SOLUTION & ANSWER FOR KCET-2009
VERSION – A1
[PHYSICS]

1. The number of significant figures in the numbers 4.8000×10^4 ----

Ans: 5 and 7

Sol: $4.8000 \times 10^4 \rightarrow$ 5 significant digits
$48000.50 \rightarrow$ 7 significant digits

2. β-decay means emission of electron ---

Ans: Radioactive nucleus

3. An electric heater rated 200 V and 550 W is connected ---

Ans: 2.5 A

Sol: $I = \frac{P}{V} = \frac{550}{220} = 2.5$ A

4. A body of mass `m' moving along a straight line covers half the distance with a speed of 2 ms^{-1} ---

Ans: $\frac{8}{3} ms^{-1}$

Sol: $v_1 = 2\ ms^{-1}$
$v_2 = 3\ ms^{-1}$, $v_3 = 5\ ms^{-1}$
$v_3' = \frac{3+5}{2} = 4\ ms^{-1}$
$v_{AV} = \frac{2v_1v_3'}{(v_1+v_3')} = \frac{2\times2\times4}{(2+4)}$
$= \frac{8}{3} ms^{-1}$

5. The moment of inertia of a circular ring of radius ------

Ans: $\frac{Mr^2}{2}$

6. A body of mass 0.05 kg is observed to fall with an acceleration of ---

Ans: 0.015 N

Sol: F = m(g – a) = 0.05 (9.8 – 9.5)
$= 0.05 \times 0.3$
= 0.015 N

7. The colloidal solution in which both the dispersed phase and -----

Ans: Emulsion

8. In fog, photographs of the objects taken with infrared radiations ---

Ans: Scattering of IR light is less than visible light.

9. Three concurrent co-planar forces 1 N, 2 N and 3 N ---

Ans: Cannot keep the body in equilibrium.

Sol: if 2 N and 1 N act in same direction, and 3 N acts in opposite direction, equilibrium is possible.

10. Sound waves transfer ---

Ans: Both energy and momentum.

11. Two rectangular blocks A and B of masses 2 kg and 3 kg respectively -----

Ans: 0.05 m

Sol: Initial momentum = $2 \times 0.15 = 0.3$ kg ms^{-1}
If `v' is the velocity of each block under maximum compression, then
$v = \frac{p}{(m_1+m_2)} = \frac{0.3}{2+3} = \frac{0.3}{5} = 0.06$ m/s
Difference in energy = $\frac{1}{2}kx^2$
$0.0135 = \frac{1}{2}kx^2$
x = 0.05 m

12. G.P. Thomson experimentally confirmed the existence of matter waves ---

Ans: Diffraction.

13. The resistance of a wire at 300 K is found to be 0.3 Ω -----

Ans: No correct choice.

Sol: $\alpha = \frac{R_2 - R_1}{R_1t_2 - R_2t_1}$
$1.5 \times 1^{-3} = \frac{0.6-0.3}{0.3\times t_2 - 0.6\times27}$
solving t_2 = 993 K

14. The work done by a force acting on a body is as shown ----

Ans: 200 J

Sol: Work done = Area below F – S graph

$= \frac{(15+10)}{2} \times 10 + \left(\frac{10+20}{2}\right) \times 5$

= 200 J

15. Two luminous point sources separated by a certain distance are at 10 km ----

Ans: 2.44 m

Sol: $\theta = \frac{1.22\lambda}{d} = \frac{1.22 \times 500 \times 10^{-9}}{2.5 \times 10^{-3}}$

$= 2.44 \times 10^{-4}$ radian

$d = D \times \theta$

$= 10000 \times 2.44 \times 10^{-4}$

= 2.44 m

(Diffraction in circular aperture is not in syllabus)

16. A door of 1.6 m wide requires a force of 1 N to be applied at the free end ----

Ans: 4 N

Sol: $\tau = 1.6 \times 1 = 1.6$ Nm

$F = \frac{\tau}{d} = \frac{1.6}{0.4} = 4$ N

17. 0.1 m^3 of water at 80°C is mixed with 0.3 m^3 of water -----

Ans: 65°C

Sol: 0.1 (80 – t) = 0.3 (– 60)

80 – t = 3 t – 180

$4t = 260 \Rightarrow t = \frac{260}{4} = 65°C$

18. The spectral series of the hydrogen atom that lies in the visible ----

Ans: Balmer series

19. A graph of pressure versus volume for an ideal gas for -----

Ans: Adiabatic process

20. Which of the following statement does not hold god for ----

Ans: The frequency changes when it travels from one medium to another.

21. A planet revolves round the Sun in an elliptical orbit ----

Ans: A

Sol: Speed is maximum, when distance from Sun is minimum

22. Horizontal tube of non-uniform cross-section has radii of 0.1 m ---

Ans: Same at M and N

Sol: $Q = A_1 v_1 = A_2 v_2$

23. A resistor and a capacitor are connected in series with an a.c. source ----

Ans: 13 V

Sol: $V = \sqrt{12^2 + 5^2}$

= 13 V

24. The amount of heat energy radiated by a metal at temperature `T' ---

Ans: 81 E

Sol: $E = \sigma T^4$

25. The angle of minimum deviation for an incident light ray on an ---

Ans: $\sqrt{3}$

Sol: $n = \frac{\sin\frac{(A+D)}{2}}{\sin\left(\frac{A}{2}\right)}$, A = D = 60°

$\Rightarrow n = \sqrt{3}$

26. In the following combination of logic gates, the outputs of A, B and C ---

Ans: 1, 1, 0

27. A stationary point source of sound emits sound uniformly in all directions ---

Ans: $\frac{9}{4}$

Sol: $I \propto \frac{1}{d^2}$

$I \propto A^2 \Rightarrow A \propto \frac{1}{d}$

$\therefore \frac{A_1}{A_2} = \frac{9}{4}$

28. A galvanometer of resistance 240 Ω allows only 4% of the main current after connecting ----

Ans: 10 Ω

Sol: $S = \frac{I_g G}{(I - I_g)} = \frac{\frac{4}{100} \times 240}{\frac{96}{100}}$

= 10 Ω

29. The phenomena in which proton flips is ---

Ans: Nuclear magnetic resonance.

30. $y = 3\sin\pi\left(\frac{t}{2} - \frac{x}{4}\right)$ represents an equation of a progressive wave, where `t' ---

Ans: 10 m

Sol: Comparing with A sin (ωt – Kx)

$v = \frac{\omega}{K} = 2$ m/s

$\therefore$ Distance = $2 \times 5 = 10$ m

31. According to the quark model, it is possible to build ----

Ans: 3 quarks and 3 anti quarks.

32. An α-particle of mass 6.4×10^{-27} kg and charge 3.2×10^{-19} C is situated in a uniform electric field ---

Ans: $4\sqrt{2} \times 10^5\ ms^{-1}$

Sol: $\frac{1}{2}mv^2 = qE \times S$

$v = \sqrt{\frac{2qES}{m}}$

$= \sqrt{\frac{2 \times 3.2 \times 10^{-19} \times 1.6 \times 10^5 \times 2 \times 10^{-2}}{6.4 \times 10^{-27}}}$

$= 4\sqrt{2} \times 10^5\ ms^{-1}$

33. A cylindrical tube open at both the ends has a fundamental frequency of 390 Hz in air ----

Ans: 260 Hz

Sol: $\frac{v}{2L} = 390$

$\frac{v}{4 \times \frac{3L}{4}} = f$

$\frac{2 \times 390}{3} = f = 260$ Hz

34. The surface temperature of the stars is -----

Ans: Wein's displacement law

35. The charge deposited on 4 μF capacitor ----

Ans: 24×10^{-6} C

Sol: 6 μF and 6 μF are in series

$\therefore$ Voltage across 4 μF = 6 V

$\therefore Q = 6 \times 4 \times 10^{-6}$

$= 24 \times 10^{-6}$ C

36. A parallel beam of light is incident on a converging lens parallel to its principal axis. As one moves away from the lens on the other side of the ----

Ans: First increases and then decreases.

Sol: Beam first converges and then diverges.

37. Continuous emission spectrum is ---

Ans: Incandescent electric lamp.

38. A coil of `n' number of turns is wound tightly in the form of a spiral ----

Ans: $\frac{\mu_0 nI}{2(b-a)}\log_e(b/a)$

Sol: No: of turns / unit length = $\frac{n}{(b-a)}$

$\therefore$ at a distance r,

$dB = \frac{\mu_0}{2}\frac{n}{(b-a)r}I\,dr$

$\therefore B = \int_a^b \frac{\mu_0 nI}{2(b-a)}\log_e\left(\frac{b}{a}\right)$

39. A ray of light is incident on a plane mirror at an angle ---

Ans: 60°

Sol: Deviation = 180 – 2i = 180 – 120 = 60°

40. The electric potential at any point x, y, z in metres is ------

Ans: –12 V/m

Sol: $E = \frac{-dV}{dx} = -6x$

$\therefore E_{(2,\,0,\,1)} = -12$ V/m

41. Young's double slit experiment gives interference fringes of width 0.3 mm. A thin glass –

Ans: 0.3 mm

Sol: Fringes get shifted but width remains same.

42. Near a circular loop of conducting wire as shown in the figure an electron -----

Ans: Variable

Sol: The flux is increasing initially and then decreases. Hence induced current reverses its direction.

43. Hydrogen atom from excited state comes to the ground state by emitting -----

Ans: $\sqrt{\frac{\lambda R}{\lambda R - 1}}$

Sol: $\frac{1}{\lambda} = R\left(1 - \frac{1}{n^2}\right)$

$\therefore\ n = \sqrt{\frac{\lambda R}{\lambda R - 1}}$

44. The magnetic dipole moment of a current ------

Ans: Magnetic field in which it is lying.

Sol: M = 1 NA

45. In ruby laser, the stimulated emission is due -----

Ans: Metastable state to ground state.

Sol: In Ruby Laser, the transition is from E_2 state (Metastable) to E_1 state (ground).

46. A direct current I flows along the length of an infinitely long straight thin -----

Ans: Is zero at any point inside the pipe.

Sol: Ampere's circuital law.

47. A convex lens made of glass has focal length 0.15 m -----

Ans: 0.6 m

Sol: f_w = 4 fair (using lens maker's formula)
$= 4 \times 0.15$
= 0.6 m

48. Two sources are said to be coherent If they ---

Ans: Having constant phase difference.

49. Three resistors 1 Ω, 2 Ω and 3 Ω are connected to form a triangle -------

Ans: 1 A

Sol: $I = \frac{V}{R} = \frac{3}{3} = 1$ A

50. In a common emitter amplifier the input signal is -----

Ans: Base and Emitter

51. In a radioactive disintegration, the ratio of initial number of atoms -----

Ans: e

Sol: $N = N_0 e^{-\lambda t}$

$t = \frac{1}{\lambda}, \quad \frac{N_0}{N} = e$

52. A ray of light is incident on a surface of glass slab at an angle -----

Ans: $\tan^{-1}\left(1 - \sqrt{\frac{2}{3}}\right)$

Sol: $S = t\,\frac{\sin(i - r)}{\cos r}$

$\frac{1}{\sqrt{3}} = \frac{\sin(i - r)}{\cos r}$

$= \frac{\sin i \cos r - \cos i \sin r}{\cos r}$

$\frac{1}{\sqrt{3}} = \frac{1}{\sqrt{2}}(1 - \tan r)$

$\frac{\sqrt{2}}{\sqrt{3}} = 1 - \tan r$

$r = \tan^{-1}\left(1 - \sqrt{\frac{2}{3}}\right)$

53. Ferromagnetic materials used in a transformer ----

Ans: High permeability and low hysteresis loss.

54. According to Newton's Corpuscular Theory, -----

Ans: Lesser in a rarer medium.

55. For the constructive interference the path difference between the two ------

Ans: $n\lambda$

Sol: Note: $(2n + 1)\frac{\lambda}{2}$ is possible for constructive interference in thin films, Lloyd's single mirror etc.

56. The accurate measurement of emf can ----

Ans: Potentiometer

Sol: Potentiometer is an ideal voltmeter.

57. The kinetic energy of an electron gets tripled, then the -----

Ans: $\frac{1}{\sqrt{3}}$

Sol: $E \propto \frac{1}{\lambda^2} \Rightarrow \lambda' = \frac{\lambda}{\sqrt{3}}$

$E' \Rightarrow 3E$

58. Which of the following is not a thermodynamic -------

Ans: Gas constant

59. Two solid pieces, one of steel and the other of aluminium when immersed ------

Ans: Aluminium piece will weight more.

Sol: Apparent weight in air $\left(1 - \frac{\text{density of liquid}}{\text{density of solid}}\right)$

$$\Rightarrow \frac{W_S}{W_A} = \frac{\left(1 - \frac{\sigma}{\rho_A}\right)}{\left(1 - \frac{\sigma}{\rho_S}\right)} < 1$$

60. The amount of energy released when one microgram ----

Ans: 25 kWh (No correct choice)

Sol: $E = mc^2$

$= 10^{-6} \times 10^{-3} \times (3 \times 10^8)^2$

$= 9 \times 10^7$ J

$\therefore E = \frac{9 \times 10^7}{3.6 \times 10^6}$ kWh

= 25 kWh

(Note:- If the mass in milligram, the answer will be 0.25×10^5 kWh)