EAMCET PHYSICS QUESTIONS

1. With due regard to significant figures, the value of (46.7 – 10.04) is
   1) 36.7 2) 36.00 3) 36.66 4) 30.6
2. The least count of a stop watch is 1/5 sec. The time of 20 oscillations of a pendulum is measured to be 25 sec. The maximum percentage error in this measurement is
   1) 8% 2) 1% 3) 0.8% 4) 16%
3. A body of mass m is suspended by a string of length *'l'* and pulled to a side through horizontal a distance 'r' by means of horizontal force. Then the tension in the string is
   1) $\frac{mg\sqrt{l^2 - r^2}}{l}$ 2) $\frac{mgr}{l}$
   3) $\frac{mgl}{r}$ 4) $\frac{mgl}{\sqrt{l^2 - r^2}}$
4. A boat takes 2 hours to travel 8km and back in Still Water Lake. With water velocity of 4 kmph, the time taken for going upstream of 8km and coming back is
   1) 160 minutes 2) 80 minutes 3) 320 minutes 4) 180 minutes
5. For a body moving with uniform acceleration ‘a’, initial and final velocities in a time interval‘t’ are ‘u’ and ‘v’ respectively. Then, its average velocity in the time interval‘t’ is
   1) $\left(v + \frac{at}{2}\right)$ 2) $\left(v - \frac{at}{2}\right)$ 3) (v-at) 4) $\left(u + \frac{at}{2}\right)$
6. The velocity of a body as a function of time is $V = t^3 - 6t^2 + 10t + 4$. Set the accelerations of a body in increasing order at given times
   a) t = 0 sec b) t = 1 sec c) t = 5 sec
   1) b, a, c 2) a, b, c 3) c, b, a 4) c, a, b
7. A ball of mass '*m*' is projected from the ground with a speed '*u*' at an angle 'α' with the horizontal. The magnitude of the change in momentum of the ball over a time interval from beginning till it strikes the ground again is
   1) $\frac{mu\sin\alpha}{2}$ 2) $2mu\cos\alpha$ 3) $\frac{mu\cos\alpha}{2}$ 4) $2mu\sin\alpha$
8. A force F is applied on a lawn mover at an angle of 60° with the horizontal. If it moves through a distance x, the work done by the force is
   1) Fx/2 2) F/2x 3) 2Fx 4) 2x/F
9. A marble going at a speed of $2\ ms^{-1}$ hits another marble of equal mass at rest. If the collision is perfectly elastic, find the velocity of the first after collision.
   1) 4 2) 0 3) 2 4) 3
10. A body of mass 50gm collides elastically with another body of mass 30 gm at rest. Then the percentage loss of the velocity of the colliding body during collision is
    1) 25% 2) 75% 3) 50% 4) 67%
11. Four identical particles each of mass ‘m’ are arranged at the corners of a square of side length “*l*”. If the masses of the particles at the end of a side are doubled, the shift in the centre of mass of the system?
    1. $\frac{l}{6}$ 2. $\frac{l}{6\sqrt{2}}$ 3. $\frac{l}{\sqrt{2}}$ 4. $\frac{l}{5\sqrt{2}}$

12. Three identical spheres each of mass 1kg are placed touching each other with the centres on a straight line. The centres are marked as A, B and C respectively. The distance of centre of mass from A is

1. $\frac{AB+BC}{3}$ 2. $\frac{AB+AC}{3}$

3. $\frac{AC+BC}{2}$ 4. $\frac{AB+AC}{2}$

13. A body of mass 2kg is placed on a horizontal surface having coefficient of kinetic friction 0.4 and coefficient of static friction 0.5. If a horizontal force of 2.5N is applied on the body, the frictional force acting on the body will be ($g = 10\ ms^{-2}$)

1. 8 N 2) 10 N 3) 20 N 4) 2.5 N

14. A body of mass 'm' is thrown vertically up with velocity 'u'. If the resistance force due to air is 'f', the time of ascent of the body is

1. $\frac{u}{g+f}$ 2. $\frac{mu}{mg+f}$ 3. $\frac{u}{g-f}$ 4. $\frac{mu}{mg-f}$

15. Two particles of masses in the ratio 1 : 2 are moving in circles of radii in the ratio 2 : 3 with time periods in the ratio 3 : 4. The ratio of their centripetal forces is

1) 9 : 4 2) 1 : 4 3) 9 : 16 4) 16 : 27

16. Let I be the moment of inertia of a uniform square plate about an axis AB that passes through its centre and is parallel to two of its sides . CD is a line in the plane of the plate that passes through the centre of the plate and makes an angle θ with AB. The moment of inertia of the plate about the axis CD is then equal to

1) I 2) $I\sin^2\theta$ 3) $I\cos^2\theta$ 4) $I\cos^2\left(\frac{\theta}{2}\right)$

17. Two satellites are revolving round the earth at different heights. The ratio of their orbital speeds is 2: 1. If one of them is at a height of 100km, the height of the other satellite is

1) 19600km 2) 24600km 3) 29600km 4) 14600km

18. A particle is kept at rest at a distance R (Earth's radius) above the earth's surface. The minimum speed with which it should be projected so that it does not return is

1) $\sqrt{\frac{GM}{R}}$ 2) $\sqrt{\frac{GM}{2R}}$ 3) $\sqrt{\frac{GM}{3R}}$ 4) $\sqrt{\frac{GM}{4R}}$

19. A body executing SHM has a total energy E. When its kinetic energy is $\frac{3E}{4}$, the displacement of the particle is (a is amplitude)

1) a 2) a/2 3) $\frac{\sqrt{3}a}{2}$ 4) $\frac{3a}{4}$

20. When a body is in SHM, match the statements in Column A with that in Column B

Column A	***Column B***
a) Velocity is maximum	e) At half of the amplitude
b) Kinetic energy is 3/4th of total energy	f) At the mean position
c) Potential energy is 3/4th of total energy	g) At extreme position
d) Acceleration is maximum	h)At $\frac{\sqrt{3}}{2}$ times amplitude

1) a – f, b – e, c – h, d – g 2) a – e, b – f, c – g, d – h

3) a –g, b – h, c – e, d – f 4) a – h, b – e, c – f, d – g

21. A uniform heavy rod of length L and area of cross section 'A' is hanging from a fixed support. If young's modulus of the material of the rod is Y, the increase the length of rod is (ρ is density of the material of the rod)

1) $\frac{L^2Y}{2\rho g}$ 2) $\frac{L^2\rho g}{2Y}$ 3) $\frac{L^2 g}{2Y\rho}$ 4) $\frac{L^2 g}{3Y\rho}$

22. Four wires P,Q,R and S of same materials have diameters and stretching forces as shown below. Arrange their strains in the decreasing order.

Wire	Diameter	stretching force
P	2 mm	10 N
Q	1 mm	20 N
R	4 mm	30 N
S	3 mm	40 N

1) Q,S,P,R 2) R,P,S,Q 3) P,Q,R,S 4) P,R,Q,S

23. The energy required splitting a liquid drop having surface tension T and radius R into n identical droplets is

1) $8\pi R^2\left(n^{1/3}-1\right)T$ 2) $4\pi R^2\left(n^{1/3}-1\right)T$

3) $8\pi R^2\left(n^{2/3}-1\right)T$ 4) $4\pi R^2\left(n^{2/3}-1\right)T$

24. An air bubble of radius r is formed at a depth h below the surface of water. The pressure inside the bubble is: [T = surface tension, P_0 = atmospheric pressure, d = density of water)

1) $P_0+\frac{2T}{r}$ 2) $\frac{4T}{r}+\frac{h}{r}$ 3) $P_0+hdg+\frac{4T}{r}$ 4) $P_0+hdg+\frac{2T}{r}$

25. A wire of length 60 cm. is bent into a circle with a gap of 1 cm. at its ends. On heating it by 100^0C, the length of the gap increases to 1.02 cm. α of material of wire is

1) $2\text{x}10^{-4/0}$C 2) $4\text{x}10^{-4/0}$C 3) $6\text{x}10^{-4/0}$C 4) $1\text{x}10^{-4/0}$C

26. A pendulum clock runs fast by 5 seconds per day at 20^0C and goes slow by 10 seconds per day at 35^0C. It shows correct time at a temperature of

1) 27.5^0C 2) 25^0C 3) 30^0C 4) 33^0C

27. For a gas $\gamma = \frac{5}{3}$. 800c.c. of this gas is suddenly compressed to 100c.c. If the initial pressure is P, then the final pressure will be

1. $\frac{P}{32}$ 2. $\frac{24P}{5}$ 3. 8P 4. 32P

28. The triatomic gas is heated isothermally. What percentage of the heat energy is used to increase the internal energy?

1. 0 % 2. 14 % 3. 60 % 4. 100 %

29. Two metal rods of same length and areas A_1 and A_2 are arranged in parallel. If the thermal conductivities of the materials are k_1 and k_2 the effective thermal conductivity of the combination is

1) $\frac{2k_1k_2}{k_1+k_2}$ 2) $\frac{k_1+k_2}{2}$ 3) $\frac{k_1A_1+k_2A_2}{A_1+A_2}$ 4) $\frac{k_1k_2\left(A_1+A_2\right)}{k_1A_2+k_2A_1}$

30. Two cylindrical rods of the same substance have diameters d_1 and d_2 . The amounts of heat conducted by these two rods, for same temperature difference between two ends will be equal if their lengths are related by

1) $\frac{l_1}{l_2}=\frac{d_1}{d_2}$ 2) $\frac{l_1}{l_2}=\left(\frac{d_1}{d_2}\right)^2$ 3) $\frac{l_1}{l_2}=\frac{d_2}{d_1}$ 4) $\frac{l_1}{l_2}=\left(\frac{d_2}{d_1}\right)^2$

31. An open pipe and closed pipe have same length .The ratio of frequencies of their n^{th} over tone is

1) $\frac{n+1}{2n+1}$ 2) $\frac{2(n+1)}{2n+1}$ 3) $\frac{n}{2n+1}$ 4) $\frac{n+1}{2n}$

32. If the length of the wire of a sonometer is halved the value of resonant frequency will be

1) double 2) half 3) four times 4) eight times

33. An achromatic combination of lenses produce

1) Image in black and white
2) Coloured images
3) Image unaffected by variation of refractive index with wave length
4) highly enlarged images

34. A ray of light from a denser medium strikes a rarer medium at an angle of incidence 'i' if the reflected and refracted rays are mutually perpendicular to each other then the critical angle is

1) $\sin^{-1}(\tan i)$ 2) $\cos^{-1}(\tan i)$
3) $\cot^{-1}(\tan i)$ 4) $\text{cosec}^{-1}(\tan i)$

35. A light of wavelength λ is incident on an object of size b. If a screen is at a distance D from the object. identify the correct condition for the observation of different phenomenon

a) if $b^2 = D\lambda$, Fresnel diffraction is observed

b) if $b^2 >> D\lambda$, Fraunhoffer diffraction is observed

c) $b^2 << D\lambda$, Fraunhoffer diffraction is observed

d) $b^2 >> D\lambda$, the approximation of geometrical optics is applicable

1) a, b and d are true 2) a,c and d are true
3) a and c are true 4) a and d are true

36. In Young's double slit experiment

1) only interference occurs 2) only diffraction occurs
3) both interference and diffraction occurs 4) polarisation occurs

37. A magnet of moment M is bent at its mid point so that angle between the two parts is 120^0, the magnetic moment of the magnet now is

1) M 2) $M\sqrt{3}$ 3) $\frac{M\sqrt{3}}{2}$ 4) $\frac{M}{2}$

38. When a bar magnet is suspended in an uniform magnetic field, then the torque acting on it will be

List-I	***List-II***
a) maximum	e) $\theta = 45^0$ with the field
b) half of the maximum value	f) $\theta = 60^0$ with the field
c) $\sqrt{3}/2$ times the maximum	g) $\theta = 30^0$ with the field
d) $1/\sqrt{2}$ times the maximum	h) $\theta = 90^0$ with the field

1) a-h, b-g, c-f, d-e 2) a-e, b-f, c-g, d-h
3) a-f, b-e, c-g, d-h 4) a-h, b-f, c-g, d-e

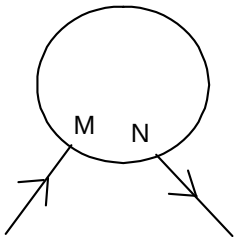
39. A cube of side b has charge q at each of its vertices. The electric field at the centre of the cube will be

1) zero 2) $\frac{32q}{b^2}$ 3) $\frac{q}{2b^2}$ 4) $\frac{q}{b^2}$

40. If an uncharged capacitor is charged by connecting it to a battery, then the amount of energy lost as heat is

1) $\frac{1}{2}QV$ 2) QV 3) $\frac{1}{2}QV^2$ 4) QV^2

41. A uniform wire of resistance $20\,\Omega$ having resistance $1\,\Omega/\text{m}$ is bent in the form of circle as shown in fig. If the equivalent resistance between M and N is $1.8\,\Omega$, then the length of the shorter section is



1) 2 m 2) 5 m 3) 1.8 m 4) 18 m

42. In a potentiometer using two cells in series gave a balance length 600cm. When the same cells are connected opposing each other then balance length is 100cm. The ratio of emfs of the cells is

1) 7 : 5 2) 5 : 7 3) 6 : 1 4) 1 : 6

43. The cold junction of a thermo couple is at 0^0C and the thermo emf (in volts) as a function of the temperature 't' of the hot junction is given by $E = \left[10\times10^{-6}t - \frac{1}{40}\times10^{-6}t^2\right]$.

The neutral temperature and the maximum emf produced are respectively

1)200^0C, 1m V 2) 400^0C, 2 mV

3) 100^0C, 1 mV 4) 200^0C, 2 mV

44. Two straight long conductors AOB and COD are perpendicular to each other and carry currents i_1 and i_2. The magnitude of magnetic induction at a point P at a distance a from the point O in the direction perpendicular to the plane ABCD is

1) $(\mu_0/2\pi a)(i_1 + i_2)$ 2) $(\mu_0/2\pi a)(i_1 - i_2)$

3) $(\mu_0/2\pi a)(i_1^2 + i_2^2)^{1/2}$ 4) $(\mu_0/2\pi a)[i_1 i_2/(i_1+i_2)]$

45. The flux linked with a coil is 0.8 Wb when a 2 A current is flowing through it. If this current begins to increase at the rate of 400 A/s, the induced emf in the coil will be

1) 20 V 2) 40 V 3) 80 V 4) 160 V

46. In an A.C circuit, a resistance R is connected in series with an inductance L. If the phase angle between voltage and current be 45^0, the value of inductive reactance will be

1) $\frac{R}{4}$ 2) $\frac{R}{2}$ 3) R 4) $\frac{R}{3}$

47. The work function of cesium is 1.8eV. Light of 5000 A^o is incident on it. The maximum velocity of emitted electrons is nearly

1) $5\times10^6 m/s$ 2) $5\times10^5 m/s$ 3) $5\times10^4 m/s$ 4) $5\times10^3 m/s$

48. The energy of the incident photon is 12.38 e V, while the energy of the scattered photon is 9.4ev. The K.E. of the recoil electron is nearly

1) 2 eV 2) 1 eV 3) 4 eV 4) 3 eV

49. On the bombardment or Boron with neutron, α - particle is emitted and product nucleus formed is.....
    1) ${}_6C^{12}$ 2) ${}_2Li^6$ 3) ${}_3Li^8$ 4) ${}_4Be^9$
50. The energy equivalent of 1g of matter is
    1) 9 x 10^{13} joule 2) 9 x 10^{13} erg
    3) 3 x 10^5 joule 4) 3 x 10^5 joule
51. A transistor has a base current of 1mA and emitter current 100mA. The current transfer ratio will be
    1) 0.9 2) 0.99 3) 1.1 4) 10.1

KEYS

1) 1	2) 3	3) 4	4) 1	5) 2	6) 1	7) 4
8) 1	9) 2	10) 2	11) 1	12) 2	13) 4	14) 2
15) 4	16) 1	17) 1	18) 1	19) 2	20) 1	21) 2
22) 1	23) 2	24) 4	25) 1	26) 2	27) 4	28) 1
29) 3	30) 2	31) 1	32) 1	33) 3	34) 1	35) 2
36) 3	37) 3	38) 1	39) 1	40) 1	41) 1	42) 1
43) 1	44) 3	45) 4	46) 3	47) 2	48) 4	49) 4
50) 1	51) 2					

HINTS

1. Rounded off to minimum significant figures
2. $\Delta T = \frac{1/5}{20} and\, T = \frac{25}{20}$

   $\%\, error = \frac{\Delta T}{T} \times 100$
3. $\frac{T}{l} = \frac{mg}{\sqrt{l^2 - r^2}}$
4. $V_B = \frac{8+8}{2} = 8kmph$

   $t = t_1 + t_2 = \frac{8}{v_B + v_r} + \frac{8}{v_B - v_r} = 160\min$
5. Average velocity$= \frac{\text{total displacement}}{\text{total time}}$

6. $a = \frac{dv}{dt}$

7. $\Delta P = m(V - u)$

8. $W = \vec{F}.\vec{S} = FS\cos\theta$

9. $v_1 = \left(\frac{m_1 - m_2}{m_1 + m_2}\right)u_1 + \left(\frac{2m_2}{m_1 + m_2}\right)u_2$

10. Colliding body is first body so, percentage loss of velocity of 1st body = $\frac{u_1 - v_1}{u_1}(100)$

$= \left[u_1 - \left[\frac{m_1 - m_2}{m_1 + m_2}\right]u_1\right]100 = \left[1 - \left[\frac{m_1 - m_2}{m_1 + m_2}\right]\right]100$

$= \frac{2m_2}{m_1 + m_2}(100) = \frac{2\times 30}{80}\times 100 = 75\%$

11. Shift = $\frac{m_2 d}{m_1 + m_2}$

12. Co-ordinates of A, B & C are (0, 0), (AB, 0), (AC, 0)

$X_{cm} = \frac{\Sigma m_i x_i}{\Sigma m_i}$

13. $F < f_s(\max)$

Then $f_s = F = 2.5N$

14. $L = \frac{1}{2}g(\sin\theta - \mu\cos\theta)t^2$

15. $F = mr\omega^2 = mr\left(\frac{4\pi^2}{T^2}\right)$

$F\,\alpha\,\frac{mr}{T^2}$

$\frac{F_1}{F_2} = \frac{m_1}{m_2}\times\frac{r_1}{r_2}\times\frac{T_2^2}{T_1^2}$

16. Angle does not change the moment of ienrtia

17. $\frac{V_1}{V_2} = \sqrt{\frac{R_2}{R_1}}\ (R_2 = R + h_2)$

18. $F = \frac{GMm}{(R+h)^2}$

and centripetal $F = \frac{MV_0^2}{(R+h)^2}$

$\Rightarrow \frac{GMm}{(R+h)^2} = \frac{MV_0^2}{(R+h)^2}$

22. $strain\ \alpha\ \frac{F}{r^2}$

25. $\alpha = \frac{l_1 - l_2}{l_1 \Delta t}$ (Gap can be taken as l_1)

26. $\frac{1}{2}\alpha(35 - t) \times 86400 = 10$

$\frac{1}{2}\alpha(t - 20) \times 86400 = 5$

27. $p_1 v_1^{\gamma} = p_2 v_2^{\gamma}$

28. In an isothermal process, as temperature remains constant internal energy does not change.

29. $K(A_1 + A_2) = k_1 A_1 + k_2 A_2$

30. $Q = \frac{KA(\theta_1 - \theta_2)t}{\ell}$

34. $\mu = \tan i = \frac{1}{\sin c}$

41. Let the resistance of shorter part MN be x.
Then resistance of longer part is (20 – x) Ω

$R_{eq} = \frac{(20 - x)x}{20 - x + x} = 1.8\,\Omega$

Solving we get x = 2 Ω

So length of shorter part = 2m

42. $\frac{e_1 + e_2}{e_1 - e_2} = \frac{l_1}{l_2}$

43. At $\frac{dE}{dt} = 0$; Find ' t'

45. $\phi = Li \Rightarrow L = \frac{0.8}{2} = 0.4$

$e = L\frac{di}{dt} = 0.4 \times 400 = 160v$

46. $Tan\phi = \frac{\omega L}{R}$

47. K.E. = $\frac{12400}{\lambda} - \omega_0$

48. K.E. = E-E' Where E' is the scattered energy

50. $E = \Delta m C^2$

51. $\alpha = \frac{I_c}{I_e}, I_e = I_b + I_c$