

DEPARTMENT OF EDUCATION
CENTRAL TIBETAN ADMINISTRATION, DHARAMSHALA
ENTRANCE EXAMINATION-2009.

PHYSICS

Time : 1 hours

Max. Marks 50.

INSTRUCTIONS:

There are fifty questions in this paper. All the questions are of Multiple Choice type and carry equal marks. Each question is followed by four responses marked (a), (b), (c) and (d). Select the one, which is the best in each case and record it clearly against the question number on the answer sheets provided with the paper.

More than one response indicated against an item or overwriting in the answer sheet would deem as incorrect response and no mark will be granted on that.

Question paper along with the answer sheet of the paper should be returned to the invigilator after the completion of the paper or when the time is over which ever is earlier.

Roll No. _____

Marks obtained by the candidate:

Signature of Examiner

- Q.1. The unit of surface energy per unit area may be expressed as:
- (a) Nm (b) Nm^2
 (c) Nm^{-2} (d) Nm^{-1}
- Q.2. Given that v is the speed, r is radius and g is acceleration due to gravity. Which of the following is dimensionless?
- (a) $v^2 r / g$ (b) v^2 / rg
 (c) $v^2 g / r$ (d) $v^2 rg$
- Q.3. A man walks in rain with a velocity of 5 kmh^{-1} . The rain drops strike at him at an angle of 45° with the horizontal. The downward velocity of the rain drops will be
- (a) 5 kmh^{-1} (b) 4 kmh^{-1}
 (c) 3 kmh^{-1} (d) 1 kmh^{-1}
- Q.4. An automobile of mass M is crossing over a concave upwards over-bridge with a speed v . If the radius of the bridge is R , the thrust on the bridge at the highest point will be:
- (a) Mg (b) Mv^2 / R
 (c) $Mg + Mv^2 / R$ (d) $Mg - Mv^2 / R$
- Q.5. A rain drop of mass $0.1g$ is falling with uniform speed of 10 cm s^{-1} . What is the net force acting on the drop?
- (a) zero (b) $2 \times 10^{-3} N$
 (c) $10^{-3} N$ (d) $10^{-2} N$
- Q.6. A heavy iron bar of weight W is having its one end on the ground and the other on the shoulder of a man. The rod makes an angle θ with the horizontal. What is the weight experienced by the man?
- (a) $W \cos \theta$ (b) $W \sin \theta$
 (c) W (d) $W / 2$

Q.7. A body starts from rest and acquires a velocity V in time T . The work done on the body in time t will be proportional to:

(a) $\frac{V}{T}t$

(b) $\frac{V^2}{T}t$

(c) $\frac{V^2}{T^2}t$

(d) $\frac{V^2}{T^2}t^2$

Q.8. A bomb at rest and of 10kg explodes into two pieces of masses 6kg and 4kg respectively. The mass of 4kg moves away with a velocity of 12m s^{-1} . The velocity of the other mass will be:

(a) 12m s^{-1}

(b) 8m s^{-1}

(c) 4m s^{-1}

(d) 2m s^{-1}

Q.9. A stone of mass m tied to a string of length l is rotating along a circular path with constant speed v . The torque on the stone is:

(a) $mv l$

(b) mv / l

(c) mv^2 / l

(d) zero

Q.10. A ring and disc of same moment of inertia roll along a plane surface with the same speed. If E_r be the rotational kinetic energy of the ring and E_d be that of the disc, then:

(a) $E_r > E_d$

(b) $E_r < E_d$

(c) $E_r = E_d$

(d) The relation depends upon the masses of the ring and disc.

Q.11. If the mass and radius of a planet are doubled, then acceleration due to gravity on its surface will become:

(a) one fourth

(b) one half

(c) double

(d) four times

- Q.12. Two satellites are in the parking orbits around the earth. Mass of one is 10 times that of other. The ratio of their periods of revolution is:
- (a) 1 (b) $\sqrt{10}$
(c) 10 (d) 100
- Q.13. A boat carrying steel balls is floating on the surface of water in a tank. If the balls are thrown into the tank one by one, how will it affect the level of water?
- (a) It will remain unchanged (b) It will rise
(c) It will fall (d) First it will rise and then fall
- Q.14. Surface tension of $1Nm^{-1}$ is equivalent to (in *cgs* system):
- (a) $10 \text{ dyn } cm^{-1}$ (b) $10^3 \text{ dyn } cm^{-1}$
(c) $10^5 \text{ dyn } cm^{-1}$ (d) $10^7 \text{ dyn } cm^{-1}$
- Q.15. The pressure of a gas is proportional to:
- (a) the sum of kinetic and potential energies
(b) potential energy
(c) kinetic energy
(d) none of the above
- Q.16. The molecular motion ceases at:
- (a) 273 K (b) 273^0 C
(c) -273 k (d) -273^0 c
- Q.17. Two thermos flasks S and C are of same capacity and height. The cross-section of S is square and that of C is circular. Which is better?
- (a) Flask S
(b) Flask C
(c) Both are equally good
(d) S is better for cold liquids and C is better for hot liquids
- Q.18. During free expansion of an ideal gas which of the following remains constant?
- (a) Pressure (b) Temperature
(c) Both pressure and temperature (d) Neither pressure nor temperature

Q.19. How will the frequency of a simple pendulum vary when it is taken from the surface of the earth to the bottom of a deep mine?

- (a) Increases
- (b) Decreases
- (c) Remains unchanged
- (d) Pendulum will not oscillate

Q.20. The differential equation representing the simple harmonic motion of the particle

is $m \frac{d^2x}{dt^2} + kx = 0$. The angular frequency of the simple harmonic motion is:

- (a) k
- (b) k/m
- (c) \sqrt{k}
- (d) $\sqrt{k/m}$

Q.21. The ratio of the electric force between two protons to that between two electrons under similar conditions is of the order of:

- (a) 10^{42}
- (b) 10^{39}
- (c) 10^{36}
- (d) 1

Q.22. If E_a be the electric field strength due to a short dipole on the axial line and E_e be that on the equatorial line at the same distance from the dipole, then:

- (a) $2E_a = E_e$
- (b) $E_a = 2E_e$
- (c) $E_a = E_e$
- (d) none of a, b and c

Q.23. The potential of a spherical conductor of radius 3m is 6V. The potential at its centre is:

- (a) zero
- (b) 2V
- (c) 6V
- (d) 18V

Q.24. Two conducting spheres of radio r and R are given the same charge. The ratio of their potential will be:

- (a) $[R/r]^{\frac{1}{2}}$
- (b) R/r
- (c) R^2/r^2
- (d) R^3/r^3

- Q.25. A wire of resistance $3\ \Omega$ is cut into three equal pieces, which are joined to form a triangle. The equivalent resistance between any two corners of the triangle is:
- (a) $\frac{3}{2}\ \Omega$ (b) $\frac{2}{3}\ \Omega$
(c) $\frac{1}{4}\ \Omega$ (d) $4\ \Omega$
- Q.26. An aluminum wire is drawn through a die so as to double its length. If the original resistance be R , then the new resistance of the wire will be:
- (a) $R/16$ (b) $R/4$
(c) $4R$ (d) $16R$
- Q.27. A wire of resistance R is bent in the form of a circle. The resistance between two points on the circumference of the wire and at the end of a diameter of the circle is:
- (a) $R/4$ (b) $R/8$
(c) $R/16$ (d) $R/32$
- Q.28. If P , Q , R and S are the resistances in the arms of wheat stone bridge, then the bridge is most sensitive, when:
- (a) $P = Q = R = S$ (b) $P = Q$ and $R = S$
(c) $P + Q = R + S$ (d) $P - Q = R - S$
- Q.29. What is converted into heat when current is set up through a conductor?
- (a) Electric current (b) Electric potential
(c) Electric energy (d) Electric resistance
- Q.30. When a 40 watt lamp is connected in series with a 100 watt lamp across a 220 V supply, which one glows brighter?
- (a) 100 Watt lamp
(b) 40 Watt lamp
(c) Both will glow with equal brightness
(d) It cannot be predicted
- Q.31. As the temperature of hot junction increases, the thermo emf :
- (a) always increases (b) always decreases
(c) may increase or decrease (d) neither increases not decreases

- Q.32. What determines the emf between the two metals placed in an electrolyte?
- Relative position of metals in the electro chemical series
 - Distance between them
 - Strength of electrolyte
 - Nature of electrolyte
- Q.33. What is the time rate of work done by the magnetic field on the test charge, when it follows a helical path?
- $q_0 B$
 - $q_0 B / v$
 - $q_0 B / v^2$
 - Zero
- Q.34. An electron and a proton enter a magnetic field with equal velocities. Which one of them experiences more force?
- Electron
 - Proton
 - Both experience same force
 - It cannot be predicted
- Q.35. The torque acting on a magnetic dipole of moment \vec{P}_m when placed in a magnetic field \vec{B} is:
- $\vec{P}_m \cdot \vec{B}$
 - $\vec{P}_m \times \vec{B}$
 - $\vec{P}_m \bullet \vec{B}$
 - None of a, b and c
- Q.36. A galvanometer may be converted into ammeter or a voltmeter. In which of the following cases the resistance of the device so obtained will be the largest?
- Ammeter of range 1A
 - Ammeter of range 10A
 - Voltmeter of range 1V
 - Voltmeter of range 10V
- Q.37. What is the angle of dip at the magnetic poles?
- 0°
 - 30°
 - 45°
 - 90°

- Q.38. A bar of diamagnetic substance is placed in a magnetic field with its length making angle 30° with the direction of the magnetic field. How will the bar behave?
- (a) It will align itself parallel to the magnetic field
 - (b) It will align itself perpendicular to the magnetic field
 - (c) It will remain as before
 - (d) Its behaviour cannot be predicted
- Q.39. If the magnetic field is parallel to a surface then the magnetic flux through the surface is:
- (a) zero
 - (b) small but not zero
 - (c) infinite
 - (d) large but not infinite
- Q.40. Which of the following helps in the operation of the choke coil?
- (a) Self induction
 - (b) Mutual inductance
 - (c) Eddy currents
 - (d) None of the above
- Q.41. During interference of light , energy is:
- (a) created at the maxima
 - (b) destroyed at the minima
 - (c) not conserved
 - (d) redistributed
- Q.42. The refractive index of glass with respect to air is 1.6. The refractive index of air w.r.t. glass is:
- (a) less than 1
 - (b) 1
 - (c) between 1 and 1.5
 - (d) more than 1.2
- Q.43. What is the magnification when the object is placed at $2f$ from the pole of a concave mirror.
- (a) $1/3$
 - (b) $2/3$
 - (c) 1
 - (d) $3/2$
- Q.44. What is the minimum distance between an object and its real image formed by a convex lens?
- (a) 0
 - (b) f
 - (c) $2f$
 - (d) $4f$

- Q.45. To obtain an achromatic combination using the lenses of same material the two lenses should be:
- (a) put in contact (b) separated from each other
(c) convex (d) one convex ; other concave
- Q.46. To obtain a magnified image at distance of distinct vision with a simple microscope , where should the object be placed?
- (a) Away from focus (b) At focus
(c) Between focus and optical centre (d) None of a, b and c
- Q.47. If an electron has an initial velocity perpendicular to direction of electric field, the path of the electron is:
- (a) a straight line (b) a parabola
(c) a circle (d) an ellipse
- Q.48. What happens when fast moving electrons are stopped by a metallic target in an evacuated chamber?
- (a) X-rays are produced
(b) γ -rays are produced
(c) Electrons are absorbed but no radiations are emitted
(d) β - particles are ejected
- Q.49. When a photon collides with an electron which of the following characteristic of the photon increases?
- (a) Energy (b) Frequency
(c) Wavelength (d) None of a, b and c
- Q.50. What is the dynamic mass of a photon of wave length λ ?
- (a) $h / \lambda c$ (b) hc / λ
(c) $hc\lambda$ (d) $(hc\lambda)^{-1}$

