PHYSICS

Units & Dimensions

1. When a wave traverses a medium, the displacement of a particle located at 'x' at a time 't' is given by $y = a\sin(bt - cx)$, where a, b and c are constants of the wave, which of the following is a quantity with dimensions **(2009-E)**

1) y/a 2) bt 3) cx 4) b/c

2. If energy E, velocity V and time T are taken as fundamental quantities, the dimensional formula for surface tension is **(2009-M)**

1) $E^1V^{-2}T^{-2}$ 2) $E^2V^1T^{-2}$ 3) $E^1V^{-2}T^{-1}$ 4) $E^{-2}V^{-2}T^{-1}$

3. The energy (E). angular momerntum (L) and universal graviational constant (G) are chiosen as fundamental quantities. The dimensions of universal gravitational constant in the dimensional formula of planks constant (h) is **(2008 E)**

(1) 0 (2) -1 (3) $\frac{5}{3}$ (4) 1

4 Some physical constants are given in List - I and their dimensional formulae are given in List - 2. Match the following : **(2007 E)**

List - I	**List - 2**
a) Planck's constant	e) $\left[ML^{-1}T^{-2}\right]$
b) Gravitationalconstant	f) $\left[ML^{-1}T^{-1}\right]$
c) Bulk modulus	g) $\left[ML^{2}T^{-1}\right]$
d) Coefficient of Viscosity	h) $\left[M^{-1}L^{3}T^{-2}\right]$

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

5. If force (F), work (W) and Velocity (V) are taken as fundametal quantities then the dimensinal formula of Time (T) is **(2007 M)**

1) $W^1F^1V^1$ 2) $W^1F^1V^{-1}$ 3) $W^{-1}F^{-1}V^{-1}$ 4) $W^1F^{-1}V^{-1}$

6 If C, R, C and I denote capacity resistance, inductance and electric current respectively, the quantities having the same dimensions of time are **(2006 E)**

a) CR b) L/R c) $\sqrt{LC}$ d) LI^2

1) a and b only 2) a and c only 3) a and d only 4) a, b and c only

7 According to Bernoulli's theorem $\frac{p}{d} + \frac{v^2}{2} + gh =$ constant. The dimensional formula of the constant is (P is pressure, d is density, h is height, v is velocity and g is accelaration due to gravity) **(2005 M)**

1) $M^0L^0T^0$ 2) M^0LT^0 3) $M^0L^2T^{-2}$ 4) $M^0L^2T^{-4}$

8. If power (P) , surface tension (T) and Planck's constant (h) are arranged so that the dimensions of time in their dimension formulae are in ascending order, then which of the following is correct ?**(2008M)**

1) P ,T , h 2) P,h,T 3) T,P,h 4) T,h,P

Vectors

9. Two persons A and B are located in the X-Y plane at the points (0,0) and (0,10) respectively. (The distances are measured in MKS units). At a time t = 0, they start moving simultaneously with velocities $\overrightarrow{u_A} = 2\overline{j}$ m/s and $\overrightarrow{u_B} = 2\overline{i}$ m/s. The time after which A and B are at their closet distance **(2009-E & M)**

1) 2.5 secs 2) 4 secs 3) 1 sec 4) $\frac{10}{\sqrt{2}}$ secs

10. The component of vector $\overline{A} = a_x\hat{i} + a_y\hat{j} + a_z\hat{k}$ along the direction of $\hat{i} - \hat{j}$ is (E-2008)

1) $a_x - a_y + a_z$ 2) $a_x - a_y$ 3) $\frac{a_x - a_y}{\sqrt{2}}$ 4) $(a_x + a_y + a_z)$

11. Three forces $\overrightarrow{A} = \{\hat{i} + \hat{j} + \hat{k}\}, \overrightarrow{B} = \{2\hat{i} - \hat{j} - 3\hat{k}\}$ and $\overrightarrow{C}$ acting on a body to keep it in equilibrium is (M-2008)

1) $-\{3\hat{i} + 4\hat{k}\}$ 2) $-\{4\hat{i} + 3\hat{k}\}$ 3) $3\hat{i} + 4\hat{j}$ 4) $2\hat{i} - 3\hat{k}$

12. A man is walking due east at the rate of 2Km/hour. The rain appears to him to come down vertically at the rate of 2km/hour. The actual velocity and direction of rainfall with the vertical respectively are (M-2008)

1) $2\sqrt{2}kmph, 45^0$ 2) $\frac{1}{\sqrt{2}}kmph, 30^0$

3) 2 kmph, 0^0 4) 1kmph, 90^0

13. Velocity and acceleration vectors of charged particle moving perpendicular to the direction of a magnetic field at a given instant of time are $\vec{v} = 2\hat{i} + c\hat{j}$ and $\vec{a} = 3\hat{i} + 4\hat{j}$ respectively. Then the value of 'c' is (E-2007)

1) 3 2) 1.5 3) -1.5 4) -3

14. Given two vectors $\overline{A} = \hat{i} - 2\hat{j} - 3\hat{k}$ and $\overline{B} = 4\hat{i} - 2\hat{j} + 6\hat{k}$. The angle made by $(\overline{A} + \overline{B})$ with X-axis is (M-2007)

1. 30^0 2) 45^0 3) 60^0 4) 90^0

15. When a man is standing, rain drops appear to him falling at 60^0 from the horizontal from his front side. When he is travelling at 5km per hour on a horizontal road they appear to him falling at 30^0, from the horizontal from his front side. The actual speed of the rain is (in km per hour) : (E-2006)

1) 3 2) 4 3) 5 4) 6

16. Of the vectors given below, the parallel vectors are, (M-2006)

$\vec{A} = 6\hat{i} + 8\hat{j}$ $\overline{B} = 210\hat{i} + 280\hat{k}$ $\overline{C} = 5.1\hat{i} + 6.8\hat{j}$ $\overline{D} = 3.6\hat{i} + 8\hat{J} + 48\hat{k}$

1) $\vec{A}$ and $\vec{B}$ 2) $\vec{A}$ and $\vec{C}$ 3) $\vec{A}$ and $\vec{D}$ 4) $\vec{C}$ and $\vec{D}$

Kinematics

17. A body is projected vertically upwards at time t = 0 and it is seen at a height 'H' at time t_1 ad t_2 seconds during its flight. The maximum height attained is (g is acceleration due to gravity) **(2009-E)**

1) $\frac{g(t_2 - t_1)^2}{8}$ 2) $\frac{g(t_1 + t_2)^2}{4}$ 3) $\frac{g(t_1 + t_2)^2}{8}$ 4) $\frac{g(t_2 - t_1)^2}{4}$

18. A body is thrown vertically up to reach its maximum height in seconds. The total time from the time of projection to reach a point at half of its maximum height while returning (in seconds) is **(EAMCET Engg 2008)**

1. $\sqrt{2}\ t$ 2. $\left(1+\frac{1}{\sqrt{2}}\right)t$ 3. $\frac{3t}{2}$ 4. $\frac{t}{\sqrt{2}}$

19. If a body is projected with an angle q to the hirizontal , then **(EAMCET 2008)**
1. its velocity is always prependicular to its acceleration.
2. its velocity becoms zero at its maximum height
3. its velocity makes zero angle with the horizontal at its maximum height
4. the body just before hitting the ground , the direction of velocity coincides with the accleration

20. A man is walking due east at the rate of 2km /hour . The rain appears to him falling down vertically at the rate of 2 km/hour . The actual velocity and direction of rainfall with the vertical respectively are **(EAMCET 2008)**

1. $2\sqrt{2}\ kmph, 45^0$ 2. $\frac{1}{\sqrt{2}}\ kmph, 30^0$ 3. $2\ kmph, 0^0$ 4. $1\ kmph, 90^0$

21. An object is projected with a speed of $100ms^{-1}$ at an angle $q = \sin^{-1}\left(\frac{3}{5}\right)$ to the horizontal . At the highest point , the object breakks into two pieces of matter m_1 *and* m_2 $(m_1 : m_2 = 1:3)$ and the smaller one comes to rest . The distance between the point of projection and the point of landing of the bigger piece (in matres) is $(g = 10m/s^2)$ **(EAMCET 2007)**

1. 3840 2. 1280 3. 1120 4. 960

22. A body of mass 2 kg is projected from the ground witn a velocity $20ms^{-1}$ at an angle 30^0 with the vertical . If t_1 is the time in seconds at which the body is projected and t_2 is the time in seconds at which it reaches the ground, the change in momentum in $kgms^{-1}$ during the time $(t_2 - t_1)$ **(EAMCET 2006)**

1. 40 2. $40\sqrt{3}$ 3. $50\sqrt{3}$ 4. 60

23 A particle is moving in a circle in a radius 'r' with a consatnt speed 'v' . Theb change in velocity after the particle has travelled a distance equal to $\left(\frac{1}{8}\right)$ of the circumference of the circle is : **(EA 2006)**

1. Zero 2. $0.500v$ 3. $0.785v$ 4. $0.125v$

24. A body is projected vertically upwards with a velocity 'u' . It crosses a point in its journey at a height 'h' twice , just after 1 and 7 seciinds .The value of u in ms^{-1} is $(g = 10ms^{-2})$ **(EAMCET 2006)**

1. 50 2.40 3. 30 4. 20

Dynamics

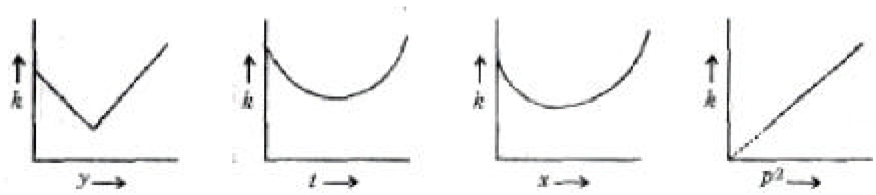
25. A motor of power P_0 is used to deliver water at a certain rate through a given horizontal pipe. To increase the rate of flow of water through the same pipe n times, the power of the motor is increased to P_1. The ratio of P_1 to P_0 is

1) n : 1 2) n^2 : 1 3) n^3 : 1 4) n^4 :1

26. A block of mass 'm' is connected to one end of a spring of 'spring constant' k. The other end of the spring is fixed to a rigid support. The mass is released slowly so that the total energy of the system is then constituted by only the potential energy, then 'd' is the maximum extension of the spring. Instead, if the mass is released suddenly from the same initial position, the maxium extension of the spring now is (g - acceleration due to gravity) **(2009-M)**

1) $\frac{mg}{k}$ 2) $2d$ 3) $\frac{mg}{3k}$ 4) $4d$

27. A particle is projected up from a point at an angle q , with the horizontal direction. At any time 't', if 'p' is its linear momentum, 'y' is the vertical displacement, 'x' is te horizontal displacement, the graph among the following, which does not represent the variation of kinetic energy k of the projectile is **(2009-M)**



1) Graph (A) 2) Graph (B) 3) Graph (C) 4) Graph (D)

28. A boy of mass 50 kg is standing on a weighing machine placed on the floor of a lift. The machine reads his weight in Newtons. What is the reading of the machine if the lift is moving upwards with a uniform speed of 10m/sec^2, (g = 10 m/sec^2) **(2009-M)**

1) 510 N 2) 480 N 3) 490 N 4) 500 N

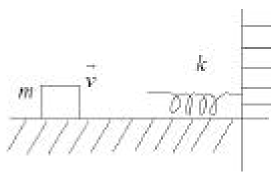
29. A motor is used to deliver water at a certain rate through a given horizontal pipe. To deliver n-times the water through the same pipe in the same time the power of the motor must be increased as follows.**(Eamcet Engg-2006)**

1) n-times 2) n^2 - times 3) n^3 - times 4) n^4 - times

30. A bullet of mass 10gm of fired horizontally with a velocity $1000ms^{-1}$ from a rifle situated at a height 50 m above the ground. If the bullet reaches the ground with a velocity $500ms^{-1}$, the work done against air resistance in the trajectory of the bullet is (in joules) $\left(g = 10ms^{-2}\right)$ **(Eamcet Engg-2006)**

1) 5005 2) 3755 3) 3750 4) 17.5

31. A block of mass m = 25 kg on a smooth horizontal surface with a velocity $\vec{v} = 3ms^{-1}$ meets the spring of spring constant k = 100N/m fixed at one end as shown in figure. The maximum compression of the spring and velocity of block as it returns to the original position respectively are **(Eamcet Engg-2007)**



1) $1.5m, -3ms^{-1}$ 2) $1.5m, 0ms^{-1}$ 3) $1.0m, 3ms^{-1}$ 4) $0.5m, 2ms^{-1}$

32. A rifle of 20kg mass can fire 4 bullets per second. The mass of each bullet is $35\times10^{-3}kg$ and its final velocity is $400ms^{-1}$. Then what force must be applied on the rifle so that it does not move backwards while firing the bullets ? **(Eamcet Engg-2007)**

1) 80 N 2) 28 N 3) -112 N 4) -56 N

33. A body is thrown vertically up with certain intial velocity, the potential and kinetic energies of the body are equal at a point P in its path. If the same body is thrown with double the velocity upwards, the ratio of potential and kinetic energies of the body when it crosses the same point, is **(Eamcet Medical-2007)**

1) $1:1$ 2) $1:4$ 3) $1:7$ 4) $1:8$

34. A body of mass 2kg is thronw up vertically with kinetic energy of 490J. If $g = 9.8 m/s^2$, the height at which the kinetic energy of the body becomes half of the original values, is **(Eam Med-2007)**

1) 50m 2) 25m 3) 12.5m 4) 19.6 m

35. The apparent weight of a person inside a lift is W_1 when lift moves up with a certain acceleration and is W_2 when lift moves down with same acceleration. The weight of the person when lift moves up with constant speed is **(Eamcet Medical-2007)**

1) $\frac{W_1+W_2}{2}$ 2) $\frac{W_1-W_2}{2}$ 3) $2W_1$ 4) $2W_2$

36. A steel wire can with stand a load up to 2940 N. A load of 150kg is suspended from a rigid support. The maximum angle through which the can be displaced from the mean position, so that the wire does not break when the load passes through the position of equilirbium, is **(Eamcet Engg-2008)**

1) 30^0 2) 60^0 3) 80^0 4) 85^0

37. The object at rest suddenly explodes into three parts with the mass ratio 2:1:1. The parts of equal masses move at right angles to each other with equal speed V. The speed of the third part after the explosion will be **(Eamcet Medical -2008)**

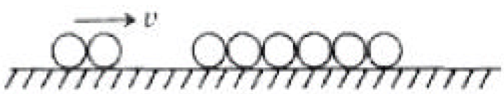
1) 2V 2) $V/\sqrt{2}$ 3) V/2 4) $\sqrt{2}V$

Collisions

38. A body of mass 5kg makes an elastic collision with another body at rest and continues to move in the original direction after collision with a velocity equal to $\frac{1}{10}$th of its original velocity. Then the mass of the second body is **(2009-E& M)**

1) 4.09 kg 2) 0.5 kg 3) 5 kg 4) 5.09 kg

39. Six marbles are lined up in a straight groove made on a horizontal frictionless surface as shown below. Two similar marbles in contact, with a commom velocity 'u' collide with a row of 6 marbles from left. Which of the following is observed? **(2009-M)**



1) One marble from the right rolls out with a speed 2u, the remaining marbles do not move
2) Two marbles from the right roll out with speed u each, the remaining marbles do not move
3) All six marbles in the row will roll out with a speed u/6 each, the two incident marbles will come to rest
4) All eight marbles will start moving to the right, each with a speed of u/8

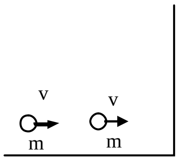
40. A ball is dropped form a height 'h' on a floor of coefficient of restitutuion 'e'. The total distance covered by the ball just before second hit is **(2008 E)**

1. $h(1-2e^2)$ 2. $h(1+2e^2)$ 3. $h(1+e^2)$ 4. he^2

41. A body of mass ‘m’ strikes another body at rest of mass $\frac{m}{9}$. Assuming the impact to be inelastic the fraction of the initial kinetic energy transformed into heat during the contact is **(2008 M)**

1. 0.1 2. 0.2 3. 0.5 4. 0.64

42 Two balls of same mass each ‘m’ are moving with same velocities ‘v’ on a smooth surface as shown in figure. If all collisions between the masses and with the wall are perfectly elastic, the possible number of collisions between the bodies and wall together is **(2008 M)**



1. 1 2. 2 3. 3 4. infinity

43. The object at rest suddenly explodes into three parts with the mass ratio 2 : 1 : 1. The parts of equal masses move at right angles to each othe with equal speeds. The speed of the third part after the explosion will be **(2008 M)**

1. 2 V 2. $V/\sqrt{2}$ 3. V/2 4. $\sqrt{2}V$

44. A sphere of mass ‘m’ moving with constant velocity u, collides with another stationary sphere of same mass. If e is the coefficient of restitution, the ratio of the final velocities of the first and second sphere is **(2007 M)**

1. $\frac{1+e}{1-e}$ 2. $\frac{1-e}{1+e}$ 3. $\frac{e}{1-e}$ 4. $\frac{1+e}{e}$

45. In two separate collisions, the coefficient of restitutions e_1 and e_2 are in the ratio 3 : 1. In the first collision the relative velocity of approach is twice the relative velocity of separation, then the ratio between relative velocity of approach and the relative velocity of separation in the second collision is **(2007 E)**

1. 1 : 6 2. 2 : 3 3. 3 : 2 4. 6 : 1

46. In two separate collisions the coefficients of restitutuions e_1 and e_2 are in the ratio 3 : 1. In first collision the relative velocity of approach is twice the relative of separation. Then the ratio of between relative velocity of approach and relative of separation in the second collision is **[2006-M]**

1. 1 : 6 2. 2 : 3 3. 3 : 2 4. 6 : 1

47. For a system to follow the law of conservation of linear momentum during a collision, the condition is

a) Total external force acting on the system is zero.

b) Total external force acting on the system is finite and time of collision is negligible.

c) Total internal force acting on the system is zero.

[2006-E]

1. a only 2. b only 3. c only 4. a or b

Centre of mass

48. Four particles, each of mass 1 kg are placed at the corners of a square OAB C of side 1m. ‘O’ is at the origin of the coordinate system. OA and OC are aligned along positive X-axis and positive Y-axis respectively. The position vector of the centre of mass is (in ‘m’) **2006 M**

1. $\hat{i}+\hat{j}$ 2. $\frac{1}{2}(\hat{i}+\hat{j})$ 3. $(\hat{i}-\hat{j})$ 4. $\frac{1}{2}(\hat{i}-\hat{j})$

49. Two bodies of 6 kg and 4 kg masses have their velocity $5\hat{i}-2\hat{j}+10\hat{k}$ respectively. Then the velocity of their centre of mass is **2007 E**

1. $5\hat{i}+2\hat{j}-8\hat{k}$ 2. $7\hat{i}+2\hat{j}-8\hat{k}$ 3. $7\hat{i}-2\hat{j}+8\hat{k}$ 4. $5\hat{i}-2\hat{j}+8\hat{k}$

50. A man of 50 kg is standing at one a boat of length 25 m and mass 200 kg . If he starts running and when he reaches the other end , he has a velocity 2 ms^{-1} with respect to the boat . The final velocity the boat is (in ms^{-1}) 50 kg **(2006-E)**

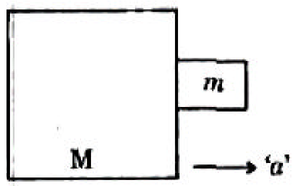
1) $\frac{2}{5}$ 2) $\frac{2}{3}$ 3) $\frac{8}{5}$ 4) $\frac{8}{3}$

Friction

51. A bullet of mass 0.02 kg travelling horizontally with velocity 250 ms^{-1} strikes a block of wood of mass 0.23 kg which rests on a rough horizontal surface. After the impact, the block and bullet move together and come to rest after travelling a distance of 40 m. The coefficient of sliding friction of the rough surface is (g = 9.8 ms^{-2}) **(2009-E)**

1) 0.75 2) 0.61 3) 0.51 4) 0.30

52. Consider a mass 'M' moving in the positive X-direction with an acceleration 'a' as shown below. The minimum acceleration needed to hold a smaller mass 'm' stationary with respect of 'M' on the vertical side of M is (Assume that the surfaces of M and m in contact are rough) **(2009-M)**



1) $\frac{g}{m}$ 2) $\frac{g}{M}$ 3) $3g$ 4) $\frac{g}{m}$

53. When the angle of inclination of an inclined plane is q , an object slides down with uniform velocity. If the same object is pushed up with an initial velocity u on the same inclined plane; it goes up the plane and stops at a certain distance on the plane Thereafter the body: **(2006 E)**

1. slides down the inclined plane and reaches the ground with velocity 'u'
2. slides down the inclined plane and reaches the ground with velocity less than 'u'
3.slides down the inclined plane and reaches the ground with velocity greater then 'u'
4. stays at rest on the inclined plane and will not slide down

54. A block of wood resting on an inclined plane of angle 30^0, just starts moving down. If the coefficient of friction is 0.2, its velocity (in ms^{-1}) after 5 seconds is (g = 10ms^{-2}) **(2006 M)**

1. 12.75 2. 16.34 3.18.25 4.20

55. A man slides down on a telegraphic pole with an acceleration equal to one.fourth of acceleration due to gravity. The frictional force between man and pole is equal to in terms of man's weight w: **(2007 E)**

1. $\frac{w}{4}$ 2. $\frac{w}{2}$ 3. $\frac{3w}{4}$ 4. w

56. A block of mass 2kg is placed on the surface of a trolley of mass 20kg which is on a smooth surface. The coefficient of friction between the block and the surface of the trolley is 0.25. If a horizontal force of 2N acts on the block, the acceleration of the system in ms^{-2} is (g = 10 ms^{-2}) **(2007 M)**

1. 1.8 2. 1.0 3. 0.9 4. 0.09

57. Strating from rest, the time taken by a body sliding down on a rough inclined plane at 45^0 with the horizontal is twice the time taken to travel on a smooth plane of same inclination and same distance. Then the coefficient of kinetic friction is **(2008 E)**

1. 0.25 2. 0.33 3. 0.50 4. 0.75

Gravitation

58. The acceleration due to gravity at a height 'h' above the earth's surface is $9ms^{-2}$. If g = $10ms^{-2}$ on the earth's surface, its value at a point at an equal distance 'h' below the surface of the earth is **(2009-M)**

1) $9ms^{-2}$ 2) $8.5\ ms^{-2}$ 3) $10ms^{-2}$ 4) $9.5ms^{-2}$

59. The orbit of geo-stationary satellite is circular, the time period of satellite depends on **(ENGG 2008)**

1) mass of the satellite 2) mass of the Earth
3) radius of the orbit 4) height of the satellite from the surface of Earth

60. If the Earth shrinks such that its density becomes 8 times to the present value then the new duration of the day in hours will be **(EAMCET MED 2008)**

1) 24 2) 12 3) 6 4) 3

61. The mass of a planet is half that of the earth and the radius of the planet is one fourth that of earth. If we plan to send an artificial satellite from the planet, the escape velocity will be, (escape velocity on earth $V_e = 11kms^{-1}$) **(EAMCET ENGG 2007)**

1) $11kms^{-1}$ 2) $5.5\ kms^{-1}$ 3) $15.55\ kms^{-1}$ 4) $7.78\ kms^{-1}$

62. A body of mass 'm' is raised from the surface of the earth to a height 'nR' (R -radius of earth). Magnitude of the change in the gravitational potential energy of the body is (g - acceleration due to gravity on the surface of earth) **(EAMCET MED 2007)**

1) $\left(\frac{n}{n+1}\right)mgR$ 2) $\left(\frac{n-1}{n}\right)mgR$ 3) $\frac{mgR}{n}$ 4) $\frac{mgR}{(n-1)}$

63. Assume the earth's orbit around the sun as circular and the distance between their centres as 'D. Mass of the earth is 'M' and its radius is 'R'. If earth has an angular velocity 'w_0' with respect to its centre and 'w' with respect to the centre of the sun, the total kinetic energy of the earth is :
(EAMCET ENGG 2006)

1) $\frac{MR^2w_0^2}{5}\left[1+\left(\frac{w}{w_0}\right)^2+\frac{5}{2}\left(\frac{Dw}{Rw_0}\right)^2\right]$ 2) $\frac{MR^2w_0^2}{5}\left[1+\frac{5}{2}\left(\frac{Dw}{Rw_0}\right)^2\right]$

3) $\frac{2}{5}MR^2w_0^2\left[1+\frac{5}{2}\left(\frac{Dw}{Rw_0}\right)^2\right]$ 4) $\frac{2}{5}MR^2w_0^2\left[1+\left(\frac{w}{w_0}\right)^2\frac{5}{2}\left(\frac{Dw}{Rw_0}\right)^2\right]$

64. Assertion (A) : A particle of mass 'm' dropped into a hole made along the diameter of the earth from one end to the other end possesses simple harmonic motion.
Reason (R) : Gravitational force between any two particles is inversely proportional to the square of the distance between them. **(EAMCET ENGG 2006)**

1) Both A and R are true and R is the correct explanation of A
2) Both A and R are true and R is not the correct explanation of A
3) A is true but R is false 4) A is false but R is true

65. How many times more, the mass of the original star is to be larger than that of the sun for the formation of 'Black Hole' ? **(EAMCET MED 2006)**

1) 2 2) 6 3) 8 4) 10

Thermal expansion

66. A piece of metal weighs 45 gms in air and 25 gms in a liquid of density $1.5\times10^{3}\,kg-m^{-3}$ kept at 30^{0}C. When the temperature of the liquid is raised to 40^{0}C, the metal piece weighs 27 gms. The density of liquid at 40^{0}C is $1.25\times10^{3}\,kg-m^{-3}$. The coefficient of linear expansion of metal is **(2009-E)**

1) $1.3\times10^{-3}\,/^0C$ 2) $5.2\times10^{-3}\,/^0C$ 3) $2.6\times10^{-3}\,/^0C$ 4) $0.26\times10^{-3}\,/^0C$

67. A clock pendulum made of invar has a period of 0.5 sec at 20^0. If the clock is used in a climate where the temperature averages 30^{0}C, how much time does the clock lose in each oscillation: (for invar $a=9\times10^{-7}\,/^0C$ and g = constant) **(2009-M)**

1) 2.25×10^{-6} sec 2) 2.5×10^{-7} sec 3) 5×10^{-7} sec 4) 1.125×10^{-6} sec

68. The volume of mercury in the bulb of a thermometer is 10^{-6} m^3. The area of cross-section of the capillary tube is 2×10^{-7} sq.m. If the temperature is raised by 100^{0}C, the increase in the length of the mercury column is ($g_{Hg}=18\times10^{-5}\,/^0C$) **(2009-M)**

1) 18 cm 2) 0.9 cm 3) 9 cm 4) 1.8 cm

69. How much heat energy in joules must be supplied to 14 gms of nitrogen at room temperature to raise to raise its temperature by 40^{0}C at constant pressure (Mol. wt. of N_2 = 28gm, R = constant) **(2009-M)**

1) 50R 2) 60R 3) 70R 4) 80R

70. A clock which keeps correct time at 20^0C, is subjected to 40^0C. If coefficient of linear expansion of the pendulum is $12\times10^{-6}\,/^0C$. How much will it gain or lose time?**(2007-E)**

1) 10.3 s/day 2) 20.6 s/day 3) 5 s/day 4) 20 min/day

71. The temperature of thin uniform circular disc, of one metre diameter is increased by 10^{0}C The percentage increase in moment of inertia of the disc about an axis passing through its centre and perpendicular to the circular face (linear coefficient of expansion =$11\times10^{-6}/^0$C **(2006-E)**

1) 0.0055 2) 0.011 3) 0.022 4) 0.044

72 Two gases A and B having same pressure P, volume V and absolute temperature T are mixed. If the mixture has the volume and temperature as V and T respectively, then the pressure of the mixture is **(2007-E)**

1) 2P 2) P 3) P/ 2 4) 4P

Thermo dynamics

73. An ideal gas is subjected to a cyclic process involving four thermodynamic states; the amounts of heat (Q) and work (W) involved in each of these states are

Q_1 = 6000J, Q_2 = -5500 J; Q_3 = -3000J; Q_4 = 3500 J

W_1 = 2500 J; W_2 = -1000J ; W_3 = -1200 J; W_4 = xJ

The ratio of the net work done by the gas to the total heat absorbed by the gas is 'h'. The values of x and h respectively are **(2009-E)**

1) 500; 7.5% 2) 700; 10.5% 3) 1000; 21% 4) 1500; 15%

74. Two cylinders A and B fitted with pistons contai equal number of moles of an ideal mono-atomic gas at 400K. The piston of A is free to move while that of B is held fixed. Same amount of heat energy is given to the gas in each cylinder. If the rise in temperature of the gas in A is 42K, the rise in temperature of the gas in B is (g = 5/3) **(2009-E)**

1) 21K 2) 35K 3) 42K 4) 70K

75. In the adiabatic compression the decrease in volume is associated with **(E.2008)**
1) increase in temperture and decrease in pressure
2) decrease in temperature and increase in pressure
3)decrease in temperature and decrease in pressure
4) increase in temperture and increase in pressure

76. Which of the following is true in the case of an adiabatic process where $g = C_P / C_V$? **(E.2008)**
1) $P^{1-g}T^g =$ constant 2) $P^g T^{1-g} =$ constant 3) $PT^g =$ constant 4) $P^g T =$ constant

77. One mole of an ideal gas undergoes an isothermal change at temperatur T so that its volume v is boubled .R is the molar gas constant Work done by the gas during this change is **(M.2008)**
1) $RT\log 4$ 2) $RT\log 2$ 3) $RT\log 1$ 4) $RT\log 3$

78. The temperature of the system decreases in the process of **(E 2007)**
1) Free expansion 2) Adiabatic expansion
3) Isothermal expansion 4) Isothermal compression

79. Two cylinders A and B fitted with pistons contain equal number of moles of an ideal monoatomic gas at 400 K. The piston of A is free to move while that of B is held fixed Same amonunt of heat energy is given to the gas in each cylinder. If the rise in temperature of the gas in A is 42K., The rise in temperature of the gas in B is $(g = 5/3)$ **(E 2007)**
1)21K 2)35 K 3)42 K 4)70 K

80. For an adiabatic process the relation between V and T is given by **(M2007)**
1) $TV^g =$ constant 2) $T^g V =$ constant 3) $TV^{1-g} =$ constant 4) $TV^{g-1} =$ constant

81. Consider the following two statements and choose the correct answer :
A) If heat is added to a system its temperature must always increase
B)If positive work is done by a system in thermodynamic process its volume must increase **(M 2007)**
1)Both (A) and (B) are correct 2)(A) is correct but (B) is wrong
3) (B) is correct but (B) is wrong 4) Both (A)and (B)are wrong

82. An ideal gas after going through a series of four thermodynamic states in order reaches the initial state again (cyclic process) the amounts of heat (Q) and work (W) involved in the states are
$Q_{1=} 6000J : Q_2 = -5500J : Q_3 = -3000J : Q_4 = -3500J :$
$W_1 = 2500j : W_2 = -1000J : W_3 = -1200J : W_4 = Xjoules$
The ratio of net work done by gas to the total heat absorbed by the gas is h the value of x and h are nearly **(M 2006)**
1)500:7.5 2)700:10.5 3)1000:21 4)1500:15

83. 'm' grams of a gas of molecular weight M is flowing in an isolated tube with velocity V If the gas flow is suddenly stopped the rise in its temperature is (g =ratio of specific heats R= universal gas constant j=mechanical equivalent of heat) **(E 2006)**
1) $\frac{MV^2(g-1)}{2RJ}$ 2) $\frac{mV^2(g-1)}{M2RJ}$ 3) $\frac{mV^2 g}{2RJ}$ 4) $\frac{MV^2 g}{2RJ}$

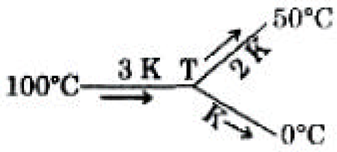
84. A bullet of mass 10×10^{-3} kg moving with a speed of 20 ms^{-1} hits an ice block $(0^0 c)$ of 990 g kept at rest on a frictionless floor and gets embedded in it If ice takes 50% of K.E. (in grams) approximately is :(J=4.2 J/Cal) (Latent heat of ice =80 cal/g) **(M 2006)**
1) 6 2)3 3) 6×10^{-3} 4) 3×10^{-3}

85. A given mass of a gas is compressed isothermaly unitl its presssure is doubled. It is then allowed to expand adiabatically until its original volume is restored and its pressure is then found to be 0.75 of its initial pressure. The ratio of the specific heats of the gas is approximately : **(E 2006)**

1) 1.20 2) 1.41 3) 1.67 4) 1.83

Transmission of heat

86. Three rods of same dimensions have thermal conductivities 3K, 2K and K respectively. The are arranged as shown below **(2009-M)**



1) $\frac{200}{3}C^0$ 2) $\frac{100}{3}C^0$ 3) $75C^0$ 4) $\frac{50}{3}C^0$

87 Two slabs A and B of equal surface area are placed one over the other such that their surfaces are completely in contact The thickness of slab A is twicc that of Bthe coefficient of thamal conductivity of slab Ais twice that of B The first surface of slab A is maintained at 100^0C While the second surface of slab B is maintained at 25^0C the temperature at the contact of therir surfacesis **(E 2008)**

1) 15^0C 2) 45^0C 3) 55^0C 4) 85^0C

88. 10 gm of ice at - $10°C$ is mixed with 100 gm of water at $5°C$ contained in a calorimeter weighing 50 gm (Speciflc heat of water $1\,cal.gm^{-1}.°C^{-1}$ Latcnt of ice -80 cal/gm specific heat of ice -0.5 cal/gm/ $°C$ and specific heat of copper =0.09 cal /gm/ $°C$ the final temperature reached by the mixturee is **(M 2008)**

1) $25.5°C$ 2) $30.0°C$ 3) $38.2°C$ 4) $40.0°C$

89. A body cools from $70°C$ to $50°C$ in 5 minules .T cmperature of surroundings is $20°C$ Its temperature after ncxt 10 minutes is **(M 2008)**

1) $25°C$ 2) $30°C$ 3) $35°C$ 4) $45°C$

90. Ablack body radiates energy at the rate of E watt/m^2 at a high temperature $T^\circ K$ when the temperature is reduced to $\left[\frac{T}{2}\right]^\circ K$ Ten radiant energy is **(E 2007)**

1) $\frac{E}{2}$ 2) $2E$ 3) $\frac{E}{4}$ 4) $\frac{E}{16}$

91. The power of a black body at temperature 200 K is 544 watt .Its surface area is $\left(s = 5.67\times10^{-8} wm^{-2}K^{-4}\right)$ **(M 2007)**

1) $6\times10^{-2}M^2$ 2) $6m^2$ 3) $6\times10^{-6}m^2$ 4) $6\times10^2 m^2$

92. Two solid spheres A and B made fo the same material have radii r_A and r_B respectively. Both the spheres are cooled from the same temperatye under the conditions valid for Newton's law of cooling. The ratio of the rate of change of temperatures of A and B is **(E-2006)**

1) $\frac{r_A}{r_B}$ 2) $\frac{r_B}{r_A}$ 3) $\frac{r_A^2}{r_B^2}$ 4) $\frac{r_B^2}{r_A^2}$