Physics Exam Answer Key - 3

Grade: VII
Duration: 2 hours
Maximum Marks: 80

SECTION A (Objective & Short Answer)

Q1. Choose the correct answers from the given options: [10]

1. **The work done by a force is negative when:**
   Answer: (iii) The force is opposite to the direction of displacement
2. **The refractive index of a medium is given by the ratio of:**
   Answer: (i) Speed of light in vacuum to speed of light in the medium
3. **A perfectly elastic collision is characterized by:**
   Answer: (iii) Conservation of both momentum and kinetic energy
4. **The unit of power in terms of base SI units is:**
   Answer: (i) kg m^2/s^3
5. **The apparent weight of a body submerged in a liquid is:**
   Answer: (ii) Less than actual weight
6. **The internal energy of an ideal gas depends on:**
   Answer: (ii) Temperature only
7. **When a convex lens forms an image at infinity, the object is located:**
   Answer: (iii) At the focal point
8. **Which of the following phenomena proves that light has a wave nature?**
   Answer: (iii) Diffraction
9. **A transformer works on the principle of:**
   Answer: (ii) Mutual induction
10. **If a pendulum is taken to the moon, its time period will:**
    Answer: (i) Increase

Q2. Fill in the blanks with appropriate terms: [5]

1. **The torque acting on a body is the product of __ and perpendicular distance from the axis of rotation.**
   Answer: Force

2. **A Carnot engine operates between two temperatures T_1 and T_2, where $T_1 > T_2$. Its efficiency is given by __.**
   Answer: $1 - (T_2/T_1)$
3. **The unit of electric flux is __.**
   Answer: Weber (Wb)
4. **The force exerted by a magnetic field on a moving charge is given by __.**
   Answer: Lorentz Force
5. **The escape velocity of a body on Earth is approximately __.**
   Answer: 11.2 km/s

Q3. State whether the following statements are True or False: [5]

1. **The center of mass of an object always lies within the object.**
   Answer: False
2. **Sound waves can be polarized.**
   Answer: False
3. **Inertia depends only on the mass of an object.**
   Answer: True
4. **A transformer can increase power.**
   Answer: False
5. **When a liquid is heated, its density increases.**
   Answer: False

Q4. Name the following: [5]

1. **The scientist who proposed the uncertainty principle.**
   Answer: Werner Heisenberg
2. **The quantity that remains constant in an isolated system.**
   Answer: Total energy (or Momentum in some cases)
3. **The process by which heavy nuclei split into lighter nuclei, releasing energy.**
   Answer: Nuclear fission
4. **The property of a body that resists changes in its state of motion.**
   Answer: Inertia
5. **The lowest possible temperature at which a substance has zero thermal energy.**
   Answer: Absolute zero (-273.15°C or 0 K)

SECTION B (Descriptive & Numerical)

Q5. Answer all the following questions: [10]

1. **Define impulse and derive its relation with momentum.**
   Answer: Impulse is the product of force and time duration.
   - **Relation with momentum:** Impulse = Change in momentum (Ft = mv - mu)
2. **Explain how the concept of moment of inertia is related to rotational motion.**
   Answer: Moment of inertia is the rotational equivalent of mass and affects how a body resists angular acceleration.
3. **Derive an expression for the acceleration due to gravity at a depth d inside the Earth.**
   Answer: $g_d = g(1 - d/R)$, where R is Earth's radius.
4. **Why do astronauts appear weightless in a spacecraft?**
   Answer: Astronauts appear weightless because they are in a state of free fall towards Earth, experiencing microgravity.
5. **Explain how a moving coil galvanometer works.**
   Answer: A moving coil galvanometer works on the principle of electromagnetic induction.
6. **Convert 100 K to Celsius and Fahrenheit.**
   Answer:
   - **Celsius:** $T_C = T_K - 273 = -173°C$
   - **Fahrenheit:** $T_F = (9/5 \times (-173)) + 32 = -279.4°F$
7. **Derive the formula for kinetic energy in terms of momentum.**
   Answer: KE = $\frac{p^2}{2m}$

End of the Answer Key