MODEL PAPER OF PHYSICS GRADE-12

Objective Type Questions

Time: 20 Minutes **Marks: 17**

Question 1: Four possible answers A, B, C & D to each question are given. The choice which you think is correct, fill the circle in front of the question (on bubble sheet) with Marker or Pen ink. Cutting or filling two or more circles will result in zero mark in that question. **(1 × 17 = 17)**

1. V_{rms} of the gas molecule is 300 m s^{-1}. If its absolute temperature is reduced to half and molecular weight is doubled, then V_{rms} will become:
   (a) 75 m s^{-1} (b) 150 m s^{-1} (c) 300 m s^{-1} (d) 600 m s^{-1}

2. The *rms* speed of the gas at 27 °C is *v*. If temperature of the gas is raised to 327 °C, the *rms* speed of the gas is:
   (a) *v* (b) $v/\sqrt{2}$ (c) $\sqrt{2}\,v$ (d) 3 *v*

3. Which quantity is zero at the extreme position of a body executing simple harmonic motion?
   (a) Acceleration (b) Speed (c) Displacement (d) angular frequency

4. If a tunnel is bored through the centre of Earth and a stone is dropped into it, then:
   (a) stone will stop at the centre of Earth
   (b) stone will move out from other side of the tunnel
   (c) stone will perform S.H.M.
   (d) none of the above

5. When light from two lamps falls on a screen, no interference pattern is obtained. Why is this so?
   (a) The lamps are not point sources (b) Lamps emit light of different amplitudes
   (c) The light from lamps is not coherent (d) The light from lamps is white

6. The colours appearing on the soap bubbles are due to the phenomenon of light:
   (a) reflection (b) refraction (c) interference in thin film (d) diffraction

7. In a charged capacitor, the energy resides in:
   (a) the positive plate (b) the negative plate
   (c) both positive and negative plates (d) the electric field between the plates

8. If a dielectric is inserted between the plates of a charged isolated capacitor, the potential difference across the plates:
   (a) increases (b) decreases (c) remains same (d) becomes zero

9. In a purely inductive or capacitive circuit, the average power consumed is:
   (a) equal to apparent power (b) minimum
   (c) maximum (d) zero

10. If magnetic field is doubled in an inductor, then magnetic energy density becomes:
   (a) half (b) four times (c) six times (d) constant

11. If the frequency of incident light is above the threshold frequency, increasing the intensity mainly increases the:
   (a) stopping potential (b) photoelectric current
   (c) work function (d) threshold frequency

12. de-Broglie waves are associated with:
   (a) moving charged particles only (b) moving neutral particles only
   (c) all moving particles (d) particles in motion or at rest

13. The K.E. of the fission fragments is ultimately converted to:
   (a) potential energy (b) heat energy
   (c) magnetic energy (d) chemical energy

14. After four half-lives, the fraction of a radioactive sample remaining is:
   (a) 1/4 (b) 1/16 (c) 1/8 (d) 1/32

15. Characteristic X-rays are produced due to:
   (a) nuclear reactions (b) inner shell electronic transitions
   (c) outer shell transitions (d) ion collisions

16. In X-ray imaging, what does "contrast" mainly depend on?
   (a) Density and thickness of tissues (b) Heartbeat rate
   (c) Distance from the detector (d) Surface temperature of the body

17. What is a standard candle in astronomy?
   (a) A star with unknown brightness
   (b) An object with known intrinsic brightness
   (c) A planet reflecting sunlight
   (d) A black hole emitting radiation

Subjective Type Questions

Time: 2:40 Hrs. **Marks: 68**

SECTION 1

Q. 2: Attempt any EIGHT short questions out of TWELVE. Each question carries 2 marks.

(8 × 2 = 16)

(i) Do all gases have the same average translational kinetic energy at the same temperature? Justify your answer.

(ii) What will be the K.E near absolute zero? Explain briefly.

(iii) If the density of a gas is doubled while the rms speed remains unchanged, what happens to the gas pressure?

(iv) Explain briefly, why it is not possible to increase the temperature of the gas while keeping its volume and pressure constant.

(v) Define simple harmonic motion and write its equation.

(vi) What role do shock absorbers play in oscillations of vehicles in a bumpy road? Explain briefly.

(vii) Will a pendulum that keeps correct time at Karachi, be accurate at Murree or at the top of mount Everest? Explain briefly.

(viii) A car crosses a bumpy road and its body must not keep oscillating for a long time. Which type of damping is most suitable and why?

(ix) State Huygens' principle in terms of secondary wavelets.

(x) What is the significance of path difference in deriving Bragg's equation?

(xi) In Young's double-slit experiment, what happens to fringe spacing if the whole apparatus is submerged in water? Give reason.

(xii) Compare the double slit experimental arrangements for light and sound waves, similarities and differences.

Q. 3: Attempt any EIGHT short questions out of TWELVE. Each question carries 2 marks.

(8 × 2 = 16)

(i) If the absolute potential at a point is zero, what can you say about the electric intensity at that point?

(ii) Is electron-volt a unit of potential difference or energy? Explain briefly.

(iii) Why does the capacitance of a capacitor increase when a dielectric is inserted between its plates?

(iv) The electric field is negative of gradient of potential. What does the negative sign indicate physically?

(v) Why are choke coils preferred over resistors for limiting current in AC circuits?

(vi) How do capacitive and inductive reactance oppositely vary with frequency?

(vii) Describe the phase relation between current and voltage in a purely capacitive AC circuit.

(viii) Is it possible to achieve mutual inductance using a combination of four coils? If yes, justify your answer?

(ix) State Planck's quantum relation and explain how photon energy depends on frequency.

(x) Is work function of a metal related to threshold frequency in photoelectric emission? State briefly.

(xi) Radiation with a certain frequency causes electrons to be emitted from the surface of one metal and not from the surface of another metal. Why?

(xii) How does the photoelectric current vary with intensity of incident light on a metal surface?

Q. 4: Attempt any SIX short questions out of NINE. Each question carries 2 marks. (6 × 2 = 12)

(i) What is meant by the half-life of a radioactive material?

(ii) After four half-lives, what percentage of a radioactive sample remains?

(iii) What factors make a fusion reaction difficult to achieve?

(iv) What do you know about the terms K_α and K_β X-rays?

(v) Why is ultrasound not effective for imaging air-filled organs such as lungs? Explain briefly.

(vi) What occurs when ultrasound hits the boundary between two tissues?

(vii) What is a standard candle, and how is it used to measure distances to galaxies?

(viii) State Hubble's law and explain its connection to the Big Bang Theory.

(ix) How would the spectrum of light from galaxies look different if the universe were not expanding?

SECTION 2

Attempt any THREE questions. Each question carries equal marks. (8 × 3 = 24)

Q. 5: (a) Show that the temperature of an ideal gas is a direct measure of the average translational kinetic energy of its molecules. **(5)**

(b) The displacement of a particle executing S.H.M is given by; $x = 0.05 \sin(4t + \pi/3)$. Find its velocity at the displacement of 0.03 m, maximum velocity and amplitude. **(3)**

Q. 6: (a) Determine the electric potential energy stored in a capacitor from the area under the potential-charge graph. **(5)**

(b) Coherent light with wavelength 450 nm falls on a pair of slits. On a screen 1.80 m away, the distance between dark fringes is 3.90 mm. What is the slit separation? **(3)**

Q. 7: (a) Explain the behaviour of a capacitor in an AC circuit. Derive the expression for capacitive reactance and show why current leads voltage by 90°. **(5)**

(b) An alternating current is represented by $I = 420 \sin(100\pi t)$. Find the rms current and the frequency of the AC. **(3)**

Q. 8: (a) What is photoelectric effect? Explain it on the basis of Einstein's photoelectric equation. **(5)**

(b) Americium-241 is an artificially produced radioactive element that emits α-particles. Its sample of mass 5.1 μg is found to have an activity 5.9×10^5 Bq. Determine, for this sample: (i) total number of nuclei (ii) decay constant (iii) half-life in years **(3)**

Q.9: (a) Describe how an ultrasound image is created using the concepts of echoes and reflected sound waves. **(5)**

(b) A supernova, acting as a standard candle, has a luminosity of 1.0×10^{36} W. If the observed flux at Earth is 2.0×10^{-12} W m^{-2}, calculate the distance between the Earth and the supernova. **(3)**