PREVIOUS YEAR PAPER

UP PGT 2021 — Physics (Series A)

UP PGT · 17 or 18 August 2021

125 questions · +3.4 for a correct answer, −0 for a wrong one · 120 minutes

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Questions from the U.P. Secondary Education Services Selection Board's paper of 17 or 18 August 2021. Each question is followed by its answer, and the answer key is repeated on the last page.

Take it as a timed practice test: exambharo.com/up-pgt/previous-year-papers/up-pgt-2021-physics-series-a/

Physics

1. Identify the incorrect statement.

(a) Radioactivity makes it possible to establish the age of many geological and biological specimens.

(b) Radiocarbon is the beta-active carbon isotope $^{1}46C$.

(c) Living plants and animals have different ratio of radiocarbon to ordinary carbon.

(d) Cosmic rays are high energy atomic nuclei chiefly protons.

Answer: (c)

2. The dynamic plate resistance r_p, mutual conductance g_m and amplification factor μ of a triode valve are related to each other as

(a) $r_p = \mu.g_m$

(b) $g_m = \mu.r_p$

(c) $\mu = r_p.g_m$

(d) $r_p^2 = \mu^2 + g_m^2$

Answer: (c)

3. The displacement equation of oscillations of a particle executing simple harmonic motion is $x = 5 \sin(0.2\pi t + 0.5\pi)$
The time period of particle is

(a) 10.0 s

(b) 1.0 s

(c) 0.8 s

(d) 0.5 s

Answer: (a)

4. A car moving at 30 m/s is approaching a factory, whose whistle has a frequency of 500 Hz. If the speed of sound in air is 340 m/s, what is the apparent frequency of whistle as heard by the car driver ?

(a) 480 Hz

(b) 500 Hz

(c) 544 Hz

(d) 600 Hz

Answer: (c)

5. The Kinetic energy per unit volume of a perfect gas is equal to
Where P is pressure.

(a) (2/3)P
(b) (3/2)P
(c) P/3
(d) (1/2)P

Answer: (b)

6. Anderson's Bridge is used for measurement of

(a) Capacitance
(b) Self-inductance
(c) Resistance
(d) Frequency of AC supply

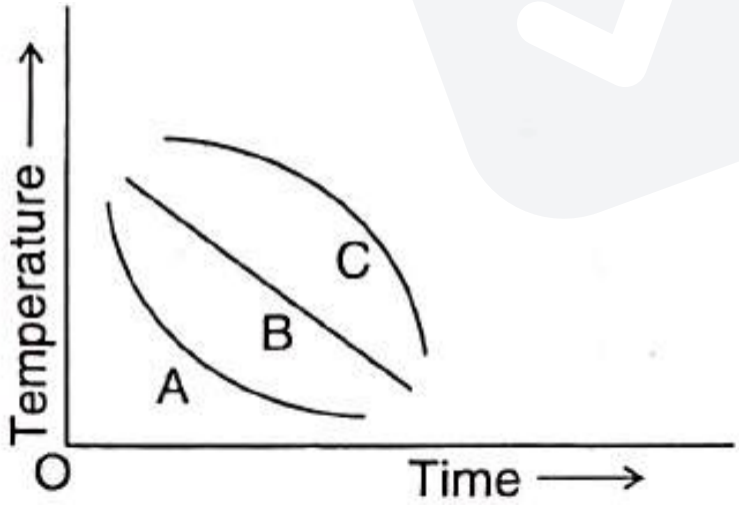
Answer: (b)

7. Newton's law of cooling is a special case of

(a) Stefan's law
(b) Kirchhoff's law
(c) Planck's law
(d) Wien's displacement law

Answer: (a)

8. A block of steel heated to 100° C is left in a room t ool. Which of the curves shown in figure, represents the correct behaviour ?



(a) A
(b) B
(c) C
(d) None

Answer: (a)

9. The wavelength of k_α x-ray line of an element of atomic number z = 11 is λ. The wavelength of k_α x-ray line of another element of atomic number z is 4λ. Then z is

(a) 11

(b) 44

(c) 6

(d) 4

Answer: (c)

10. An electrical heater is labeled 1500 W/220 V. How much current does this heater draw from a 220 V source ?

(a) 5.1 A

(b) 6.8 A

(c) 9.2 A

(d) 10.0 A

Answer: (b)

11. For a van der Waals gas the inversion temperature at low pressure is

(a) 27a/(bR)

(b) a/(8Rb)

(c) ab/(8R)

(d) 2a/(Rb)

Answer: (d)

12. Infinite equal charges q are placed along a line at distances 1 meter, 2 meter, 4 meter, 16 meter, 32 meter and so on. Potential due to all charges at

(a) Zero

(b) $q/(4\pi\in 0)$

(c) $q/(2\pi\in 0)$

(d) $q/(8\pi\in 0)$

Answer: —

13. Eight equal drops of water are falling through air with a steady velocity of 5 cm/sec. If the drops coalesce, what will be the new terminal velocity ?

(a) 5 cm/s

(b) 10 cm/s

(c) 20 cm/s

(d) 40 cm/s

Answer: (c)

14. The length of an object is measured as 1.526 m. Taking significant figures into account, the absolute error, relative error and percentage error are

(a) 0.0001 m, 0.000065, 0.065%

(b) 0.001 m, 0.00065, 0.065%

(c) 0.001 m, 0.001, 0.1%

(d) 0.0001 m, 0.0001, 0.1%

Answer: (b)

15. When the plate voltage applied to a diode valve is changed from 48 V to 50 V, the plate current increases from 60 mA to 70 mA. What is the dynamic plate resistance of the diode ?

(a) 200 Ω

(b) 180 Ω

(c) 150 Ω

(d) 120 Ω

Answer: (a)

16. Two thin lenses, of focal lengths +15 cm and −12 cm, are placed in contact. The focal length of the combination lens will be

(a) + 3 cm

(b) + 15 cm

(c) – 12 cm

(d) – 60 cm

Answer: (d)

17. The critical angle is maximum when light travels from

(a) water to air

(b) glass to air

(c) glass to water

(d) air to water

Answer: (c)

18. The ratio of masses of a pion and an electron is about

(a) 270

(b) 50

(c) 20

(d) 5

Answer: (a)

19. At what temperature of a body, the Fahrenheit and Kelvin thermometer scales give equal numerical values ?

(a) 40°

(b) 180°

(c) 435°

(d) 574°

Answer: (d)

20. Fibre optics works on the principle of

(a) Snell's law

(b) Total internal reflection

(c) (A) and (B) both

(d) Population inversion

Answer: (b)

21. Which of the following is path dependent ?
Where U = Internal Energy
P = Pressure
V = Volume

(a) U

(b) PdV

(c) P

(d) V

Answer: (b)

22. What is the potential difference between the centre and the surface of a sphere of radius R with uniform charge density e within it ?

(a) $eR^2/(3\in 0)$

(b) $eR^2/(6\in 0)$

(c) $eR^2/(2\in 0)$

(d) zero

Answer: (b)

23. For a given material the value of Young's ..s (Y) is 2.4 times of its modulus of rigidity (η), the value of Poisson's ratio of the material is

(a) 2.4

(b) 1.2

(c) 0.4

(d) 0.2

Answer: (d)

24. Which of the following circuit is being used in impedance matching ?

(a) transistor in common base configuration

(b) transistor in common emitter configuration

(c) transistor in common collector configuration

(d) zener diode in reverse bias

Answer: (c)

25. A satellite is revolving round the earth at a height of 600 km from the surface of earth. The speed of the satellite is (Radius of the earth = 6400 km, mass of the earth : 6×10^24 kg. G = 6.67×10^{-11} N-m²/kg²)

(a) 11.00 km/s

(b) 9.00 km/s

(c) 7.60 km/s

(d) 4.92 km/s

Answer: (c)

26. For $\mu_o = 1.544$, $\mu_E = 1.558$ and $\lambda = 6500$ Å, the thickness of a quarter wave plate is
Here notations carry their usual meaning.

(a) 10.0 µm

(b) 11.6 µm

(c) 0.25 µm

(d) 0.28 µm

Answer: (b)

27. Kirchhoff's Laws are applicable to

(a) DC only

(b) AC only

(c) AC and DC both

(d) None of the above

Answer: (c)

28. If 25% of a radioactive material decays in 5 years, how much of the original material will be left undecayed after 20 years ?

(a) 5%

(b) 10%

(c) 25%

(d) 32%

Answer: (d)

29. A dipole is formed by two charges of 5µC and −5µC at a distance of 8 mm. Find electric field at i) a point 25 cm away from dipole centre at its axis and ii) a point 20 cm away on a line perpendicular to the axis and passing through its centre

(a) 6 × 106 N/C, 4.5 × 104 N/C

(b) 4.6 × 104 N/C, 4.5 × 104 N/C

(c) − 4.6 × 104 N/C, 4.5 × 104 N/C

(d) 4.5 × 104 N/C, 6 × 106 N/C

Answer: (c)

30. In a driven series LCR circuit, the resonant frequency f_r is given by

(a) $f_r = 1/(2\pi\sqrt{(LC)})$

(b) $f_r = 2\pi\sqrt{(LC)}$

(c) $f_r = 2\pi\sqrt{(L/C)}$

(d) $f_r = 2\pi\sqrt{(C/L)}$

Answer: (a)

31. At constant pressure the temperature of gas T, at which root–mean–square velocity is twice its value at 0°C, is

(a) 819° K

(b) 900° K

(c) 980° K

(d) 819° C

Answer: (d)

32. A galvanometer has a resistance of 80 Ω and deflects full scale for a potential of 20 mV across it. How large a series resistance is required to convert it to a 5V voltmeter ?

(a) 4920 Ω

(b) 5220 Ω

(c) 10520 Ω

(d) 19920 Ω

Answer: (d)

33. A Carnot cycle is represented on an entropy-ter erature diagram by which one of the following figures ?

(a)



(b)



(c)



(d)



Answer: (b)

34. The mean Kinetic energy of one mole of gas per degree of freedom (on the basis of Kinetic theory of gases) is

(a) (1/2)KT
(b) (3/2)KT
(c) (3/2)RT
(d) (1/2)RT

Answer: (d)

35. In central force motion which one of the following physical quantity is conserved ?

(a) Angular momentum
(b) Kinetic energy
(c) Linear momentum
(d) Total energy

Answer: (a)

36. The best filter used in a power supply is

(a) L – section filter
(b) Capacitor input filter
(c) Choke input filter
(d) π – section filter

Answer: (d)

37. Viscosity of a gas is due to transport of

(a) momentum
(b) energy
(c) mass
(d) none of these

Answer: (a)

38. The gain in potential energy of an object of mass m raised from the surface of earth to a height equal to the radius R of the earth, is (g = acceleration due to gravity at the earth's surface).

(a) (3/2)mgR
(b) (1/2)mgR
(c) (2/3)mgR
(d) mgR

Answer: (b)

39. The peak voltage in a 240V A.C. source is

(a) 240 V
(b) 300 V
(c) 340 V
(d) 380 V

Answer: (c)

40. Two coherent sources of intensity ratio 100 : 1 interfere. The ratio of intensity between maxima and minima is

(a) 100 : 1

(b) 10 : 1

(c) 11 : 9

(d) 121 : 81

Answer: (d)

41. In a Young's double slit experiment the slit separation is 0.12 mm, the wavelength of light used is 5893 A° and interference pattern is observed on a screen 1m away. The separation between successive bright fringes will be

(a) 6.50 mm

(b) 5.50 mm

(c) 4.91 mm

(d) 4.50 mm

Answer: (c)

42. An achromatic combination of two thin lenses of focal lengths f1 and f2, is achieved if separation between them is equal to

(a) f1/2

(b) (1/2)(f1 + f2)

(c) f2/2

(d) (1/2)(f1 – f2)

Answer: (b)

43. The mean separation of two points on mo[illegible] can be resolved by a 500 cm telescope aperture is (distance of the moon is 4 × 105 km, eye is most sensitive to wavelength 5500 Å)

(a) 40 m

(b) 43 m

(c) 53.6 m

(d) 50.6 m

Answer: (c)

44. The light from the sun has maximum intensity for the wavelength of 470 nm. Assuming that the surface of the sun emits as a blackbody, calculate the temperature of the sun. (Wien's constant = 0.288 cm. °K)

(a) 8000°K

(b) 7000°K

(c) 6128°K

(d) 5000°K

Answer: (c)

45. Two Nicols are crossed to each other. Now, one of them is rotated through 30°. What percentage of incident polarised light will pass through the system ?

(a) 100%
(b) 75%
(c) 25%
(d) 12.5%

Answer: —

46. The process of changing a weak signal without altering its shape into a strong one is known as

(a) Biasing
(b) Rectification
(c) Modulation
(d) Amplification

Answer: (d)

47. The potential energy U(x) of a particle executing S.H.M. is

(a) U(x) = constant
(b) U(x) = Ae^(−bx)
(c) U(x) = (1/2)K(x − a)²
(d) U(x) = K1x + K2x²

Answer: (c)

48. The magnetic susceptibility χ of a material varies with absolute temperature T as χ = C/T where C is a constant. This material is

(a) paramagnetic
(b) diamagnetic
(c) ferromagnetic
(d) ferrimagnetic

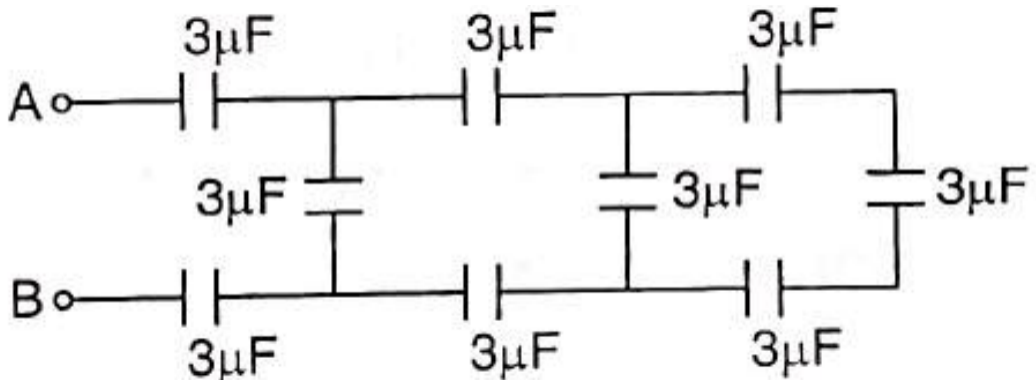
Answer: (a)

49. Thermal conductivity of bad conductors is measured by

(a) Searle's method
(b) Lee's disc method
(c) Callendar and Barne's method
(d) None of the above

Answer: (b)

50. In the following circuit if between point A and B, a potential of 100 volt is established, then find value of charge of the nearest capacitor to point A.



(a) 100 μC

(b) 300 μC

(c) 150 μC

(d) 200 μC

Answer: —

51. 0.0314 cm^3 of a liquid is flowing out per second through a capillary tube of 1 mm radius. Velocity of the liquid at a point on the axis of the capillary is

(a) 2 cm/s

(b) 1.5 cm/s

(c) 1 cm/s

(d) 0

Answer: (a)

52. The average value of I from t = 0 to t = T, if $I = I_0\sin^2\omega t$ where $\omega = 2\pi/T$, is

(a) 2I0

(b) 3I0

(c) I0/2

(d) I0/3

Answer: (c)

53. Mark the wrong statement.

(a) The characteristic X-ray spectrum consists of sharp peaks superimposed on the continuous spectrum.

(b) The characteristic X-rays from substances of higher atomic number are of longer wavelength than those from lower atomic number.

(c) X-rays from higher atomic number are more penetrating.

(d) Characteristic X-rays are generated when an electron from a higher inner shell jumps to lower.

Answer: (b)

54. The current in an AC circuit is wattless when the phase difference between current and voltage is

(a) zero

(b) π/4

(c) π/2

(d) π

Answer: (c)

55. The mean free path of molecules of a certain gas at pressure p and temperature T is 2 × 10−7 m. The mean free path for the same gas at pressure p/2 and temperature 2T, will be

(a) 10 × 10−7 m

(b) 8 × 10−7 m

(c) 6 × 10−7 m

(d) 4 × 10−7 m

Answer: (b)

56. Two waves y1 = A1 sin k(x − ut) and y2 = A2 sin k(x − ut + x0), where k = 2π cm^{-1} and x0 = 1.50 cm are superposed. If A1 = 9.00 mm and A2 = 7.00 mm, what is the amplitude of the resulting wave ?

(a) 16.0 mm

(b) 8.0 mm

(c) 2.0 mm

(d) 1.0 mm

Answer: (c)

57. The function of a detector is to demodu[illegible] the [illegible]odulated carrier wave and the steps for the process are

(a) Demodulation and filtering

(b) Demodulation and rectification

(c) Rectification and filtering

(d) Generation and filtering

Answer: (c)

58. An air core solenoid with 2000 loops in it, is 60 cm long and has a diameter of 2 cm. If a current of 5A is sent through it, the flux density within it will be

(a) 0.042 T

(b) 0.035 T

(c) 0.030 T

(d) 0.021 T

Answer: (d)

59. Consider a solid cylinder of mass M and radius R rolling down an inclined plane without slipping from a height h. The speed of its centre of mass when the cylinder reaches the bottom, is

(a) $\sqrt{(4/3)gh}$

(b) $\sqrt{2gh}$

(c) $\sqrt{(3/2)gh}$

(d) $\sqrt{(3/5)gh}$

Answer: (a)

60. Two charges q1 and q2 are placed close to each other, if a third charge q3 is brought near to it, the force now exerted by q1 on q2

(a) increases

(b) decreases

(c) remains the same

(d) reduces to zero

Answer: (c)

61. The greatest length of a wire that can be stretched without breaking. (Given breaking stress = 7.2 × 108 N/m², density of wire = 7.8 × 10³ kg/m³)

(a) 10 metre

(b) 9.4 metre

(c) 9.4 kilometre

(d) 100 metre

Answer: (c)

62. The elementary particles responsible f[illegible]oldi[illegible]ucleons together to form atomic nuclei are

(a) Gluons

(b) Mesons

(c) Bosons

(d) Neutrinos

Answer: (b)

63. Which of the following is a reversible process ?

(a) Production of heat by the passage of current through an electrical resistance

(b) Conduction of heat from a hot body to a colder body

(c) The changes in the pressure and volume of the working substance takes place at infinitely slow rate

(d) Forcing of a real gas or liquid through a valve or porous plug while keeping them insulated with the environment

Answer: (c)

64. The source of solar energy is

(a) burning of hydrogen

(b) nuclear fission reactions

(c) nuclear fusion reactions

(d) radiant energy received from other solar systems

Answer: (c)

65. What is the capacitance of the earth if it is assumed to be a spherical conductor of radius 6400 Km ?

(a) 711 μF

(b) 640 μF

(c) 900 μF

(d) 1406 F

Answer: (a)

66. A spherical body with radius 12 cm radiates 450 W power at 500 K. If the radius were halved and the temperature doubled, what would be the power radiated ?

(a) 900 W

(b) 7200 W

(c) 3600 W

(d) 1800 W

Answer: (d)

67. The ratio of most probable speed and average s ed of a gas enclosed in a vessel is

(a) $\sqrt{\pi}/4$

(b) 1

(c) $\sqrt{\pi}/2$

(d) $2/\sqrt{\pi}$

Answer: (c)

68. The mean free path of thermal neutrons in ^{113}Cd is (Given : $n\sigma = 1.12 \times 104\ m^{-1}$, n → number of atoms per cubic metre, σ → capture cross section)

(a) 0.2678 mm

(b) 0.1786 mm

(c) 0.0892 mm

(d) 0.1339 mm

Answer: (c)

69. Maximum rectification efficiency of a half-wave rectifier is

(a) 40.6%

(b) 50.0%

(c) 81.2%

(d) 100.0%

Answer: (a)

70. For incidence at Brewster's angle, the angle between reflected and refracted rays, is

(a) 120°

(b) 90°

(c) 70°

(d) 60°

Answer: (b)

71. An object of mass M moving with velocity v explodes and breaks up into three equal pieces. Immediately after the explosion two pieces become stationary, but the third piece keeps moving. What is the kinetic energy of this piece ?

(a) $2\ Mv^2$

(b) $(3/2)Mv^2$

(c) Mv^2

(d) $(1/2)Mv^2$

Answer: (b)

72. The streamline flow of an incompressible and non-viscous liquid is described by

(a) Boyle's law

(b) Poiseuille's law

(c) Archimedes principle

(d) Bernoulli's principle

Answer: (d)

73. The flux of the electric field strength through ea of the faces of a closed cube of edge length l, if a charge q is placed at its centre, is

(a) $q/(6\in 0l^2)$

(b) $q/(6\in 0l)$

(c) $q/(6\in 0)$

(d) $q/(6\in 0l^3)$

Answer: (c)

74. 20 μA current is flowing in a wire for 30 seconds. The number of electrons passing through wire is

(a) 375×10^{13}

(b) $375 \times 10^{1}5$

(c) $375 \times 10^{1}6$

(d) $375 \times 10^{1}7$

Answer: (a)

75. A cube of aluminium of side 10 cm is subjected to a shearing force of 100 N. The top surface of the cube is displaced by 0.01 cm with respect to bottom. The value of modulus of rigidity is

(a) 104 N/m²

(b) 10^3 N/m²

(c) 107 N/m²

(d) 10−5 N/m²

Answer: (c)

76. A coil having inductance 0.15 H and resistance 15Ω is connected across a 220 V, 50 Hz line. Compute the current in the coil.

(a) 4.45 A

(b) 4.25 A

(c) 4.00 A

(d) 3.50 A

Answer: (a)

77. Two interfering waves have intensities in the ratio 9 : 1. The ratio of maximum and minimum intensities, in interference pattern, will be

(a) 5 : 4

(b) 2 : 1

(c) 25 : 16

(d) 4 : 1

Answer: (d)

78. The internal radius of a 1 m long resonance tube is 3 cm. With a tuning fork of frequency 2000 Hz, the first resonating position is 4.6 cm and the second resonating position is 14.0 cm. Speed of sound at the room temperature is

(a) 336 m/s

(b) 376 m/s

(c) 332 m/s

(d) 340 m/s

Answer: (b)

79. The efficiency of a Carnot engine is 25%. If the temperature of its source is 327°C, the temperature of the sink must be

(a) 82°C

(b) 127°C

(c) 177°C

(d) 227°C

Answer: (c)

80. A driven (forced) harmonic oscillator has settled down to a steady state of oscillation. In steady state, the ratio of average power absorbed and average power dissipated will be

(a) 1/3
(b) 1/2
(c) 1
(d) 2

Answer: (c)

81. The value of grad (1/r) is

(a) $-\vec{r}/r$
(b) zero
(c) $-\vec{r}/r^3$
(d) $-\vec{r}/r^2$

Answer: (c)

82. The electric potential due to dipole p, at a point distant r from it and in the direction θ from the dipoles is

(a) $(1/(4\pi\in 0))\ (p\ \cos\theta/r^2)$
(b) $(1/(4\pi\in 0))\ (p/r^3)$
(c) $(1/(4\pi\in 0))\ (p\ \sin\theta/r^2)$
(d) $(1/(4\pi\in 0))\ (p\ \tan\theta/r^2)$

Answer: (a)

83. The radius of the orbit of a satellite is 16 times t' adius of the orbit of a geo-stationary satellite. The period of the satellite is

(a) 4 days
(b) 16 days
(c) 64 days
(d) 96 days

Answer: (c)

84. $\vec{J} = \sigma\vec{E}$, where J is current density, σ is conductivity and E is electric field, is

(a) Maxwell's equation
(b) Continuity equation
(c) Ampere's law
(d) A form of Ohm's law

Answer: (d)

85. A rectangular glass plate of refractive index 1.5 is used as a polarizer. The corresponding polarizing angle will be

(a) 43.7°
(b) 33.7°
(c) 56.3°
(d) 23.4°

Answer: (c)

86. Planck's radiation law reduces to Wien's law for

(a) higher λ

(b) lower λ

(c) higher temperature

(d) lower temperature

Answer: (b)

87. The displacement current arises due to

(a) positive charges only

(b) negative charges only

(c) both positive and negative charges

(d) time varying electric field

Answer: (d)

88. Two lenses have dispersive powers in ratio 2 : 3. These glasses are used to make achromatic lens of focal length 20 cm. The value of focal lengths of two lenses are

(a) f1 = 5 cm, f2 = − 10 cm

(b) f1 = −10 cm, f2 = 10 cm

(c) f1 = 6.67 cm, f2 = − 10 cm

(d) f1 = 10 cm, f2 = − 10 cm

Answer: (c)

89. If the resultant $\vec{R}$ of two vectors $\vec{P}$ and $\vec{Q}$ is such that $R^2 = P^2 + Q^2$, the angle between vector $\vec{P}$ and $\vec{Q}$ is

(a) zero

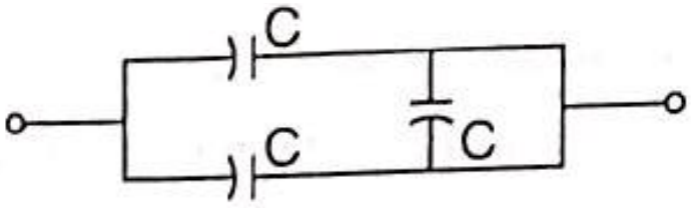
(b) 45°

(c) 60°

(d) 90°

Answer: (d)

90. The equivalent capacitance of the combination shown in figure below, is



(a) 3C

(b) 2C

(c) C

(d) C/2

Answer: (b)

91. Torsional couple required to twist a cylinder of length L/2, radius r and modulus of rigidity η by one turn will be

(a) $2\pi^2\eta r4/L$

(b) $\pi\eta r4/(2L)$

(c) $\pi^2\eta r4/L$

(d) $360\pi\eta r4/L$

Answer: (a)

92. The photoelectric threshold wavelength for a metal is 3000 Å. What is the kinetic energy of an electron ejected from it by radiation of wavelength 1200 Å ?

(a) 6.2 eV

(b) 3.1 eV

(c) 1.65 eV

(d) 1.03 eV

Answer: —

93. If 1.20 V potential difference must be applied to stop the fastest photoelectrons emitted by a nickel surface under the action of ultraviolet light of wavelength 2000 Å, calculate the work function of nickel.

(a) 6.21 eV

(b) 5.01 eV

(c) 4.80 eV

(d) 4.50 eV

Answer: (b)

94. A half-wave plate produces a phase diffe etween O (ordinary) and E (extraordinary) waves equal to

(a) π/2

(b) 3π/2

(c) π

(d) π/4

Answer: (c)

95. Which one of the following is used as a coolant/moderator in a nuclear reactor ?

(a) Distilled water

(b) Fresh water

(c) Heavy water

(d) Ice

Answer: (c)

96. A water drop of radius 10^{-2} m is broken into 1000 equal droplets. If the surface tension of water is 0.075 N/m, the gain in surface energy will be

(a) 8.5×10^{-4} J

(b) 8.1×10^{-4} J

(c) 7.7×10^{-4} J

(d) 7.5×10^{-4} J

Answer: (a)

97. The average binding energy per nucleon of most nuclei is of the order of

(a) 10^{-12} eV

(b) 10^{-12} MeV

(c) 10^{-12} BeV

(d) 10^{-12} J

Answer: (d)

98. The numerical aperture of a microscope is given by

(a) μ/sin i

(b) μ sin i

(c) sin i/μ

(d) $\sin^{-1}$ i/μ

Answer: (b)

99. A tuning fork of frequency 260 Hz is vibrated wi sonometer wire and 5 beats are heard. If the tension in the wire is slightly increased, the bea equency also increases. The original frequency of the sonometer is

(a) 265 Hz

(b) 260 Hz

(c) 255 Hz

(d) 250 Hz

Answer: (a)

100. If r0 is the radius of the first (n = 1) Bohr orbit in a hydrogen atom, the radius of the fourth (n = 4) orbit is given by

(a) 16 r0

(b) 4r0

(c) (1/4)r0

(d) (1/16)r0

Answer: (a)

101. An adiabatic process is also known as

(a) isothermal

(b) isobaric

(c) isoentropic

(d) isochoric

Answer: (c)

102. An iron plate 2 cm thick has a cross-section of 5000 cm². Its one side is at 110°C and the other side is at 100°C. If thermal conductivity of iron is 0.115 cal/s-cm-°C, the rate of heat flow through the plate is

(a) 5750 cal/s

(b) 4750 cal/s

(c) 2875 cal/s

(d) 2375 cal/s

Answer: (c)

103. Sunlight is reflected from a lake is 100% polarized at any instant. The angle between the sun and horizon at that instant is (Given $\tan^{-1}(1.33) = 53.06°$, μ of water = 1.33)

(a) 53.06°

(b) 36°54′

(c) 143.06°

(d) 126°54′

Answer: (c)

104. At the peak of the nuclear binding energy curve

(a) Z is even but N is odd

(b) Z is odd but N is even

(c) Both Z and N are odd

(d) Both Z and N are even

Answer: (d)

105. When a small solid sphere is dropped in a viscous liquid, it finally acquires a uniform velocity which is called

(a) Escape velocity

(b) Terminal velocity

(c) Critical velocity

(d) Reynold velocity

Answer: (b)

106. The instrument used to measure optical rotation is known as

(a) spectrometer

(b) microscope

(c) polarimeter

(d) interferometer

Answer: (c)

107. If the focal length of objective lens is increased then magnifying power of

(a) microscope will increase but that of telescope decrease

(b) microscope and telescope both will increase

(c) microscope and telescope both will decrease

(d) microscope will decrease but that of telescope will increase

Answer: (d)

108. A capacitor with air between its plates has a capacitance of 8 μF. Its capacitance on introducing a dielectric with dielectric constant 6 between its plates, is

(a) 48 μF

(b) 40 μF

(c) 32 μF

(d) 16 μF

Answer: (a)

109. The gravitational field due to a mass distribution is given by E = kx^(−3/2) in x-direction, where k is a positive constant. Taking gravitational potential to be zero at infinity, its value at a distance x is

(a) $2k\sqrt{x}$

(b) $2k/\sqrt{x}$

(c) $2kx^3$

(d) $2k/x^3$

Answer: (b)

110. Potential energy per unit volume u of a strained wire is

(a) u = stress × strain

(b) u = (1/4) stress × strain

(c) u = (1/2) stress × strain

(d) u = (3/4) stress × strain

Answer: (c)

111. A Carnot engine is working between 127°C and C. It absorbs 80 cals of heat. How much heat is rejected ?

(a) 80 cals

(b) 60 cals

(c) 40 cals

(d) 20 cals

Answer: (b)

112. State of population inversion in LASER is

(a) an equilibrium state and number of atoms in ground state is more than that of excited state

(b) a non equilibrium state and number of atoms in ground state is less than that of in excited state

(c) an equilibrium state and number of atoms in ground state is same as that in excited states

(d) a non equilibrium state and number of all atoms lie in excited state

Answer: (b)

113. Compute the magnetic induction in air at a point 10 cm from a long straight wire carrying a current of 20 A.

(a) 3 × 10−5 T

(b) 4 × 10−5 T

(c) 5 × 10−5 T

(d) 6 × 10−5 T

Answer: (b)

114. When the current in a coil changes from 8A to 2A in 3 × 10^{-3}s, the emf induced in the coil is 2V. The self inductance of the coil is

(a) 1 mH

(b) 5 mH

(c) 20 mH

(d) 10 mH

Answer: (a)

115. A 200 mm long polarimeter tube containing 48 cm^3 of sugar solution produces an optical rotation of 11° when placed in a polarimeter and infront of white light, if the specific rotation of sugar solution is 66°. The amount of sugar contained in the tube in form of solution is

(a) 5 gm

(b) 10 gm

(c) 2 gm

(d) 4 gm

Answer: (d)

116. 4 equal point charges, +4μC, are placed at corners of a square that is 50 cm on a side. The force on any of the charges, is

(a) 1.10 N inward along diagonal

(b) 0.72 N inward along diagonal

(c) 0.72 N outward along diagonal

(d) 1.10 N outward along diagonal

Answer: (d)

117. According to Planck the average energy of oscillators with frequency υ and its integral multiples is

(a) kT

(b) hυ exp(−hυ/kT)

(c) hυ / [exp(−hυ/kT) + 1]

(d) hυ / [exp(−hυ/kT) − 1]

Answer: —

118. The differential equation of three dimensional wave is

(a) $\nabla^2\Psi = (1/\upsilon^2)\, \partial^2\Psi/\partial t^2$

(b) $\Psi(\vec{r}, t) = A0 \sin(\omega t - k\vec{r})$

(c) $\partial^2\Psi/\partial t^2 = \upsilon^2\, \partial\Psi/\partial x$

(d) $\nabla\Psi = \upsilon^2\, \partial\Psi/\partial t$

Answer: (a)

119. Minimum energy required for electron-positron pair production is

(a) 0.5 MeV

(b) 1 KeV

(c) 0.5 KeV

(d) 1 MeV

Answer: (d)

120. The magnetic susceptibility of a diamagnetic material is

(a) small and negative

(b) small and positive

(c) large and positive

(d) large and negative

Answer: (a)

121. The sensitivity of a Wheatstone bridge is maximu[illegible]when

(a) P/Q = R/X

(b) P = Q, R = X

(c) P = Q = R = X

(d) None of these

Answer: (c)

122. 20 grams of ice at 0°C melts to water at 0°C. The entropy change in this process, is (Latent heat of water is 80 cal/gm)

(a) 24.5 J/°K

(b) 30.2 J/°K

(c) 35.7 J/°K

(d) 49.2 J/°K

Answer: (a)

123. The shape of the Lissajous Figures depends on

(a) The amplitude of the superposing waves

(b) Frequencies of superposing waves

(c) The phase difference between the superposing waves

(d) All of the above

Answer: (d)

124. When a linear load W is applied to a metal wire of length l, its length increases by Δl. The fractional change in its volume ΔV/V will be proportional to

(a) $\sqrt{(\Delta l/l)}$

(b) $(\Delta l/l)^2$

(c) $\Delta l/l$

(d) $(\Delta l/l)^3$

Answer: (c)

125. The population inversion between energy states in a Ruby laser is achieved through

(a) raising of temperature

(b) lowering of temperature

(c) optical pumping

(d) vacuum pumping

Answer: (c)

Answer key

Answer key from the U.P. Secondary Education Services Selection Board's official answer key for this sitting. "—" means the key gave none.

Physics

1	**(c)**	2	**(c)**	3	**(a)**	4	**(c)**	5	**(b)**	6	**(b)**
7	**(a)**	8	**(a)**	9	**(c)**	10	**(b)**	11	**(d)**	12	**—**
13	**(c)**	14	**(b)**	15	**(a)**	16	**(d)**	17	**(c)**	18	**(a)**
19	**(d)**	20	**(b)**	21	**(b)**	22	**(b)**	23	**(d)**	24	**(c)**
25	**(c)**	26	**(b)**	27	**(c)**	28	**(d)**	29	**(c)**	30	**(a)**
31	**(d)**	32	**(d)**	33	**(b)**	34	**(d)**	35	**(a)**	36	**(d)**
37	**(a)**	38	**(b)**	39	**(c)**	40	**(d)**	41	**(c)**	42	**(b)**
43	**(c)**	44	**(c)**	45	**—**	46	**(d)**	47	**(c)**	48	**(a)**
49	**(b)**	50	**—**	51	**(a)**	52	**(c)**	53	**(b)**	54	**(c)**
55	**(b)**	56	**(c)**	57	**(c)**	58	**(d)**	59	**(a)**	60	**(c)**
61	**(c)**	62	**(b)**	63	**(c)**	64	**(c)**	65	**(a)**	66	**(d)**
67	**(c)**	68	**(c)**	69	**(a)**	70	**(b)**	71	**(b)**	72	**(d)**
73	**(c)**	74	**(a)**	75	**(c)**	76	**(a)**	77	**(d)**	78	**(b)**
79	**(c)**	80	**(c)**	81	**(c)**	82	**(a)**	83	**(c)**	84	**(d)**
85	**(c)**	86	**(b)**	87	**(d)**	88	**(c)**	89	**(d)**	90	**(b)**
91	**(a)**	92	**—**	93	**(b)**	94	**(c)**	95	**(c)**	96	**(a)**
97	**(d)**	98	**(b)**	99	**(a)**	100	**(a)**	101	**(c)**	102	**(c)**
103	**(c)**	104	**(d)**	105	**(b)**	106	**(c)**	107	**(d)**	108	**(a)**
109	**(b)**	110	**(c)**	111	**(b)**	112	**(b)**	113	**(b)**	114	**(a)**
115	**(d)**	116	**(d)**	117	**—**	118	**(a)**	119	**(d)**	120	**(a)**
121	**(c)**	122	**(a)**	123	**(d)**	124	**(c)**	12	**(c)**		