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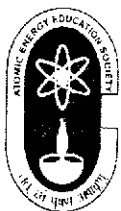
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AEES

**Previous Year Paper
PGT Physics September
2015**





ATOMIC ENERGY EDUCATION SOCIETY

Anushaktinagar, Mumbai-400 094

2015 – Open Candidates Examination

Post – PGT (Physics)

Date – 27-09-2015

Time – 1 Hour 30 Minutes

Maximum Marks – 50

Instructions

1. There are 50 Multiple Choice Questions (MCQ) in this paper. Each question carries 1 mark. There will be negative marking of 0.25 per wrong answer.
2. Answer should be darkened/marked in the OMR answer sheet only.
3. Use of any electronic gadget (e.g. calculator, mobile phone, etc.) is not permitted, in the examination hall.
4. In case a candidate has not signed the Attendance Sheet or the OMR Answer Sheet is not signed by the Invigilator, it will be dealt with as a case of unfair means.
5. On completion of the test, the candidates MUST HAND OVER THE OMR ANSWER SHEET AND QUESTION PAPER TO THE INVIGILATOR in the room/hall.
6. The candidates should ensure that the OMR answer sheet is not folded or damaged.

To be filled by the candidate

Name of the Candidate: _____

Roll Number: _____

OMR Number: _____

No of printed pages –9

2015-Open Candidates- PGT (Physics) – QP

- Q.1) If a transparent parallel plate of thickness t and refractive index n is introduced perpendicularly in the light beam, the optical path is
- (a) increased by $(n - 1)t$ (b) decreased by nt
(c) decreased by $(n - 1)t$ (d) increased by nt
- Q.2) Internal energy of an ideal gas decreases by the same amount as the work done by the system.
- (a) the process must be isothermal (b) the process must be adiabatic
(c) the process must be isobaric (d) the temperature of the system must increase
- Q.3) In a resonance column experiment the first 3 resonant lengths are l_1 , l_2 and l_3 respectively. The l_1 : l_2 : l_3 may be given as
- (a) 1:2:3 (b) 2:3:5
(c) 1:3:5 (d) 3:4:6
- Q.4) An intrinsic semiconductor at absolute zero of temperature behaves as
- (a) an insulator (b) a metallic conductor
(c) a superconductor (d) a semiconductor
- Q.5) The motion of planets in the solar system is an example of conservation of
- (a) mass (b) linear momentum
(c) angular momentum (d) kinetic energy
- Q.6) A $4\mu\text{F}$ capacitor is charged by a 200V supply. The energy stored in the electric field of the capacitor is
- (a) $8 \times 10^{-2} \text{ J}$ (b) $1.6 \times 10^{-9} \text{ J}$
(c) $8 \times 10^{-4} \text{ J}$ (d) $1.6 \times 10^{-1} \text{ J}$
- Q.7) A thin concave and a thin convex lens are in contact. The ratio of the magnitude of power of two lenses is $\frac{2}{3}$ and the focal length of combination is 30 cm. The focal length of the convex lens is
- (a) 10 cm (b) 12cm
(c) 15cm (d) 20cm

- Q.8) The relation connecting magnetic susceptibility χ and relative permeability μ_r is
- (a) $\chi = (\mu_r + 1)$ (b) $\chi = (\mu_r - 1)$
 (c) $\chi = \mu_r^{-1}$ (d) $\chi = 3(\mu_r + 1)$
- Q.9) Taking the significant figures into consideration, the product of 109.832 and 0.6107 should be written as
- (a) 67.0744 (b) 67.1
 (c) 67.07 (d) 67.074402
- Q.10) One spring has force constant 200Nm^{-1} , another has force constant 500Nm^{-1} . If they are joined in series, the force constant will be nearest to
- (a) 700Nm^{-1} (b) 300Nm^{-1}
 (c) 143Nm^{-1} (d) 100Nm^{-1}
- Q.11) Two plane mirrors are inclined at an angle of 60° to each other. A point object is placed in between them. The total number of images produced by both the mirrors is
- (a) 2 (b) 4
 (c) 5 (d) 6
- Q.12) A 150 m long train is travelling from east to west at a speed of 20ms^{-1} . A bird is flying from west to east at a speed of 5ms^{-1} . How long will the bird take to cross the train?
- (a) 6 s (b) 8 s
 (c) 10 s (d) 12 s
- Q.13) The masses of two particles having same kinetic energy are in the ratio of 2:1. Their de Broglie wavelengths are in the ratio
- (a) 2 : 1 (b) 1 : 2
 (c) $\sqrt{2}$: 1 (d) $1 : \sqrt{2}$
- Q.14) A ball of mass m collides with a wall with speed v and rebounds on the same line with the same speed. If the mass of the wall is taken as infinite, the work done by the ball on the wall is
- (a) $2mv$ (b) $2mv^2$
 (c) mv^2 (d) zero

Q.15) The mean kinetic energy of molecules in 1 mole of a monatomic ideal gas is equal to (k is Boltzmann constant)

- (a) $\frac{1}{2} kT$ (b) kT
 (c) $\frac{3}{2} kT$ (d) $3kT$

Q.16) The equation $y = 0.02 \sin(500\pi t) \cos(4.5t)$ represents

- (a) progressive wave of frequency 250 Hz along x-axis
 (b) a standing wave of wavelength 1.4m
 (c) a transverse progressive wave of amplitude 0.02m
 (d) progressive wave of speed approximately 350ms^{-1}

Q.17) If v_o be the orbital velocity of a satellite in a circular orbit close to earth's surface and v_e is the escape velocity for the earth, the relation between the two is

- (a) $v_e = \sqrt{2} v_o$ (b) $v_e = \sqrt{3} v_o$
 (c) $v_o = v_e$ (d) $v_e = 2v_o$

Q.18) The refractive index μ of a material varies with wavelength λ in the following manner (a and b are constants)?

- (a) $\mu = a + \lambda b$ (b) $\mu = a + \frac{b}{\lambda}$
 (c) $\mu = a + \frac{b}{\lambda^2}$ (d) $\mu = a + b\lambda^2$

Q.19) If vectors \vec{a} and \vec{b} are given as

$$\vec{a} = 5\vec{i} + 6\vec{j} + 3\vec{k}$$

$$\vec{b} = 6\vec{i} - 2\vec{j} - 6\vec{k},$$

which of the following statements is correct?

- (a) \vec{a} and \vec{b} are mutually perpendicular (b) $\vec{a} \times \vec{b}$ is same as $\vec{b} \times \vec{a}$
 (c) $|\vec{a} + \vec{b}| = a + b$ (d) $|\vec{a} \times \vec{b}|^2 = a^2 + b^2 + \vec{a} \cdot \vec{b}$

Q.20) Two photons are emitted in opposite directions by a source.

The velocity of one photon relative to the other is

- (a) c (b) $2c$
 (c) $\sqrt{2} c$ (d) zero

- Q.21) In Young's double slit experiment, the fringe width with light of wavelength $\lambda = 600 \text{ nm}$ is 3 mm. The fringe width, when the λ of light is changed to 400 nm is
- (a) 4 mm (b) 3 mm
(c) 2 mm (d) 1mm
- Q.22) An electric field does not exist in the region.
- (a) between the nucleus and the electron in an atom
(b) inside a current carrying conductor
(c) inside a plate of insulator held between the plates of a charged parallel plate capacitor
(d) inside a cavity of a charged conductor.
- Q.23) A Table-Tennis ball floating on the top of a vertical water jet is a consequence of
- (a) Stokes' Law (b) Bernoulli's principle
(c) Pascal's Law (d) the phenomenon of surface tension
- Q.24) Balmer series in the spectrum of H – atom lies in
- (a) Near Infrared region (b) Far Infrared region
(c) Visible region (d) UV region.
- Q.25) The surface tension of soap solution is S. What is the work done in blowing a small bubble of radius r?
- (a) $\pi r^2 S$ (b) $2\pi r^2 S$
(c) $4\pi r^2 S$ (d) $8\pi r^2 S$
- Q.26) The average power dissipated in a pure capacitor in one complete cycle of AC is (V is the rms value of the AC voltage)
- (a) zero (b) CV
(c) $\frac{1}{2} CV^2$ (d) $\frac{1}{4} CV^2$
- Q.27) Velocity of sound in a gas at a given temperature is 340 ms^{-1} .
If the pressure of gas is doubled isothermally, the speed of sound in this case is
- (a) 170 ms^{-1} (b) 340 ms^{-1}
(c) 680 ms^{-1} (d) 1360 ms^{-1}

Q.28) An enclosure maintained at 1000K radiates the most at the wavelength λ_m . If temperature is raised to 2000K, the maximum emission of radiation will occur at the following wavelength

- (a) $\frac{\lambda_m}{2}$ (b) $2\lambda_m$
 (c) $16\lambda_m$ (d) $\frac{\lambda_m}{16}$

Q.29) In a charged parallel plate capacitor, the plates carry charges $\pm\sigma A$, where A= area of each plate. The oppositely charged parallel plates attract each other by a force F equal to

- (a) $\frac{\sigma^2 A}{\epsilon_0}$ (b) $\frac{\sigma^2 A}{2\epsilon_0}$
 (c) $\frac{(\sigma A)^2}{\epsilon_0}$ (d) $\frac{(\sigma A)^2}{4\pi\epsilon_0}$

Q.30) In a series LCR circuit, the rms voltage across R, L and C is 10V each. The rms value of applied emf is

- (a) 10 V (b) $10\sqrt{2}$ V
 (c) $10\sqrt{3}$ V (d) 20 V

Q.31) Magnifying power of an astronomical telescope for normal vision (in usual notations) is

- (a) $-f_e / f_o$ (b) $-f_o / f_e$
 (c) $-f_o \times f_e$ (d) $f_o + f_e$

Q.32) The maximum and minimum values of Poisson's ratio for a metal lie in the following limits

- (a) -1 to +1 (b) -1 to 0
 (c) 0 to 1 (d) 0 to 0.5

Q.33) A projectile projected at 30° with the horizontal achieves a horizontal range R. It can achieve the same horizontal range R if projected (with the same initial velocity) at the following angle α with the vertical

- (a) 15° (b) 22.5°
 (c) 30° (d) It cannot achieve the same horizontal range for any angle $\alpha < 60^\circ$ with the vertical.

Q.34) In an electromagnetic wave the \vec{E} and \vec{B} vectors at any instant of time have

- (a) the same phase (b) same amplitude
 (c) phase difference π (d) phase difference $\frac{\pi}{2}$

Q.35) A simple pendulum is attached to the ceiling of a lift. Its time period of oscillation when the lift is stationary is T . Its frequency of oscillations, when the lift falls freely is

- (a) T (b) $\frac{1}{T}$
(c) zero (d) ∞

Q.36) A star converts all of its Helium into Oxygen nucleus. Find the amount of energy released per nucleus of oxygen. The masses of two Nuclei are as follows:

$m(\text{He}) = 4.0026 \text{ u}$, $m(\text{O}) = 15.9994 \text{ u}$.

- (a) 5.12 Mev (b) 7 Mev
(c) 7.26 Mev (d) 10.24 Mev

Q.37) Two satellites of masses $3M$ and M orbit the earth in the circular orbits of radii r and $3r$ respectively. The ratio of their orbital velocities is

- (a) 1 : 1 (b) $\sqrt{3} : 1$
(c) 3 : 1 (d) 9 : 1

Q.38) The moment of inertia of a uniform disc about an axis perpendicular to the disc at its centre is $\frac{MR^2}{2}$, where M is the mass and R the radius of the disc. If the disc is rolling on the edge without slipping, on a straight line path, the ratio of rotational kinetic energy to the translational kinetic energy is

- (a) 1 (b) $\frac{1}{2}$
(c) $\frac{1}{4}$ (d) $\frac{1}{8}$

Q.39) Wavelength K_{α} line of X-ray spectra varies with atomic number (Z) as

- (a) $\lambda \propto Z$ (b) $\lambda \propto \sqrt{Z}$
(c) $\lambda \propto \frac{1}{Z^2}$ (d) $\lambda \propto \frac{1}{\sqrt{Z}}$

Q.40) The excess pressure inside a small soap bubble of radius r is proportional to

- (a) r (b) $\frac{1}{r}$
(c) $\frac{1}{r^2}$ (d) r^2

Q.41) An electron is travelling along X- direction. It encounters a magnetic field in the Y- direction. Its subsequent motion will be

- (a) a circle in the XZ- plane
- (b) a circle in the YZ- plane
- (c) a circle in the XY-plane
- (d) a straight line along X- direction.

Q.42) A particle moving along a circular path with uniform speed has a

- (a) radial velocity and radial acceleration
- (b) radial velocity and transverse acceleration
- (c) transverse velocity and radial acceleration
- (d) transverse velocity and transverse acceleration.

Q.43) In a region of space the electric field is given as $\vec{E} = 8\vec{i} + 4\vec{j} + 3\vec{k}$.

The electric flux through a surface area of 100 units in XY- plane is

- (a) 300 units
- (b) 400 units
- (c) 800 units
- (d) 1200 units

Q.44) Which of the following pair of physical quantities does not have the same dimensions?

- (a) Electric flux, Electric dipole moment
- (b) Pressure, Young's modulus
- (c) Electromotive force, Potential difference
- (d) Heat, Potential energy.

Q.45) When a magnetic material is subjected to an external magnetizing field, its ability to get magnetized is represented by

- (a) magnetic permeability
- (b) magnetic susceptibility
- (c) magnetic viscosity
- (d) magnetic resonance

Q.46) Which of the following represents an adiabatic process in an ideal gas(the symbol γ has its usual significance)

- (a) $pV = \text{constant}$
- (b) $TV^\gamma = \text{constant}$
- (c) $pV^{\gamma-1} = \text{constant}$
- (d) $TV^{\gamma-1} = \text{constant}$

Q.47) The amplitude of the bob of an oscillating simple pendulum decreases with time. The force F responsible for it depends on the velocity v of the bob as

- (a) $F \propto v$ (b) $F \propto v^2$
(c) $F \propto \frac{1}{v}$ (d) $F \propto \frac{1}{v^2}$

Q.48) Two charges are kept in air, separated by a distance r . If they are kept in a dielectric medium of dielectric constant K , separated by the same distance, the force between them

- (a) remains unchanged (b) decreases K times
(c) increases K times (d) increases K^2 times.

Q.49) When a standing wave is formed, its frequency is

- (a) same as that of individual waves (b) twice that of individual waves
(c) half that of the individual waves (d) $\sqrt{2}$ times that of the individual waves

Q.50) For a given bipolar junction transistor the value of β is 99. What is the corresponding value of α ? (symbols have their usual meanings)

- (a) 0.01 (b) 1.01
(c) 1.99 (d) 0.99



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PGT (PHYSICS)

ANSWERS KEY

- | | |
|-------|-------|
| 1. A | 26. A |
| 2. B | 27. B |
| 3. C | 28. A |
| 4. A | 29. B |
| 5. C | 30. A |
| 6. A | 31. B |
| 7. A | 32. D |
| 8. B | 33. C |
| 9. C | 34. A |
| 10. C | 35. C |
| 11. C | 36. D |
| 12. A | 37. B |
| 13. D | 38. B |
| 14. D | 39. C |
| 15. C | 40. B |
| 16. B | 41. A |
| 17. A | 42. C |
| 18. C | 43. A |
| 19. A | 44. A |
| 20. A | 45. B |
| 21. C | 46. D |
| 22. D | 47. A |
| 23. B | 48. B |
| 24. C | 49. A |
| 25. D | 50. B |



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