased by 25%, then the kinetic energy is increased by :
   (A) 25%
   (B) 50%
   (C) 56.25%
   (D) 75%

3. The distance between the two nuclei of HCl is $1.27\,A^0$. If the mass of chlorine atom is 37 times than that of hydrogen, then the centre of mass of the system is at this distance from the hydrogen nucleus :
   (A) $1.20\,A^0$
   (B) $1.24\,A^0$
   (C) $1.35\,A^0$
   (D) $1.42\,A^0$

4. The centre of mass of a body :
   (A) Lies always outside body
   (B) May be within, outside or on the surface
   (C) Lies always inside the body
   (D) Lies always on the surface of the body

5. The equinoxes of the Earth are :
   (A) 21 March, 22 September
   (B) 22 March, 21 September
   (C) 2 July, 10 June
   (D) 10 August, 8 May

6. A satellite is geostationary in a particular orbit. It is allowed to be taken in another orbit having orbital radius two times to that of the earth. Time period in the second orbit is :
   (A) 48 hrs.
   (B) 24 hrs.
   (C) $48\sqrt{2}$ hrs.
   (D) 2000 hrs.

7. Two satellites of masses 50 kg and 100 kg revolve round the earth in the circular orbits of radii 9R and 16R. If R is the radius of the earth, the speed of the satellites are in the ratio :
   (A) 3/4
   (B) 4/3
   (C) 9/10
   (D) 16/9

8. A spinning top is an example of :
   (A) Uniform circular motion
   (B) Precessional motion
   (C) Oscillatory motion
   (D) Translatory motion

9. Central forces are :
   (A) Gravitational forces
   (B) Electromagnetic forces
   (C) Conservative forces
   (D) Non-conservative forces

10. Given that Poisson's ratio for silver is 0.39 and its Young's modulus is 7.2×10^{10} N/m². The bulk modulus of the silver is :

(A) 11×10^{10} N/m²   (B) 3.2×10^{10} N/m²

(C) 5.2×10^{10} N/m²   (D) 1.2×10^{10} N/m²

11. The Pitot tube works on the principle of :

(A) Prevost's theorem   (B) Maxwell's theorem

(C) Bernoulli's theorem   (D) Stoke's theorem

12. The Galilean transformations are :

(A) $x' = x + vt;\ y' = y;\ z' = z;\ t' = t$

(B) $x' = x - \dfrac{c}{vt};\ y' = y;\ z' = z;\ t' = t$

(C) $x' = x + \dfrac{c}{vt};\ y' = y;\ z' = z;\ t' = t$

(D) $x' = x - vt;\ y' = y;\ z' = z;\ t' = t$

13. If the distance of each plate is 2 m and the wavelength of monochromatic radiation is $4000\,A^0$, then the expected fringe shift in Michelson-Morley experiment is :

(A) 0.1   (B) 0.01

(C) 0.001   (D) 1.00

14. The value of coefficient of restitution in perfectly elastic collision :

(A) 0   (B) 1

(C) 0.5   (D) 2

15. The moment of inertia of a solid cylinder of mass m and radius b about its own axis is :

(A) $1/2\ mb^2$ (B) $2\ mb^2$

(C) $1/2\ m^2b^2$ (D) zero

16. The rocket works on the principle of :

(A) Conservation of mass   (B) Conservation of charge

(C) Conservation of angular momentum   (D) Conservation of linear momentum

17. Two tunning forks A and B produce 6 beats per second when sounded together. When B is loaded slightly with wax the beats reduced to 4 per second. If the frequency of A is 512 Hz, then the frequency of B is :

(A) 506 Hz   (B) 516 Hz

(C) 508 Hz   (D) 518 Hz

18. If the velocity of the sound is 350 m/s. The wavelength of ultrasonic wave of 70 kHz frequency is :
    (A) 5 m   (B) 5×10^{-3} m
    (C) 5×10^{-3} km   (D) 5 km

19. Lissajou's figures obtained by combining $x = a \sin \omega t$ and $y = a \sin(\omega t + \frac{\pi}{2})$ is :
    (A) An ellipse   (B) Straight line
    (C) Circle   (D) Parabola

20. If the tension is increased 4 times, length is doubled and area of cross-section is reduced 4 times for a stretched string, then fundamental frequency becomes :
    (A) Half   (B) One third
    (C) Four times   (D) Twice

21. If the mass of the particle is m and γ is damping constant, then the time constant is :
    (A) m γ (B) 2m/γ
    (C) γ/m   (D) None of these

22. The particle executing SHM when it passes through mean position, it has :
    (A) Maximum K.E. and maximum P.E.   (B) Maximum K.E. and minimum P.E.
    (C) Minimum K.E. and minimum P.E.   (D) Minimum K.E. and maximum P.E.

23. The types of waves in a sonometer wire is :
    (A) Longitudinal progressive waves   (B) Transverse progressive waves
    (C) Longitudinal stationary waves   (D) Transverse stationary waves

24. The length of a pendulum changes from 1 m to 1.21 m. The percentage of the change in its period is :
    (A) 20%   (B) 10%
    (C) 50%   (D) 49%

25. The period of a compound pendulum about an axis though the centre of gravity is :
    (A) Minimum   (B) Infinity
    (C) Maximum   (D) Zero

26. Which of the following have damped vibrations ?
    (A) The oscillations of simple pendulum in vacuum
    (B) The oscillations of a simple pendulum in oil
    (C) The oscillations of a swing maintained by a periodic force
    (D) None of the above

27. The velocity of the sound in air is 350 ms^{-1}. The length of an open pipe in fundamental mode in resonance with a source of 700 Hz is :
   (A) 0.25 m
   (B) 0.75 m
   (C) 0.5 m
   (D) 1 m

28. The rate of decay of the amplitude of damped vibration depends on :
   (A) Force constant
   (B) Phase
   (C) Frictional force
   (D) Velocity of sound

29. The resonance is very sharp when :
   (A) Q factor is small
   (B) Q factor is medium
   (C) Q factor is high
   (D) Q factor is constant

30. The magnitude and the velocity of a simple harmonic oscillator is maximum in :
   (A) Over damping
   (B) Critical damping
   (C) Resonance
   (D) No damping

31. A tuning fork of frequency 320 Hz is sounded on a resonance tube. The first and second resonances are obtained at 20 cm and 73 cm. Then the velocity of sound is :
   (A) 360 m/s
   (B) 380 m/s
   (C) 339 m/s
   (D) 400 m/s

32. Bats can detect their obstacles in darkness with the help of :
   (A) Ultrasonic waves
   (B) Infrasonic waves
   (C) Light waves
   (D) All the above

33. X-axis of a quartz crystal is :
   (A) Optical axis
   (B) Electrical axis
   (C) Mechanical axis
   (D) Principal axis

34. Ultrasonic waves are detected in thermal detector from :
   (A) Change of temperature
   (B) Change of pressure
   (C) Change of electric resistance of the hot filament
   (D) Change of entropy

35. Magnetostriction means :
   (A) Change of magnetism with temperature
   (B) Change of mass with magnetic field
   (C) Change of length with magnetic field
   (D) Change of magnetic poles

36. The work done by the centripetal force in one complete revolution is :
   (A) Zero
   (B) Product of the centrifugal force and mass of the body
   (C) Product of the centrifugal force and radius of the circle
   (D) Impossible to calculate

37. A man is standing on rotating table with his hands stretched out. If he suddenly lowers his arms, then angular velocity :
   (A) Remains constant
   (B) Decreases
   (C) Increases and then decreases
   (D) Increases

38. A swimmer while jumping into water from a height easily forms a loop in air if :
   (A) He pulls his arms, legs in
   (B) He spreads his arms and legs
   (C) He keeps himself straight
   (D) None of these

39. The ratio of the total energy to the rotational energy of a uniform circular disc rolling on a horizontal plane is :
   (A) 2 : 1
   (B) 1 : 1
   (C) 1 : 3
   (D) 3 : 1

40. When a body is vibrating at a frequency other than the natural frequency then, vibrations are :
   (A) Forced vibrations
   (B) Free vibrations
   (C) Damped vibrations
   (D) None of these

41. The system matrix of an optical system is :
   (A) The product of translation and refractive matrices
   (B) The sum of the translation and refractive matrices
   (C) Equals to the translation matrix
   (D) None of these

42. For nodal points which one of the following is correct ?
   (A) They have unit negative angular magnification
   (B) They have unit positive angular magnification
   (C) They don't lie on the principle axis
   (D) The distance between two nodal points doesn't equal to the distance between the principle points

43. The achromatic doublet with two lenses separated by a distance equal to the mean of their focal lenses is used in :
   (A) Microscope   (B) Telescope
   (C) Eyepiece   (D) All the above

44. Two thin converging lenses of powers 5 diopters and 4 diopters are placed co-axially 10 cm apart. Then the focal length of the combination is :
   (A) 14.3 cm   (B) 1.43 cm
   (C) 4 cm   (D) 10 cm

45. The sign of the spherical aberration produced by a concave lens is :
   (A) Negative   (B) Positive
   (C) Neutral   (D) None

46. For coma which of the following is correct :
   (A) The image formed is not in a perfect focus
   (B) The image formed has comet like shape
   (C) More than one image is formed
   (D) The image formed is multicolored

47. The focal lengths of a convergent lens made of glass having refractive index n, for violet and red colors are f_v and f_r, respectively, then :
   (A) $f_v = f_r$ (B) $f_v < f_r$
   (C) $f_v > f_r$ (D) $f_v = nf_r$

48. As the diameter of the objective lens of a telescope increases, the resolution of the telescope :
   (A) Decreases   (B) Increases
   (C) Remains the same   (D) Depends on the focal length of the lens

49. In a plane transmission grating, if the width of the ruled and unruled portions are made equal, then :
   (A) 2nd order spectrum will be shifted   (B) 2nd order spectrum will be absent
   (C) 1st order spectrum will be absent   (D) All the above

50. Sound waves generally show diffraction effects, the reason is :
    (A) The nature of the sound waves is different than that of light
    (B) Sound is a transverse as well as a longitudinal distribution
    (C) Wavelength of sound is large
    (D) Wavelength of the sound is very small

51. A calcite crystal is placed over a dot on a piece of paper and rotated. On seeing through the calcite, one will see :
    (A) Two rotating dots   (B) Two stationary dots
    (C) One dot only   (D) One dot rotating about the other

52. Unpolarized light can be converted into a partially polarized light or plane polarized light by several processes. Which of the following does not do that ?
    (A) Reflection   (B) Diffraction
    (C) Double refraction   (D) Scattering

53. Which of the following is a uniaxial crystal ?
    (A) Quartz   (B) Aragonite
    (C) Topaz   (D) All the above

54. Which of the following experiment is based on the division of wavefront ?
    (A) Newton's rings   (B) Michelson's interferometer
    (C) Biprism   (D) All the above

55. In Lloyd's mirror experiment the central fringe is dark since the phase change between the direct and reflected rays is :
    (A) 0   (B) $\pi/2$
    (C) 2π (D) π

56. Fabry-Perot interferometer works on the principle of :
    (A) Reflection at a single surface
    (B) Multiple beam interference
    (C) Interference due to division of wavefront
    (D) Diffraction

57. The dispersive power of a grating is :
   (A) Proportional to the wavelength
   (B) Proportional to the separation of lines
   (C) Proportional to intensity of light used
   (D) Independent of incident light

58. He-Ne laser is a :
   (A) Two level laser
   (B) Four level laser
   (C) Three level laser
   (D) None of these

59. In a Ruby laser population inversion is achieved by :
   (A) Electrical pumping
   (B) Chemical reaction
   (C) Optical pumping
   (D) All the above

60. Raman shift is :
   (A) Independent of frequency of incident radiation, but depends on scatterer
   (B) Independent of scatterer, but depends on the frequency of incident radiation
   (C) Independent of both the frequency of the incident radiation and scatterer
   (D) Dependent on both the frequency of the incident radiation and scatterer

61. In a thermodynamic process pressure of a fixed mass of a gas is changed in such a manner that the gas released 20 J of heat and 8 J of work done on the gas. If the initial energy of the gas was 30 J, the final internal energy level will be :
   (A) 18 J
   (B) 20 J
   (C) 58 J
   (D) 28 J

62. Zeroth law of thermodynamics corresponds to :
   (A) Conversion of heat into work
   (B) Conversion of work into heat
   (C) Heat lost equal to heat gained
   (D) Existence of temperature of the body

63. A monoatomic gas expanded adiabatically and the pressure is reduced to one eighth. Then the ratio of final volume to initial volume is :
   (A) $2^{9/5}$
   (B) $2^{5/9}$
   (C) $2^{3/5}$
   (D) $2^{5/3}$

64. 20 g of water at 0°C is mixed with 40 g of water at 10°C. The temperature of the mixture is :
   (A) –20 °C
   (B) 6.6 °C
   (C) 5 °C
   (D) 10 °C

65. A diatomic gas undergoes same change of temperature by two different processes, (i) at constant volume and (ii) at constant pressure. The amounts of heat supplied in the two cases are in the ratio :

(A) 1 : 1
(B) 3 : 2
(C) 5 : 7
(D) 7 : 5

66. A man feels iron and wooden blocks equally cold or hot at :

(A) 98.6 °C
(B) 98.6 °F
(C) 212 °C
(D) 80 °C

67. Two balls of same material and the same surface finish have their diameters in the ratio 1:2. They are heated to the same temperature and then are left in a room to cool by radiation, then the rate of cooling :

(A) Will be same for both the balls
(B) For larger ball is half that of the other ball
(C) For larger ball is twice that of other ball
(D) For larger ball is four times that of the other ball

68. The mean free path of gas at constant temperature is inversely proportional to :

(A) Pressure
(B) Square root of pressure
(C) Square of pressure
(D) Cube of pressure

69. A Carnot refrigerator takes heat from water at 0°C and discards it to the surroundings at temperature of 27°C. If 100 Kg of water at 0°C is to be changed to ice, what is the required work in joules ? (Latent heat of ice $= 3.4 \times 10^5$ joules/kg)

(A) 4.36×10^6 joules/kg
(B) 3.36×10^6 joules/kg
(C) 5.36×10^6 joules/kg
(D) 6.36×10^6 joules/kg

70. A black body radiates energy at the rate of E watt/m^2 at a high temperature T °K. When the temp. is reduced T/2 °K, the radiant energy will be :

(A) E/2
(B) 2E
(C) E/4
(D) E/16

71. Find the quantity of heat required to increase the volume of 1 litre of air at N.T.P. to double its volume at constant pressure. Density of air at N.T.P. is 0.001293 gcm^{-3}, specific heat of air at constant volume = 0.618 cal g^{-1} $^{\circ}$C^{-1} :
    (A) 83 cal
    (B) 92 cal
    (C) Zero
    (D) 12.6 cal

72. In a diesel engine, the cylinder compresses air from approximately standard pressure and temperature to about one-sixteenth the original volume and a pressure of about 50 atm. What is the temperature of the compressed air ?
    (A) 835 K
    (B) 853 K
    (C) 558 K
    (D) 658 K

73. When dQ calories of heat supplied to a gas its internal energy is increased by dU Joules and work done by the gas is dW joules, then :
    (A) dU = dQ + dW
    (B) dU = dQ – dW
    (C) dU = dQ/J – dW
    (D) dU = JdQ – dW

74. The slopes of isothermal and adiabatic curves are related as :
    (A) Isothermal curve slope = adiabatic curve slope
    (B) Isothermal curve slope = γ adiabatic curve slope
    (C) Isothermal curve slope = 1/γ × adiabatic curve slope
    (D) Adiabatic curve slope = 1/2 × isothermal curve slope

75. A vessel is filled with an ideal gas at a pressure of 10 atmospheres and temperature of 27 $^{\circ}$C. If half of the mass is removed from the vessel and temperature of the remaining gas is increased to 87 $^{\circ}$C, then the pressure of the gas in the vessel will be :
    (A) 3 atm
    (B) 6 atm
    (C) 7 atm
    (D) 8 atm

76. At 0 $^{\circ}$C fluids are assumed to have :
    (A) Minimum entropy
    (B) Maximum entropy
    (C) Zero entropy
    (D) Fixed value of entropy

77. A second order phase transition is characterized by :
   (A) Latent heat
   (B) A discontinuous change in its specific heat
   (C) A change in volume
   (D) Irreversible behavior during warming and cooling

78. If the temperature of the gas molecules is increased to 4 times of its value, then the r.m.s. speed of the molecules will be :
   (A) Quadrupled   (B) Doubled
   (C) Halved   (D) Unchanged

79. The specific heat of an electron gas :
   (A) Approaches the value 3/2 R at low temperatures
   (B) Increases linearly at high temperatures
   (C) Approaches the value 3/2 R at high temperatures
   (D) None of these

80. The law that governs the ratio of spectral emissive and absorptive powers of a body at a given temperature is called as :
   (A) Wien's law   (B) Stefan's law
   (C) Kirchoff's law   (D) Displacement law

81. In the charge distribution shown in the figure below, the electric field at Gaussian surface (shown in dotted lines) will be due to the total charge of :
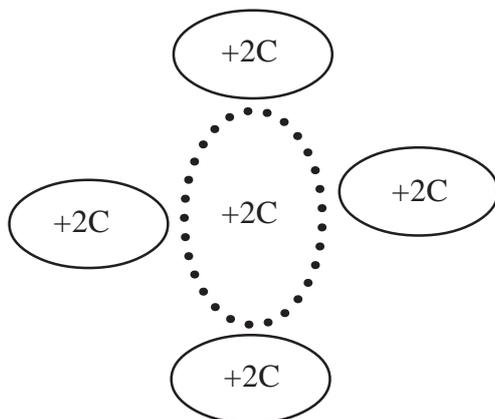
   (A) 14 C   (B) 2 C
   (C) 6 C   (D) 10 C

82. When a water bubble is charged :
    (A) It contracts
    (B) It expands
    (C) It does not undergo any change in size
    (D) None of these

83. It requires 50 µJ of work to carry a 2 µC charge from the point R to S. Then the potential difference between the points is :
    (A) 25 V   (B) 60 V
    (C) 70 V   (D) Zero

84. Two capacitors, $C_1 = 3$ µF and $C_2 = 6$ µF are connected in series and charged by connecting a battery of voltage 10 V in series with them. If they are disconnected from the battery, and connected together, then the charge on each capacitor become :
    (A) $Q_1 = 30$ µC, $Q_2 = 60$ µC   (B) $Q_1 = 60$ µC, $Q_2 = 30$ µC
    (C) $Q_1 = Q_2 = 0$ (D) $Q_1 = Q_2 = 5$ µC

85. What is the magnitude of polarization of a dielectric material which is kept in electric field of 0.15 MV/m and $\chi_e = 4.25$, $\varepsilon_0 = 8.85 \times 10^{-12}$ C/m ?
    (A) 5.64 µC/m^2 (B) 0.562 µC/m^2
    (C) 7.24 µC/m^2 (D) Zero

86. In a millikan oil drop experiment, an oil drop carries four unit electric charges and has a mass of 1.8×10^{-12}g. It is held almost at rest between two horizontal charge plates of 1.8 cm apart. Then the voltage between the charge plates is ($q = 1.6 \times 10^{-19}$ C, $g = 980$ cm/sec^2) :
    (A) 469 V   (B) 750 V
    (C) 50 V   (D) 90 V

87. A conducting circular loop of radius r carries a constant current i. It is placed in a uniform magnetic field B_0 such that B_0 is perpendicular to the plane of the loop. The magnetic force acting on the loop is :
    (A) irB_0 (B) $2\pi irB_0$
    (C) zero   (D) iB_0

88. A He^{2+} ion travels at right angles to a magnetic field of 0.80 T with a velocity of 10^5 m/s. Find the magnitude of the magnetic force on the ion :

(A) 2.56×10^{-14} N (B) 0.256×10^{-14} N

(C) 3.56 N (D) 6.34×10^{-14} N

89. In an ac circuit the inductive reactance is 20 Ω, the capacitive reactance is 60 Ω, the resistance is 30 Ω. Then the value of impedance in the circuit is :

(A) 120 Ω (B) 100 Ω

(C) 99.9 Ω (D) 50 Ω

90. If the Q factor of the coil $\omega_0 L/R$ is measured by varying the frequency :

(A) The plot between Q and frequency is linear

(B) The value of Q initially decreases with increase of frequency and afterwards increases with increase of frequency

(C) The value of Q initially increases with increase of frequency and afterwards decreases with increase of frequency

(D) The Q value is constant with frequency

91. The direction of propagation of electromagnetic wave is given by :

(A) E . B (B) E

(C) B (D) $E \times B$

92. The Hall coefficient of a metal is low. It means that :

(A) The charge carrier density in that metal is high

(B) The charge carrier density in that metal is low

(C) The Hall field produced in that metal is high

(D) The conductivity of that metal is zero

93. The Curie's law holds for :

(A) Diamagnetic substances (B) Paramagnetic substances

(C) Ferromagnetic substances (D) All substances

94. The radius of the first orbit of hydrogen atom is :

(A) 1.5 A° (B) 0.40 A°

(C) 0.5 A° (D) 0.3 A°

95. When the Bohr's formula is used to calculate ionization energy of helium it is found to be higher than the experimentally measured value due to :
   (A) Electron-electron interaction
   (B) Spin-orbit interaction
   (C) Spin-spin interaction
   (D) None of these

96. As the wavelength of the X-rays is smaller than that of visible light, the speed of X-rays in vacuum is :
   (A) Same as that of the visible light
   (B) Larger than that of the visible light
   (C) Smaller than that of the visible light
   (D) None of these

97. The difference between the soft and hard X-rays is of :
   (A) Velocity
   (B) Intensity
   (C) Frequency
   (D) Polarization

98. Photoelectric effect can be explained on the basis of :
   (A) Wave theory of light
   (B) Corpuscular theory of light only
   (C) Still remains unexplained
   (D) Quantum theory alone

99. In Compton effect :
   (A) The wavelength of the scattered photon is larger than the incident photon
   (B) The K.E. of the electron is largest when the incident and scattered photons moves in opposite direction
   (C) The electron can acquire a kinetic energy equal to the energy of incident photon
   (D) All above

100. Weak nuclear force acts on :
   (A) Both hadrons and leptons
   (B) Hadrons only
   (C) Leptons only
   (D) All charged particles

101. Which of the following material can be used as an alternate fuel in the fusion process ?
   (A) $_{92}U^{238}$
   (B) $_{36}K^{86}$
   (C) $_{7}N^{14}$
   (D) $_{90}Th^{232}$

102. Typical energies released in the nuclear fission and nuclear fusion per event are respectively :
   (A) 50 MeV and 1000 MeV
   (B) 200 MeV and 1000 MeV
   (C) 5000 MeV and 1000 MeV
   (D) 200 MeV and 10 MeV

103. The quarks are supposed to exist in following number of flavours :
   (A) Two   (B) Four
   (C) Six   (D) Sixteen

104. Find the de Broglie wavelength of a neutron traveling at a speed of 2200 m/s
   ($h = 6.63 \times 10^{-34}$ J-s, $m_n = 1.67 \times 10^{-27}$ kg) :
   (A) 0.18 nm   (B) 1.8 nm
   (C) 80 nm   (D) 100 nm

105. Which of the following statement is wrong ?
   (A) Neutrino has spin 1/2   (B) Neutrino has zero rest mass
   (C) Neutrino does not interact with matter (D) Neutrino has charge equal to 1.6×10^{-19} C

106. One Bequeral is defined as :
   (A) 1 disintegration per sec   (B) 10^6 disintegrations per sec
   (C) 3.7×10^{10} disintegrations per sec   (D) 10^3 disintegrations per sec

107. The particle which easily penetrates through the nucleus of an atom is :
   (A) Electron   (B) Neutron
   (C) Proton   (D) Alpha particle

108. In a triode, the plate potential increases by 24 V to hold constant plate current when the grid
   potential changes from –1.8 to –3 V. Then the amplification factor of the triode is :
   (A) 10   (B) 30
   (C) 20   (D) 0.05

109. In a p-n junction the depletion region is created by :
   (A) Ionization   (B) Diffusion
   (C) Recombination   (D) All of the above

110. When a voltmeter is placed across a forward biased diode, it will read a voltage approximately
   equal to :
   (A) The bias battery voltage   (B) The diode barrier voltage
   (C) 0 V   (D) The total circuit voltage

111. A 60 V peak full wave rectified voltage is applied to a capacitor input filter. If f = 120 Hz, R_L = 10 kΩ and C = 10 μF, the ripple voltage is :

(A) 0.6 V
(B) 6 mV
(C) 5 V
(D) 2.88 V

112. When operated in cutoff and saturation regions, the transistor acts like a :

(A) A linear amplifier
(B) A switch
(C) A variable capacitor
(D) A variable resistor

113. For the operation as an amplifier, the base of an npn transistor must be :

(A) Positive with respect to the emitter
(B) Negative with respect to the emitter
(C) Negative with respect to collector
(D) 0 V

114. An oscillator differs from an amplifier because :

(A) It has more output
(B) It requires no input signals
(C) It requires no dc supply
(D) It always has the same output

115. For oscillations to occur, the gain around the feed back circuit must initially be :

(A) Zero
(B) One
(C) Less than one
(D) Greater than one

116. The cathode of a zener diode in a voltage regulator is normally :

(A) More positive than anode
(B) More negative than anode
(C) At +0.7V
(D) Ground

117. A diode that has a negative resistance characteristics is the :

(A) Schottky diode
(B) Tunnel diode
(C) Laser diode
(D) Hot-carrier diode

118. The OR gate operation can be produced with :

(A) Two AND gates
(B) Three AND gates
(C) Three NAND gates
(D) One NOR gate

119. The active devices used in digital circuits generally operate as :

   (A) Waveform generator   (B) Rectifiers

   (C) Switches   (D) Amplifiers

120. In an npn transistor circuit, the collector current is 15 mA. If 95 percent of the electrons emitted reach the collector, then the base current is :

   (A) 0.79 mA   (B) 0.79 A

   (C) 5.0 mA   (D) 0 A

ROUGH WORK