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SECTION – 1

PHYSICS

CHAPTER-1 UNIT & MEASUREMENT

Practice Questions

1. The dimension of constant 'a' in Vander Waal's equation is –
   (1) MLT^{-2} (2) $ML^{-1}T^{-3}$
   (3) $ML^{5}T^{-2}$ (4) $L^{2}T^{0}$
2. Dimension of $\frac{1}{\mu_0 \in_0}$ is
   (1) $[LT^{-1}]$ (2) $[L^{-1}T]$
   (3) $[L^{-2}T^{-2}]$ (4) $[L^{2}T^{-2}]$
3. What is the dimension of coefficient of viscosity is?
   (1) $ML^{-1}T^{-1}$ (2) $ML^{-1}T^{-2}$
   (3) $ML^{-2}T^{-2}$ (4) $ML^{2}T^{-2}$
4. Physical quantities which have same units are
   (1) Force and Work (2) Pressure and Stress
   (3) Pressure and Strain (4) Pressure and Volume
5. Planck's constant has the dimension of
   (1) Force (2) Energy
   (3) Linear Momentum (4) Angular Momentum
6. If p represents radiation pressure q represents speed of light and r represents radiation Energy striking a unit area per second, then the values of x, y, z such that $p^x q^y r^z$ is dimension less are:
   (1) $x = 1, y = 1, z = -1$ (2) $x = -1, y = 1, z = 1$
   (3) $x = 1, y = -1, z = 1$ (4) $x = 1, y = 1, z = 1$
7. The resistance is $R = \frac{V}{I}$, Where $V = (100 \pm 5)$ V and $I = (10 \pm 0.2)$ ampere.
   What is the percentage error in R _____?
8. When wave particle travels in Medium the displacement of a particle located at distance x at time t is given by $y = a\sin(bt - cx)$. Where a, b, c are constant at the wave. The dimension of $\frac{b}{c}$ are square as that of
   (1) Wave Velocity (2) Wave length
   (3) Wave amplitude (4) Wave frequency
9. In arithmetic $17.8 \times 3.1143 = 55.43454$ but as a result the best way to express the product is
   (1) 55.4345 (2) 55.4
   (3) 55.44 (4) 55.435
10. The time dependence of physical quantity P is given $P = P_0 \exp(-\alpha t^2)$ where α is constant and t is the time. The constant α
    (1) Is dimention less (2) Has dimension T^{-2}
    (3) Has dimension T^2 (4) Has dimension of p
11. The velocity of particle at time t is given by $V = at + \frac{b}{t+c}$
    Where a, b and c are constant, the dimension of a,, b and c are respectively
    (1) $[L^2, T \text{ and } LT^2]$ (2) $[LT^2, LT \text{ and } L]\}$
    (3) $[L, LT \text{ and } T^2]$ (4) $[LT^{-2}, L \text{ and } T]$
12. If the error measurement of radius of a sphere is 2% then error in the volume of sphere will be?
    (1) 4 % (2) 6%
    (3) 10% (4) 3%
13. Percentage error occurred in measurement of physical quantities $a, b, c \text{ and } d$ 1%, 2%, 3% and 4% respectively.
    Then maximum percentage of error in the measurement of X. Where $X = \frac{a^2 b^{1/2}}{c^{1/3} d^3}$ is
    (1) 15% (2) 16%
    (3) 18% (4) 10%
14. Dimensional formula of Torque is
    (1) ML^2T^{-2} (2) $M^0L^0T^0$
    (3) L^2T^{-2} (4) MLT^{-1}
15. If $x = \text{at} + bt^2$.Where x is the distance travelled by the body in kilometers while t is the time in seconds. Then unit of b is
    (1) km/s (2) kms
    (3) km/s^2 (4) kms^2
16. Dimension of strain are
    (1) ML^2T^{-2} (2) LT^{-1}
    (3) $M^0L^0T^{-1}$ (4) $M^0L^0T^0$
17. What is unit of Thermal Conductivity?
    (1) JmK^{-1} (2) $Jm^{-1}K^{-1}$
    (3) WmK^{-1} (4) $Wm^{-1}K^{-1}$
18. If A and B are non-zero vectors which obey the relation $|A + B| = |A - B|$, then angle B/W them is
    (1) 0° (2) 120°
    (3) 90° (4) 80°
19. The angle between two vectors
    $\vec{A} = 4\hat{\imath} + 3\hat{\jmath} - 4\hat{k}$
    $\vec{B} = 3\hat{\imath} + 4\hat{\jmath} - 6\hat{k}$
    (1) 45° (2) 0°
    (3) 90° (4) 106°

20. If A, B are perpendicular vectors then $A = 5i + 7j - 3k, B = 2i + 2j - ak$,
The value of a is?
(1) -2 (2) 8
(3) -7 (4) -8

21. The torque of the force $F = -3\hat{\imath} + \hat{\jmath} + 5\hat{k}$ acting at the point $\vec{r} = 7\hat{\imath} + 3\hat{\jmath} + \hat{k}$ is
(1) $4\hat{\imath} + 4\hat{\jmath} + 6\hat{k}$ (2) $14i - 38j + 16k$
(3) $-2i + 5j + 5k$ (4) $-10i + 30j - 16\hat{k}$

22. Planck's constant has the same unit as:
(1) Force × Time
(2) Force × Speed
(3) Force × Distance
(4) Force × Distance × Time

23. Dimension of quality factor is
(1) [T] (2) $[T^2]$
(3) $[T^{-1}]$ (4) $[T^0]$

24. The dimensions of $\frac{a}{b}$ in the Relation $P = \frac{a+x}{b}$ Where p is pressure and x is distance, are
(1) $ML^{-1}T^{-2}$ (2) $M^{-1}L^1T^2$
(3) ML^2T^{-1} (4) $M^{-1}L^{-2}T$

25. A physical quantity Q is given by Q = $\frac{a^2 b^{3/2}}{c^4 d^{1/2}}$ the percentage error in a, b, c, d are 1%, 2%, 4% and 2% respectively. Calculate the percentage error in Q.
(1) $\pm 11\%$ (2) $\pm 22\%$
(3) $\pm 30\%$ (4) $\pm 15\%$

26. State the number of significant figures in 0.0078 m.
(1) 1 (2) 2
(3) 3 (4) 4

27. The length and breadth of rectangle are (5.7 ± 0.1)cm and $(2.4 \pm 0.2)cm$.
Calculate area of the rectangular with error limits.
(1) $(13.7 \pm 1.4)sq.cm$ (2) $(13.7 \pm 2.0)sq.cm$
(3) $(15.3 \pm 1.4)sq.cm$ (4) $(13 \pm 0.0)sq.cm$

28. If $[\epsilon_0]$and $[\mu_0]$ represent dimensions of permittivity and permeability of free space respectively, what is the relation between $[\epsilon_0]$ and $[\mu_0]$?
(1) $[\mu_0] = [\epsilon_0]L^2T^{-2}$ (2) $[\mu_0] = [\epsilon_0]L^{-2}T^2$
(3) $[\mu_0] = [\epsilon_0]L^{-1}T^{-2}$ (4) $[\mu_0] = [\epsilon_0]^{-1}L^{-2}T^2$

29. What is the value of $(5 \times 10^{-6})(5.0 \times 10^{-8})$ with due regards to significant figure?
(1) 2.5×10^{-13} (2) 25×10^{14}
(3) 25×10^{-14} (4) 250×10^{-15}

30. If energy (E), Velocity (V) and Time (T) are Cchosen as the fundamental quantities, the dimensional formula of surface Tension is
(1) $[EV^{-1}T^{-2}]$ (2) $[E^{-2}V^{-1}T^{-3}]$
(3) $[EV^{-2}T^{-2}]$ (4) $[EV^{-2}T^{-1}]$

31. The position x of the particle at time t is given by $x = \frac{V_0}{a}(1 - e^{-at})$
Where V_0 is constant and $a > 0$. The dimension of V_0 and a are
(1) M^0LT^{-1} and T^{-1} (2) M^0LT^0 and T^{-1}
(3) M^0LT^{-1} and LT^{-2} (3) M^0LT^{-1} and T

32. The number of significant figure in 0.008403 is
(1) 6 (2) 4
(3) 3 (4) 2

33. Momentum per unit volume has the dimensions
(1) MLT^{-1} (2) ML^2T^{-1}
(3) MLT^{-2} (4) $ML^{-2}T^{-1}$

34. The percentage error in determination of $g = 4\pi^2 \frac{l}{t^2}$, where l and t are measured with $\pm$ 1% and $\pm 2\%$ errors is
(1) $\pm 1\%$ (2) $\pm 2\%$
(3) $\pm 5\%$ (4) $\pm 9\%$

ANSWER KEY

1	2	3	4	5	6	7	8	9	10
4	4	1	2	4	2	7	1	2	2
11	12	13	14	15	16	17	18	19	20
4	2	2	1	3	4	4	3	3	4
21	22	23	24	25	26	27	28	29	30
2	4	4	1	2	2	1	4	3	3
31	32	33	34						
1	2	4	3						

CHAPTER-2 KINEMATICS

Practice Questions

1. A car moves from X to Y with a uniform speed V_u and returns with a uniform speed V_d. The average speed for this round trip is
   (1) $\sqrt{V_u V_d}$ (2) $\frac{V_d V_u}{V_d + V_u}$
   (3) $\frac{V_u + V_d}{2}$ (4) $\frac{2V_d V_u}{V_d + V_u}$
2. The displacement of particle varies with time as $x = ae^{-\alpha t} + be^{\beta t}$ Where $a, b, \alpha \text{ and } \beta$ are constant. The velocity of particle will be?
   (1) Be independent on $\alpha + \beta$
   (2) Drop to zero when $\alpha = \beta$
   (3) Go on decreasing with time
   (4) Go on increasing with time
3. The distance travelled by a particle starting from rest and moving with an acceleration $\frac{4}{3} m/s^2$ in the third second is
   (1) $6m$ (2) 4m
   (3) 10/3 m (4) 19/3 m
4. The distance covered by a particle with time as $x = at^2 - bt^3$. The time 't' of the body, when its acceleration is zero.
   (1) $\frac{a}{b}$ (2) $\frac{b}{a}$
   (3) $\frac{a}{3b}$ (4) $\frac{2a}{3b}$
5. A stone is dropped from a tower of height H meter. Its position from ground after time 't' is
   (1) $\frac{H}{2} m$ (2) $\frac{1}{2} gt^2 m$
   (3) $\left(H - \frac{1}{2} gt^2\right) m$ (4) $\left(H + \frac{1}{2} gf^2\right) m$
6. The area under velocity time graph equals to
   (1) Acceleration (2) Force
   (3) Displacement (4) Momentum
7. The position of particle is given by $X = (-2t^3 + 3t^2 + 5) m$ where x in the meter t is in second. Find acceleration of particle, when its velocity is zero?
   (1) 6 m/s^2 (2) 12 m/s^2
   (3) -6 m/s^2 (4) -6 m/s
8. A body is project4ed vertically upward with a velocity of 10m/s. It reaches the maximum height h in time t.
   In time $\frac{t}{2}$ the height covered is
   (1) $\frac{h}{2}$ (2) $\left(\frac{2}{5}\right) h$
   (3) $\left(\frac{3}{4}\right) h$ (4) $\left(\frac{5}{8}\right) h$
9. Rain is falling vertically with a speed of 35 m/s. Winds starts belonging after sometime with a speed of 12 m/s in East to West direction. In which direction should a boy waiting at a bus stop hold his umbrella?
   (1) tan $\theta = 0.34$ with vertical towards East
   (2) tan $\theta = 0.5$ with vertical towards east
   (3) tan $\theta = 0.34$ with vertical towards West
   (4) tan $\theta = 0.5$ with vertical towards West
10. A boat is sent across a river with a velocity of 8 km/h. If the resultant velocity of boat is 10 km/h.
    Then velocity of river is
    (1) 4 km/h (2) 6 km/h
    (3) 8 km/h (4) 10 km/h
11. A projectile has the same range R when the maximum height attained by it is either H_1 or H_2. What is the relation B/w , R, H_1 and H_2?
    (1) $R = 2\sqrt{H_1 H_2}$ (2) $R = 4\sqrt{H_1 H_2}$
    (3) $R = \sqrt{4H_1 H_2}$ (4) $R = \sqrt{H_1 H_2}$
12. A body dropped from top of a tower fall through 40m during the last two seconds of its fall. The height of tower is (g = 10m/s^2)
    (1) 60 m (2) 45m
    (3) 80m (4) 50m
13. What will be ration of the distance moved by a freely falling body from rest in 4th and 5th second of journey?
    (1) 4:5 (2) 7:9
    (3) 16:25 (4) 1:1
14. A train of 150m long is going towards north direction at a speed of 10m/s. A parrot the speed of 5 m/s towards south direction parallel to the railways track.
    The time taken by parrot if cross the train is
    (1) 8 sec (2) 15 sec
    (3) 10 sec (4) 20 sec
15. Two bodies of same mass projected with the same velocity at angle 20° and 70° respectively.
    The ration of their range is
    (1) 1:2 (2) 2:1
    (3) 1:$\sqrt{2}$ (4) 1: 1
16. A missile fired for maximum range with an initial velocity of 20 m/s.
    If g=10m/s^2, the range of the missile is

(1) 40m (2) 50m
(3) 60m (4) 20m

17. A particle of mass m is projected with velocity V making an angle of 45° with horizontal when the particle hands on the level ground the magnitude of change in its momentum will be:
(1) 2mv (2) Zero
(3) $mv/\sqrt{2}$ (4) $mv\sqrt{2}$

18. The horizontal range and the maximum height of a projectile are equal.
The angle of projection of projectile is
(1) $\theta = tan^{-1}\left(\frac{1}{4}\right)$ (2) $\theta = tan^{-1}(4)$
(3) $\theta = tan^{-1}(2)$ (4) $\theta = 60°$

19. A body is projected with a velocity of 40m/s. After 2s it crosses a vertical pole of height 20.4m.
The angle of projection is $(g = 9.8\,m/s^2)$
(1) 15° (2) 30°
(3) 45° (4) 60°

20. A projectile can have same range R for two angle of projection. If $t_1$and t_2 be the times of flight in two cases, then the product of the times of flight is proportional to
(1) R (2) 1/R
(3) R^2 (4) $1/R^2$

21. A body whose displacement varies with time as y = $-\frac{2}{3}t^2 + 16t + 2$ will come to Rest after.
(1) 8 Second (2) 10 Second
(3) 12 Second (4) 16 Second

22. A particle is moving in a circle uniform speed it has constant.
(1) Velocity (2) Acceleration
(3) Kinetic Energy (4) Displacement

23. A moving body is covering distances in proportion into the square of time. The acceleration of the Body is
(1) Increasing (2) Decreasing
(3) Zero (4) Constant

24. The path of a projected body is described by the equation $y = x - \frac{1}{2}x^2$, then its time of flight shall be-
(1) $1/\sqrt{g}$ (2) $\sqrt{g}$
(3) $\frac{2}{\sqrt{g}}$ (4) $\frac{g}{2}$

25. A ball whose kinetic energy is E, is thrown at an angle of 45 degree with the horizontal its kinetic energy at the highest point of flight will be
(1) Zero (2) $\frac{E}{2}$
(3) $E/\sqrt{2}$ (4) E

26. A boat which has speed of 5 km/hr in still water crosses a river of width 1 km along the shortest possible path in 15 minute. The velocity of water of river in km/hr is?
(1) 3 (2) 4
(3) 2 (4) $\sqrt{14}$

27. A man slides down a snow covered hill along a curved path and falls 20m below his initial position. The velocity in m/s with which he finally strikes the ground is (g = 10 m/s^2)
(1) 20 (2) 40
(3) 200 (4) 400

28. A person sees an object on a tree at a height of 40 m and at a distance of 60m with what velocity he should throw an arrow at an angle of 45° so that it may hit of 45°so that it may hit the object (g=10m/s^2)
(1) $30\sqrt{4}$ (2) $30\sqrt{2}$
(3) $10\sqrt{2}$ (4) 30

29. A particle is projected from the ground with an initial velocity of 20m/s at an angle of 30° with horizontal what is magnitude of change in velocity in 0.5 seconds (g=10m/s^2)
(1) 5 m/s (2) 3m/s
(3) 4 m/s (4) 6 m/s

30. A ball is released from the top of tower travels 11/36 of the height of the two tower in the last second of its journey. The height of tower is
(1) 11m (2) 36m
(3) 180m (4) 110 m

31. A Jet airplane travelling at the speed of 500 km/hr ejects the burnt gases at the speed of 1100 km/h relative to the jet plane. Find the speed of the burnt gases w.r.t. a stationary observer on earth is.
(1) 300 km/Hr (2) 400 km/hr
(3) 500 km/hr (4) 600 km/hr

32. A bass is dropped from the roof of a tower of height h. The total distance coursed by it in the last second of its motion is equal to the distance covered by it in first three seconds. What is the value of 'h'?
(1) 125 m (2) 100 m
(3) 500 m (4) 250 m

33. The position of particle changes with time according the relation
$\vec{r}(t) = 15t^2\hat{\imath} + (4 - 20t^2)\hat{\jmath}$
What is magnitude of acceleration at $t = 1$?
(1) 40 (2) 100
(3) 25 (4) 50

34. A body of mass 5 kg is revolving in a circle of diameter 0.30 m making 2000 revolutions in 2 minute calculate the linear velocity?
(1) 13.5 (2) 15.7
(3) 14 (4) 16.35

35. A train is moving with velocity 40 km/h due east and a car is moving with velocity 60 km/hr due north. What is the velocity of train as appear to a passenger in the car/
(1) 72.11 km/hr (2) 60 Km/Hr
(3) 70 Km/Hr (4) 60.11 Km/Hr

36. Determine sine of angle B/W the vector $(3i + 2j + 4k)$ and $(2i - 2j - 4k)$
(1) 0.46 (2) 0.84
(3) 0.35 (4) 0.5

37. A person can throw a ball if a maximum horizontal distance 90 m. Calculate the maximum vertical height to which he can through the ball (g=10 m/s^2)
(1) 50 m (2) 90 m
(3) 45 m (4) 60 m

38. A particle is projected with a velocity u so that its horizontal Range is twice the greatest height attained. Find the horizontal range of it.
(1) 5u^2/4g (2) 4u^2/5g
(3) $\frac{2}{3}, \frac{u^2}{g}$ (4) $\frac{u^2}{g}$

39. A body is projected with velocity of 40 m/s. After 2s it crosses a vertical pole of height 20.4 m.. The Angle of projection be (g=9.8 m/s^2)
(1) 15° (2) 45°
(3) 30° (4) 60°

40. Two guns A and B can fire bullets at speed 1km/s and 2 km/s respectively. From a point on a horizontal ground, they are fired in all possible directions. The ratio of maximum area covered by the bullets fired by two guns on the ground.
(1) 1:16 (2) 1:8
(3) 1:2 (4) 1:4

41. A projectile of mass 100 g is fired with velocity of 20 m/s making an angle of 30° with the horizontal. At it rises to the highest point of its path, its momentum changes by-
(1) $\frac{1}{2}\ kg\frac{m}{s}$ (2) $1\ kgm/s$
(3) 2 kg m/s (4) NOTA

42. A car travelling at 36 km/h due North turns West in 5 seconds and maintain the same speed. What is the acceleration of car?
(1) $2\sqrt{2}$ South East (2) $2\sqrt{2}$ South West
(3) $\sqrt{2}$ South West (4) $\sqrt{2}$ North East

43. A particle is projected at an angle θ from the horizontal with kinetic Energy E. What is K. Energy at highest point
(1) $E\ sin^2\theta$ (2) $E \sin\theta$
(3) $E\ cos^2\theta$ (4) $E \cos\theta$

44. A ball of mass m is thrown vertically up another ball of mass 2m is thrown at an angle θ with the vertical. Both of them stay in air for the same period of time. What is the ratio of the height attained by two balls?
(1) $1:1$ (2) $1:2$
(3) $2:1$ (4) $1:\sqrt{2}$

45. Find the angle of projection for a projectile motion. Whose range R is n times the maximum height H.
(1) $\theta = tan^{-1}(n)$ (2) $\theta = tan^{-1}(4)$
(3) $\theta = tan^{-1}\left(\frac{4}{n}\right)$ (4) $\theta = tan^{-1}\left(\frac{n}{4}\right)$

46. What will be effected on maximum height of projectile when its angle of projection is changed from 30° to 60°, without changing its initial velocity of projection?
(1) $H_2 = 2H_1$ (2) $H_2 = H_1$
(3) $H_2 = 3H_1$ (4) $H_2 = H_1/2$

47. A body is projected with a speed u at an angle. If the horizontal to have maximum range, what is velocity at highest point?
(1) u (2) $u/\sqrt{2}$
(3) $2u$ (4) $u/\sqrt{3}$

48. Two bodies are projected at angle θ and $(90 - \theta)$ to the horizontal with the same speed. Find the ratio of time of flight
(1) $\tan\theta$ (2) $\cos\theta$
(3) $\cot\theta$ (4) $2:1$

49. A man is walking due east at a rate of 5 km/h and the rain appears to be falling vertically with speed of 12 km/h. Find the directions of rain with vertical?
(1) $\tan^{-1}\left(\frac{5}{12}\right)$ (2) $\tan^{-1}\left(\frac{12}{5}\right)$
(3) $\sin^{-1}\left(\frac{5}{12}\right)$ (4) $\sin^{-1}\left(\frac{12}{5}\right)$

50. An object of mass 3 kg is at Rest. Now a force of F $6t\text{^}2i + 4tj$ is appeared on the object. Then velocity on the object. Then velocity at $t = 3$ sec is
(1) $18i + 3i$ (2) $18i + 6j$
(3) $3i + 18i$ (4) $18i + 9j$

51. Linear speed of a particle moving in a circle of radius 18m is given by $v = 3t\frac{m}{s}$. What is magnitude of acceleration at $t = 4\ sec$

(1) 6 m/sec^2 (2) 8 m/s^2

(3) 10 m/s^2 (4) 12 m/s^2

52. The slope of speed time graph gives?

(1) Distance travelled (2) Velocity

(3) Acceleration (4) Displacement

53. If a body after travelling some distance comes back to its starting point. Then

(1) Average velocity is zero

(2) Average speed is zero

(3) Distance travelled is zero

(4) All of the above

54. If a car at rest accelerates uniformly to a speed of 144 km/h in 20 sec. It covers a distance of

(1) 2880 m (2) 1440 m

(3) 400 m (4) 20 m

55. The displacement of particle is given as $x = 3t^3 + 7t^2 + 5t + 8$ where x is in metre and t is in seconds. The acceleration of particle at t $= 1\,\text{sec}\,is$?

(1) 14 m/s^2 (2) 18 m/s^2

(3) 32 m/s^2 (4) Zero

56. A ball is thrown vertically downward with a velocity of 20m/s from the top of tower. It hits the ground after some time with a velocity of 80 m/s. The height of tower is?

(1) 340 m (2) 300 m

(3) 320 m (4) 360 m

57. A boy standing at the top of tower 20 m height drops a stone. Assuming g=10 m/s^2, the velocity with which it hits the ground is

(1) 10 m/s (2) 20 m/s

(3) 40 m/s (4) 5 m/s

58. A body starts from Rest, what is the ratio of the distance travelled by the body during 4th and 3rd seconds?

(1) 7/5 (2) 5/7

(3) 7/3 (4) 3/7

59. A car covers the first half of the distance b/w two places at 40 km/h and other half at 60 km/hr. The average speed of car is

(1) 40 km/hr (2) 50 km/hr

(3) 48 km/hr (4) 60 km/hr

60. A particle moves in a circle of radius 5 cm with constant speed of time period $0.2\pi\ s$. The acceleration of the particle is?

(1) 15 m/s^2 (2) 25 m/s^2

(3) 36 m/s^2 (4) 5 m/s^2

ANSWER KEY									
1	2	3	4	5	6	7	8	9	10
4	4	3	3	3	3	2	3	1	2
11	12	13	14	15	16	17	18	19	20
2	2	2	3	4	1	4	2	2	1
21	22	23	24	25	26	27	28	29	30
3	3	4	3	2	1	1	2	1	3
31	32	33	34	35	36	37	38	39	40
4	1	4	2	1	2	3	2	2	1
41	42	43	44	45	46	47	48	49	50
2	2	3	1	3	3	2	1	1	2
51	52	53	54	55	56	57	58	59	60
2	3	1	3	3	2	2	1	3	4

CHAPTER-3 LAWS OF MOTION

Practice Questions

1. Physical independence of force is a consequence of
   (1) Second law of Motion (2) Third law of Motion
   (3) First law of Motion (4) All of the above
2. If the force on a Rocket moving with a velocity of 300 m/s is 345 N, then the ratio combustion of the fuel is?
   (1) 0.55 kg/sec (2) 0.75 kg/sec
   (3) 1.15 kg/sec (4) 2.25 kg/sec
3. A 10 N force is applied on a body produces an acceleration of 1m/s^2. The mass of body is
   (1) 5 kg (2) 10 kg
   (3) 15 kg (4) 20 kg
4. A lift weighing 1000 kg is moving upwards with an acceleration of 1m/s^2. The tension in the supporting cable is
   (1) 980 N (2) 10800 N
   (3) 9800 N (4) 8800 N
5. A body in initially at rest and sliding along horizontal track a height h just complete a vertical circle of radius r. The height h of track is
   (1) 3/2 r (2) r
   (3) 7/5 r (4) 5/2 r
6. A ball is moving with a momentum of 15 kg m/s strikes against the ball at an angle of 30° and is reflected back with the same momentum at the same angle calculate Impulse?
   (1) $15\sqrt{3}$ (2) $15\sqrt{2}$
   (3) $50\sqrt{3}$ (4) $50\sqrt{2}$
7. A bullet of Mass 0.04 kg moving with speed of 90 m/s enters a heavy wooden block and is stopped after a distance of 60 cm. What is the average resistive force exerted by the block on the bullet?
   (1) -170 N (2) -200
   (3) 200 N (4) -270 N
8. Two bodies of unequal masses have same linear momentum which body has greater kinetic Energy?
   (1) Heavy Body (2) Light Body
   (3) Same for Both (4) None of these
9. A cricket player catches a Ball of mass 0.1 kg moving with a speed of 10 m/s in 0.1 s. Force exerted by him is
   (1) 10 N (2) 5 N
   (3) 2 N (4) 1 N
10. A nucleus disintegrates into two parts which have their velocities in the ratio 2:1. The ration of their nuclear sizes will be?
    (1) $3\sqrt{2}:1$ (2) $1:\sqrt{2}$
    (3) $\sqrt{3}:1$ (4) $1:3\sqrt{2}$
11. A bomb at rest exploded into 3 parts of the same mass. The momentum of the 2 parts are $-2p\hat{\imath}$ and$p\hat{\jmath}$. The momentum of third part will have a magnitude of
    (1) $\hat{p}$ (2) $\sqrt{3}\hat{p}$
    (3) $\hat{p}\sqrt{\ }5$ (4) $zero$
12. A force vector is applied on a mass is $\vec{F} = (6\hat{\imath} - 8\hat{\jmath} + 10\hat{k})$ and accelerated with 1m/s^2. What will be the Mass of the body?
    (1) $10\sqrt{2}$ kg (2) $2\sqrt{10}$ kg
    (3) 10 kg (4) 20 kg
13. An elevator weighs 4000 kg. When the upward tension in the supporting cable is 48000 N. What is the upward acceleration?
    (1) 1.1 m/s^2 (2) 2.2 m/s^2
    (3) 3.3 m/s^2 (4) 4.4 m/s^2
14. A gun weight is 9 kg fires a Bullet of 30 g with a velocity of 300 m/s. What is Recoil velocity of the gun
    (1) 2 m/s (2) 4 m/s
    (3) 1 m/s (4) Zero
15. A machine gun has a mass of 20 kg. It fires 25 g bullets at the ration of 600 bullets per minute with a speed of 200 m/s. What is recoil velocity of gun
    (1) 2.5 m/s (2) 2 m/s
    (3) 3 m/s (4) 4.5 m/s
16. A block slides down an incline of an angle 30° with an acceleration of $\frac{g}{4}$. Find the coefficient of Kinetic Frictions?
    (1) $1/\sqrt{3}$ (2) $\frac{1}{2\sqrt{3}}$
    (3) $\frac{1}{2}$ (4) $\frac{1}{\sqrt{2}}$
17. An aircraft execute a horizontal loop at a speed of 720 Km/hr with its swings banked at 15° what is radius of loop
    (1) 15.23 km (2) 20 km
    (3) 20.15 km (4) 13 km

18. A constant retarding force of 50 N is applied to a body of mass 20kg moving initially with a speed of 15 m/s. How long does the body take to stop?
    (1) 65 (2) 55
    (3) 35 (4) 25
19. A mass m is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when.
    (1) The mass is at highest point
    (2) The wire is horizontal
    (3) The mass is at lowest point
    (4) Never Break
20. A stone is dropped from a height h. If the ground with a certain momentum p. If the same stone is dropped from a height 100% more than the previous height. The momentum when it hits the ground will change by.
    (1) 68% (2) 41%
    (3) 200% (4) 100%
21. A block has been placed on an inclined plane with the scope angle θ. The block slides down the plane at constant speed. The coefficient of kinetic friction is equal to
    (1) $\sin\theta$ (2) $\tan\theta$
    (3) $\cos\theta$ (4) g
22. A car of mass 1000 kg negotiates a banked curve road of radius 90m on a frictions less road. If the banking angle is 45°, the speed of car is?
    (1) 20 m/s (2) 30 m/s
    (3) 5 m/s (4) 10 m/s
23. For completing the vertical loop of radius 2m. The minimum velocity with which a body of mass m must throw?
    (1) $\sqrt{2g}$ (2) $\sqrt{6g}$
    (3) $\sqrt{g}$ (4) $\sqrt{10g}$

ANSWER KEY									
1	2	3	4	5	6	7	8	9	10
3	3	2	2	4	1	4	2	1	4
11	12	13	14	15	16	17	18	19	20
3	1	2	3	1	2	1	1	3	4
21	22	23							
2	3	4							

CHAPTER-4 WORK POWER & ENERGY

Practice Questions

1. Value coefficient of restitution for perfectly elastic collision is
   (1) 1 (2) 0
   (3) ∞ (4) -1
2. Body A of mass 4m moving with speed u collide with another body B of mass 2m at rest. The collision is head on & elastic in nature. After the collision the fraction of energy lost by the colliding body A is?
   (1) $\frac{1}{9}$ (2) $^{8}/_{9}$
   (3) $\frac{4}{9}$ (4) $^{5}/_{9}$
3. If the k.ε of a particle is increased by 300% the momentum of particle will increase by
   (1) 20% (2) 200%
   (3) 100% (4) 5%
4. In a simple pendulum of length l the bob is pulled aside from its equilibrium position through an angle θ then released.
   The bob passes through the equilibrium position with speed?
   (1) $\sqrt{2gl(1+\cos\theta)}$ (2) $\sqrt{2gl\sin\theta}$
   (3) $\sqrt{2gl}$ (4) $\sqrt{2gl(1-\cos\theta)}$
5. The bodies of mass m & 4m are moving with equal kinetic energies, the ration of linear momenta will be –
   (1) 1 : 4 (2) 4 : 1
   (3) 1 : 2 (4) 2 : 1
6. If the momentum of body is increased by 50%, then the percentage increase in its $k.\varepsilon$ will be-
   (1) 5% (2) 100%
   (3) 125% (4) 200%
7. Calculate the work done in Raising a stone of mass 5kg and specific gravity 3 lying at the bed of a lake though a height 4 meter.
   (1) 140J (2) 130.6J
   (3) 150.6J (4) 145.5J
8. A particle moves along the x-axis from $x = 0$ to $x = 5m$ under th3e influence of force given by $f = (7 - 2x + 3x^2)$ find the work done.
   (1) 145J (2) 150J
   (3) zero (4) 135J
9. A particle of mass 0.5kg travels in a straight line with a velocity $V = \left(5x^{5/2}\right) m/s$. How much work done by the net force during the displacement $x = 0$ to $= 2m$?
   (1) 100J (2) 300J
   (3) 200J (4) 400J
10. A ball falls under gravity from a height of 10m with an initial ϕ downward velocity u. It collide with ground loses half its energy I then rises back to the same height. Find initial velocity u?
    (1) 14 m/s (2) 10 m/s
    (3) 20 m/s (4) 50 m/s
11. A ball is dropped from a height b. it rebounds from the ground n number of times. If the coefficient of restitution is e. to what height does it go after n^{th} rebounding?
    (1) $H = e^{2n}h$ (2) $H = e^{n}h$
    (3) $H = 2e^{n}h$ (4) $H = e^{4n}h^2$
12. A light body and a heavy body have same kinetic energy?
    Which one has greater linear momentum?
    (1) $P_2 > P_1$ (2) $P_2 < P_1$
    (3) $P_2 = P_1$ (4) NOTA
13. A 10kg ball & a 20kg ball approach each other with velocities 20m/s & 10m/s respectively. What are their velocities after collision:
    If the collision is perfectly elastic?
    (1) 10, -20 (2) -20, 10
    (3) 20, 10 (4) -10, 20
14. A particle of mass m is driven by a machine that delivers a constant power k watts if the particle start from rest the force on the particle at time t is?
    (1) $\sqrt{mk}\, t^{-1/2}$ (2) $\sqrt{2mk}\, t^{-1/2}$
    (3) $\frac{1}{2}\sqrt{mk}\, t^{-1/2}$ (4) $\sqrt{\frac{mk}{2}}\, t^{-1/2}$
15. A body of mass (4m) is lying in xy plane at rest it suddenly explodes into these pieces. Two pieces each of mass (m) moves perpendicular to each other with speed (v). the total kinetic energy generated due to explosion is ?
    (1) mv^2 (2) $^{3}/_{2}\, mv^2$
    (3) $2mv^2$ (4) $4mv^2$

16. A bullet weighing 5g and moving with a velocity 600m/s strikes a 5kg block of ice resting on a frictionless surface. The speed of block after collision is?
(1) 6 cm/s (2) 60 cm/s
(3) 6 m/s (4) 0.6 cm/s

17. A body of mass 1kg begins to move under the action of a time dependent force $F = (2t\hat{\imath} + 3t^2\hat{\jmath})N$, where $\hat{\imath}$ & $\hat{\jmath}$ are unit vector along x & y axis. What power will be developed by the source at time t?
(1) $(2t^2 + 4t^4)w$ (2) $(2t^3 + 3t^4)w$
(3) $(2t^3 + 3t^5)w$ (4) $(2t + 3t^3)w$

18. A stationary particle explodes into two pieces of mass m_1 & m_2 which move in opposite directions with velocity v_1 & v_2. The ratio of their kinetic energy $\frac{k_1}{k_2}$ is
(1) 1 (2) $\frac{m_1}{m_2}$
(3) $\frac{m_2}{m_1}$ (4) $\frac{m_1 v_2}{m_2 v_1}$

19. A machine delivering constant power moves a body along a straight line. The distance moved by the body in time t is proportional to?
(1) t (2) $\sqrt{t}$
(3) $t^{-3/2}$ (4) $t^{3/4}$

20. A body of mass m, accelerates uniformly form rest to v_1 in time t_1. The instantaneous power delivered to the body as a function of time t is
(1) $\frac{mv_1 t}{t_1}$ (2) $\frac{mv_1^2 t}{t_1}$
(3) $\frac{mv_1 t^2}{t_1}$ (4) $\frac{mv_1^2 t}{t_1^2}$

21. Which of the following is unit of energy?
(1) watt second (2) watt
(3) kilowatt (4) J/second

22. The linear momentum of a body is increased by 2% what percentage increase in in $k.\varepsilon$?
(1) 2% (2) 3%
(3) 4% (4) 5%

23. A body of mass 1kg, initially at rest explodes and breaks into three parts of masses in the ratio 1 : 1 : 3. If the two pieces of equal masses fly off perpendicular to each other with a speed to 30m/s. the speed of third pieces will be
(1) $10\sqrt{2}\, m/s$ (2) $20\sqrt{2}\, m/s$
(3) $5\sqrt{2}\, m/s$ (4) $40\sqrt{2}\, m/s$

24. A bomb at rest explode into three fragments of equal masses. Two fragments fly off at right angles to each other with velocities of 9m/s & 12m/s.
Calculate the speed of third fragments?
(1) 15 m/s (2) -15 m/s
(3) $15\sqrt{2}$ (4) $15\sqrt{3}$

25. A bomb at rest explode into three parts of the same mass. The linear momenta of two parts are $-2p\hat{\imath}$ & $p\hat{\jmath}$. Calculate the magnitude of linear momenta of third part?
(1) $p\sqrt{5}$ (2) $p\sqrt{2}$
(3) $\frac{p}{2}$ (4) $\frac{p}{\sqrt{2}}$

26. A force of $(2\hat{\imath} + 3\hat{\jmath} + 4\hat{k})N$ acts on a body for a 4s and produces a displacement of $(3\hat{\imath} + 4j + 5k)m$. The power used is –
(1) 4.5 w (2) 6.5 w
(3) 7.5 w (4) 9.5 w

27. A body of mass 2kg makes an elastic collision with another body at rest and continues to move in the original direction with a speed equal to one third of its original speed. Find the mass of the second body?
(1) 1kg (2) 2kg
(3) 3kg (4) 5kg

28. A body pushes the wall & fails to displace it. Therefor he does :
(1) positive work
(2) negative work
(3) positive but not maximum work
(4) no work at all

29. A person had a weight of 10kg at a height of 5m above the ground 5 minutes. Work done by him is –
(1) zero (2) 50 J
(3) 250 J (4) 300 J

30. When a body is thrown up work done by gravity on the body –
(1) positive (2) zero
(3) negative (4) cannot say

31. A stationary particle explodes into two pieces of masses m_1 & m_2 which move in opposite direction with velocity v_1 & v_2. The ratio of their kinetic energy $\frac{k_1}{k_2}$ is
(1) 1 (2) $\frac{m_1}{m_2}$
(3) $\frac{m_2}{m_1}$ (4) $\frac{m_1 v_2}{m_2 v_1}$

32. A body whose mass is 120g has velocity $v = (2\hat{\imath} + 5\hat{\jmath})$ at a certain instant. Its kinetic energy is?
(1) 1.74J (2) 2.75J
(3) 3.75J (4) 4.75J

33. One – fourth chain is hanging down from a table. The work done to bring the hanging part of the chain on the table is

(1) $\frac{Mgl}{32}$ (2) $\frac{Mgl}{16}$
(3) $\frac{Mgl}{8}$ (4) $\frac{Mg}{4}$

34. A car is moving along a straight horizontal road with a speed v_0. If the coefficient of friction between the tyres & the road is it. Then the shortest distance in which the car can be stopped is
(1) $\frac{v_0^2}{\mu}$ (2) $\frac{v_0^2}{\mu g}$
(3) $\frac{v_0^2}{2\mu}$ (4) $\frac{v_0}{\mu g}$

35. A particle moves from position $(\vec{r_1}) = 3\hat{\imath} + 2j - 6x$ to position $\vec{r_2} = 14\hat{\imath} + 13j + 9\hat{k}$ under the action of a force $(\vec{F}) = 4i + j - 3\hat{k}$ work done by the force is?
(1) 50 units (2) 75 units
(3) 10 units (4) 200 units

36. A well 20m deep & 3m in diameter contains water to a depth of 14m. How long will a 5hp engine take to empty it?
(1) 3381.6s (2) 2000s
(3) 3000s (4) 1500s

37. An engine pumps up 100kg of water through a height of 10m in 5 seconds. If the efficiency of the engine is 60%. Calculate the power of the engine in kw. (Take g $10m/s^2$)
(1) $4\ kw$ (2) $4.5\ kw$
(3) $5\ kw$ (4) $3.3\ kw$

38. What percentage of KE of a moving particle is transferred to a stationary particle of 4 times in mass?
(1) 64% (2) 50%
(3) 75% (4) 45%

39. $F = 1 + 2x$ acts on a particle in x direction.
Work done by this force to move particle from $x = 0$ to $x = 1$ is
(1) 1 J (2) 5 J
(3) 2 J (4) 6 J

40. A body of mass 1kg is thrown upwards with a velocity 20m/s. it momentarily comes to rest after attaining a height of 18m.
How much energy is lost due to air friction? $(g = 10\ m/s^2)$
(1) 30 J (2) 40 J
(3) 10 J (4) 20 J

41. How much water a pump of 2kw can raise in one minute to a height of 10 m. $(take\ g = 10\ m/s^2)$
(1) 1000 litres (2) 100 litres
(3) 1200 litres (4) 2000 litres

42. A body of mass m_1 is moving with collide with a body of mass m_2 at rest $(m_2 >> m_1)$ what is the velocity of first body after collision?
(1) 0 (2) u_1
(3) $-u_1$ (4) v_1

43. Two bodies of equal masses moving with u_1 & u_2 collide elastically.
What is the velocities of bodies after collision
(1) $0, u_2$ (2) $0, u_1$
(3) $u_1, 0$ (4) $0, v_2$

44. Calculate the work done by a car against gravity in moving along a straight horizontal road. The mass A car is 400 kg & the distance moved is 2m.
(1) 800 J (2) 400 J
(3) 600 J (4) zero

45. Calculate the power of a crane in watts, which lifts a mass of 100 kg to a height of 10m in 20 seconds.
(1) $300\ w$ (2) $490\ w$
(3) $600\ w$ (4) $590\ w$

46. A body of mass m_1 collides elastically with another body of mass m_2 at rest if the velocity of m_1 after collision is $\frac{2}{3}$ times its initial velocity, the ratio of their masses is
(1) $1:5$ (2) $5:1$
(3) $5:2$ (4) $2:5$

47. Which of the following force in non-conservative in value?
(1) coulomb
(2) Gravitational
(3) Restoring force of string
(4) frictional

48. A bomb of mass 30 kg at rest explodes to into two pieces of masses 18 kg & 12 kg. The velocity of 18 kg mass is 6 m/s. the $k.\varepsilon$ of other mass is
(1) 324 J (2) 486 J
(3) 256 J (4) 527 J

49. One coolie takes 1 minute to raise a suitcase through a height of 2m but the other one take 30s to raise the same suitcase to the same height, power of two coolie are in the ratio
(1) $1:2$ (2) $1:4$
(3) $2:1$ (4) $3:1$

50. Two bodies with kinetic energies in the ratio $4:1$ are moving with equal linear momenta the ratio of their masse is
(1) $1:2$ (2) $1:1$
(3) $4:1$ (4) $1:4$

51. A force acts on a 30gm particle in such a way that the position of the particle as a function of time is given by $x = 3t.4t^2 + t^3$, where x in meter & t is in seconds. The work done during 4 seconds is

(1) $576\ mj$ (2) $450\ mj$

(3) $490\ mj$ (4) $530\ mj$

52. 400 J of work done in sliding a 3kg block an inclined plane of height 10m. Work done against friction is

(1) 400 J (2) 500 J

(3) 300 J (4) 100 J

53. A ball moving with velocity of 2m/s collides head on with another stationary ball of doule mass.

If $e = 0.5$, find velocity after collision ?

(1) 1, 0 (2) 0, 1

(3) 0, 2 (4) 1, 2

ANSWER KEY									
1	2	3	4	5	6	7	8	9	10
1	2	3	4	3	3	2	4	3	1
11	12	13	14	15	16	17	18	19	20
1	1	2	4	2	2	3	3	3	4
21	22	23	24	25	26	27	28	29	30
1	3	1	2	1	4	1	4	1	3
31	32	33	34	35	36	37	38	39	40
2	1	1	3	3	1	4	1	3	4
41	42	43	44	45	46	47	48	49	50
3	3	2	4	2	2	4	2	1	4
51	52	53							
1	4	2							

CHAPTER-5 ROTATIONAL DYNAMICS

Practice Questions

1. A man of mass m_1 standing on a platform of mass m_2 kept on a smooth horizontal surface. If the man moves a distance d w.r.t the platform find the displacement of platform w.r.t ground.
   (1) $x = \frac{m_2 d}{m_1+m_2}$ (2) $x = \frac{m_1 d}{m_1+m_2}$
   (3) $x = \frac{m_1 m_2 d}{m_2+m_1}$ (4) $x = \frac{2m_1 d}{m_1+m_2}4$
2. Find the Torque of a force $(5i - 2j + \hat{k})$ about the origin. Which act on a particle whose position vector is $(i - j + k)$.
   (1) $\left(-\hat{\imath} + 2\hat{\jmath} + 3\hat{k}\right)$ (2) $\left(2i + 2j + 4\hat{k}\right)$
   (3) $(-i + 2j + 4\hat{k})$ (4) $\left(-i + 3j + 2\hat{k}\right)$
3. A Torque of $10^3 N - m$ acting on a rigid body, turn it trough $30°$ in 0.2 seconds. Calculate the work done by the Torque on the body.
   (1) 6.23×10^2J (2) 5.23×10^4J
   (3) 5.23×10^2J (4) 6.23×10^3J
4. An energy of 484J is spent in increasing the speed of flywheel from 60 rpm to 360rpm. Calculate the moment of Inertia of flywheel is?
   (1) 0.5 kgm^2 (2) 1 kgm^2
   (3) 0.7 kgm^2 (4) 2.5 kgm^2
5. What will be the duration of the day, if the earth suddenly shrinks to $\frac{1}{64}$th of its original volume, mass remaining unchanged?
   (1) $2h$ (2) 1.5 h
   (3) $4h$ (4) $6h$
6. A disc of moment of inertia I_1 is rotating freely with angular speed ω_1 when another non-rotating disc of moment of inertia I_2 is dropped on it. The two discs then rotate as one unit. Find the angular speed?
   (1) $\omega = \frac{I_2\omega_1}{I_1+I_2}$ (2) $\frac{I_1\omega_1}{I_1+I_2}$
   (3) $\omega = \frac{I_1 I_2 \omega_1}{I_1+I_2}$ (4) $(I_1 + I_2)\omega_1$
7. What is the moment of inertia of a rod of mass M, length l about an axis perpendicular to it passing through one of its end?
   (1) $\frac{Ml^2}{3}$ (2) $\frac{Ml^2}{12}$
   (3) $\frac{Ml^2}{4}$ (4) $\frac{Ml^2}{2}$
8. What is the moment of inertia of a ring about a tangent to the circle in the plane of the Ring?
   (1) $\frac{MR^2}{4}$ (2) $\frac{MR^2}{2}$
   (3) $\frac{3}{4}MR^2$ (4) $\frac{3}{2}MR^2$
9. The angular speed of a motor wheel is increased from a 1200 rpm to 3120 rpm in 16 seconds. Find angular acceleration.
   (1) $3\pi\ rad/s^2$ (2) $4\pi\ rad/s^2$
   (3) $2\pi\ rad/s^2$ (4) $\pi\ rad/s^2$
10. Three bodies, a ring, a solid cylinder & a solid sphere rolls down the same incline plane with slipping. They start from Rest. Radii of bodies are identical. Which of them will reach first?
    (1) Cylinder (2) Ring
    (3) All at the same time (4) Sphere
11. A flywheel has a Moment of Inertia of 0.5 $kg\ m^2$. What Torque required to increases its velocity from $2\pi\ rad/s$ to $15\ \pi\ rad/s$ in 10s is?
    (1) 1.0 $N - m$ (2) 1.5 $N - m$
    (3) 2.0 $N - m$ (4) 3.0 $N - m$
12. The angular velocity of a body changes from ω_1 to ω_2 without applying any torque but due to change in its moment of inertia. The Ratio of radii of gyration in both case is
    (1) $\sqrt{\omega_2} : \sqrt{\omega_1}$ (2) $\sqrt{\omega_1} : \sqrt{\omega_2}$
    (3) $\omega_1 : \omega_2$ (4) $\omega_2 : \omega_1$
13. A solid cylinder of mass M and radius R rolls without slipping down an inclined plane of length L & height h. What is the speed of its centre of mass when the cylinder reaches bottom?
    (1) $\sqrt{gh}$ (2) $\sqrt{2gh}$
    (3) $\sqrt{\frac{3}{4}gh}$ (4) $\sqrt{\frac{4}{3}gh}$
14. If Rotational kinetic energies of two bodies having moment of inertia $9\ kg - m^2$ & $1\ kg - m^2$ are same, then ratio of their angular moments is?
    (1) 9: 1 (2) 1: 9
    (3) 1: 3 (4) 3: 1
15. If the earth were to suddenly contract to half to half of its present change in the duration of the day will be

(1) 6h increase (2) 18h increase
(3) 6h increase (4) 18 h decrease

16. If a sphere is rolling, the ratio of the Translational energy to total kinetic energy is given by,
(1) 7: 10 (2) 2: 5
(3) 10: 7 (4) 5: 7

17. A uniform circular ring a solid cylinder rolling down smooth inclined plane of inclination 30°. It linear acceleration of ring is $g/2$. Then find the acceleration of solid cylinder.
(1) $\frac{g}{4}$ (2) $\frac{g}{3}$
(3) $\frac{3g}{2}$ (4) None of the above.

18. The ratio of the acceleration for a solid sphere (mass m & radius R) rolling down an incline of angle 'θ' without slipping & slipping down the incline without rolling is?
(1) 5: 7 (2) 2: 3
(3) 2: 5 (4) 7: 5

19. A solid sphere, disc & Ring all of the same mass & made of same material are allowed to Roll down without slipping from an Inclined plane, then
(1) solid sphere reaches bottom first
(2) Ring will reach first
(3) disc will reach last
(4) All reach the bottom at the same time.

20. Moment of Inertia of a uniform circular disc about a diameter is I. Its moment of inertia about an axis ⊥ to its plane & passing through a point on its Rim will be
(1) 3I (2) 4I
(3) 6I (4) 10I

21. The ratio of the radii of Gyration of a circular disc of Radius R & mass M about an axis touching the disc at its diameter normal to the disc is?
(1) $\frac{2}{5}MR^2$ (2) $\frac{3}{2}MR^2$
(3) $\frac{1}{2}MR^2$ (4) MR^2

22. A Boy suddenly comes & sites on a circular rotating table. What will remains conserved?
(1) Angular velocity (2) Angular momentum
(3) Linear momentum (4) Kinetic energy

23. A constant torque of 1000N-m turns a wheel of moment of inertia $200kg - m^2$ about an axis through its centre. Its angular velocity after 3 seconds is?
(1) $1\ rad/s$ (2) $5\ rad/s$
(3) $10\ rad/s$ (4) $15\ rad/s$

24. A thin circular Ring of mass 'M' & radius r is rotating about its axis with a constant angular velocity ω.Four object each of mass 'm' are kept gently to the opposite ends of two perpendicular diameter of the Ring. The angular velocity of the Ring will be-
(1) $\frac{4m\omega}{m+4m}$ (2) $\frac{(M-4m)\omega}{M+4m}$
(3) $\frac{(M+4m)\omega}{M-4m}$ (4) $\frac{M\omega}{M+4m}$

25. A disc is rotating with angular velocity w. If a child sits on it, what is conserved?
(1) Linear momentum (2) Angular momentum
(3) Kinetic energy (4) Moment of inertia

26. The angular position of a point on a rotating wheel is given by the equation $\theta = 2t^3 - 6t^2$. The torque pm the wheel becomes zero at?
(1) $t = 1\ s$ (2) $t = 0.5\ s$
(3) $t = 0.25\ s$ (4) $t = 2\ s$

27. Three masses are placed on the axis 300g at origin. 500g at $x = 40\ cm$ & 400 g at $x = 70\ cm$. The distance of centre of mass from the origin is?
(1) $40\ cm$ (2) $45\ cm$
(3) $50\ cm$ (4) $30\ cm$

28. If a flywheel makes 120 revolution/minute. Then its angular speed will be
(1) $8\pi\ rad/sec$ (2) $6\pi\ rad/sec$
(3) $4\pi\ rad/sec$ (4) $2\pi\ rad/sec$

29. The radius of gyration of uniform circular disc of radius R, about any diameter of the disc is
(1) $k = R$ (2) $k = R/2$
(3) $k = 2R$ (4) NOTA

30. Two bodies of mass 10 kg & 2 kg are moving with velocities of centre of mass?
(1) $\hat{k}\ m/s$ (2) $3\hat{k}\ m/s$
(3) $4\hat{\imath}\ m/s$ (4) $2\hat{k}\ m/s$

31. From a uniform circular disc of diameter D, a circular hole of diameter D/6 & having centre at a distance D/4 from the centre of disk is cut off Find the com of remaining portion?
(1) $\frac{D}{140}$ (2) $\frac{D}{70}$
(3) $\frac{-D}{240}$ (4) $\frac{2D}{140}$

32. The speed of wheel increases from 600 rpm to 1200 rpm in 20 s. What is angular acceleration?
(1) $2\pi\ rad/s^2$ (2) $\pi\ rad/s^2$
(3) $\pi\ rad/s^2$ (4) $\frac{\pi}{2}\ rad/s^2$

33. The sun rotates around itself once in 27 days.
If it were to expand to twice its present diameter.
What would be its new period of rotation?
(1) 110 days (2) 54 days
(3) 108 days (4) 100 days

34. Distance of centre of mass of a solid uniform cone from its vertex is Z_0, if the radius of its base is R & its height h, then Z_0 is equal to

(1) $\frac{h^2}{4R}$ (2) $\frac{3h}{4}$

(3) $\frac{5h}{8}$ (4) $\frac{3h^2}{4R}$

35. The centre of wheel rolling on a plane surface moves with a speed V_0.

A particle on the rim of the wheel at the same level as centre will be moving at a speed

(1) $\sqrt{2}\,V_0$ (2) V_0

(3) $2\,V_0$ (4) 0

36. A wheel has a moment of gnertia $5 \times 10^{-3}\ kg\ m^2$ and is making 20 rev/s.

The torque needed to stop if in 10s is …… $\times\ 10^{-2}\ N$.

(1) 2π (2) $2.5\,\pi$

(3) $4\,\pi$ (4) $4.5\,\pi$

37. A solid cylinder & a hollow cylinder both of the same mass & same radius are released from the same height at the same time on an inclined plane.

Both rolls down without slipping.

Which one reach bottom first

(1) Solid cylinder (2) Both together

(3) Hollow cylinder (4) Data insufficient

38. A small object of uniform density rolls up a curved surface with an initial velocity v. It reaches upto a maximum height of $\frac{3v^2}{4g}$ with respect to initial position.

The body is

(1) Solid sphere (2) Solid cylinder

(3) Ring (4) Hollow sphere

39. Moment of inertia is

(1) $\frac{2\,k.\varepsilon}{w^2}$ (2) $3\,k.\varepsilon w^2$

(3) $\frac{2\,k.\varepsilon}{w}$ (4) $2\,k.\varepsilon\,w^2$

40. The ratio of MoF of a solid cylinder about its diameter and about one of its tangent is

(1) $\frac{2}{5}$ (2) $\frac{2}{7}$

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

41. The moment of inertia of a solid sphere of mass m and radius R about a tangent is

(1) $\frac{2}{3}mR^2$ (2) $\frac{2}{5}\,mR^2$

(3) $\frac{7}{5}mR^2$ (4) $\frac{5}{3}mR^2$

42. Masses of 1, 2, 3 & 4 kg are lying at the point $(0,0),(2,0),(0,3)$ & $(-2,-2)$ respectively.

Moment of inertia of this system about X- axis will be

(1) 47 kg m^2 (2) 43 kg m^2

(3) 27 kg m^2 (4) 72 kg m^2

43. A boy is standing on a rotating table with dumbbells in his hands, he suddenly with draws his hand to his chest. The angular velocity of table will

(1) Decrease (2) Increase

(3) Remain same (4) Becomes zero

44. A circular ring of mass M and radius r is rotating about its axis with angular speed. Two particles having mass m each are gently attached at diametrically opposite points. The angular opposite points. The angular speed of ring will becomes.

(1) $\frac{\omega M}{M+m}$ (2) $\frac{\omega M}{M+2m}$

(3) $\frac{M+m}{\omega<M}$ (4) $\frac{\omega(M+2m)}{M}$

45. Which of the following relation is true for rotating body

(1) $T = \frac{1}{2}\,c^2$ (2) $L = F\,\omega^2$

(3) $I = \omega L$ (4) $T = \frac{dL}{dt}$

46. Position of two particle of masses of 100 gm & 300 gm are $2\hat{\imath} + 5j + 13\hat{k}$ cm & $-6i + 4j + 2\hat{k}$ cm respectively. Position of com is

(1) $\left(16i + 8j - 5\hat{k}\right)/4$ (2) $\left(-16i + 17j - 7\hat{k}\right)/3$

(3) $\left(-16i + 17j + 7\hat{k}\right)/4$ (4) $\left(6i + 7j + 5\hat{k}\right)/3$

47. If the earth is treated as a sphere of radius R & mass M, its angular momentum about the axis of rotation with period T is

(1) $\frac{mR^2T}{2\pi}$ (2) $\frac{\pi mR^3}{T}$

(3) $\frac{4\pi\,mR^2}{5T}$ (4) $\frac{2\pi\,mR^2}{T}$

48. We have one solid sphere & one very thin spherical shell. They have identical masses & moment of inertia about their respective diameter. The ratio of their radii is given by-

(1) $\sqrt{3}:\sqrt{7}$ (2) 3: 7

(3) 5: 3 (4) $\sqrt{5}:\sqrt{3}$

49. A system consist of two identical particle one of the particle has an acceleration a & other is at rest. The com has an acceleration of

(1) 2a (2) a

(3) $\frac{a}{2}$ (4) $\frac{a}{4}$

50. A metre stick is balanced on a knife edge at its centre. When two coins each of mass 5g are put one on top of the other at the 12.0 cm mark, the stick is found to be balanced at 45.0 cm. What is the mass of the stick?

(1) 70 gram (2) 66 gram

(3) 100 gm (4) 60 gram

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

CHAPTER-6 GRAVITATIONAL

Practice Questions

1. What is he value of acceleration due to gravity at height (h=R)?
   (1) $g' = \frac{g}{2}$ (2) $g' = \frac{g}{4}$
   (3) $g' = g$ (4) $g' = 0$
2. How much below the surface of earth does the acceleration due to gravity become 70% of its value on the surface of earth?
   Radius of earth $R = 6.4 \times 10^6 m$
   (1) $1.92 \times 10^6 m$ (2) $1.92 \times 10^8 m$
   (3) $1.92 \times 10^{10} m$ (4) $1.92 \times 10^{-6} m$
3. Find the % decrease in the weight of the body when taken 64 km below the surface of the earth.
   The Radius of earth $R = 6400\ km$
   (1) 2% (2) 1%
   (3) 3% (4) 4%
4. Time period of satellite in a circular orbit around a planet is independent of of
   (1) Mass of satellite (2) Radius of planet
   (3) Mass of planet (4) All of the above
5. Kepler's second law is consequences of
   (1) Conservation of Area
   (2) Conservation of angular momentum
   (3) Conservation of energy
   (4) NOTA
6. The mass ratio of two planets is x & the density ratio is y. What is the ratio of acceleration due to gravity on their surface is?
   (1) $\frac{x^2}{y}$ (2) $\left(\frac{x^2}{y}\right)^{1/3}$
   (3) $x^2 y$ (4) $(xy^2)^{2/3}$
7. The weight of body at centre of the earth is-
   (1) zero
   (2) infinite
   (3) same as in the surface of earth
   (4) NOTA
8. If the earth shrinks by one third of its present radius the acceleration due to gravity will be?
   (1) $\frac{2}{3}g$ (2) $\frac{3}{2}g$
   (3) $\frac{4}{9}g$ (4) $\frac{9}{4}g$
9. The distance of two planets of the son are 10^{13} & $10^{12} m$ respectively. Ratio of time periods of these planets is
   (1) $\frac{1}{\sqrt{10}}$ (2) 100
   (3) $10\sqrt{10}$ (4) $\sqrt{10}$
10. The satellite A & B are revolving round a planet P in circular orbits having Radii 4R & R respectively.
    If the speed if satellite A is 3V then the speed of satellite B will be
    (1) 12V (2) 6V
    (3) $\frac{4}{3}v$ (4) $\frac{3}{2}v$
11. The Radii of two planets are R_1 & R_2 and their densities are respectively P1 & P2. The ratio of the acceleration due to gravity $\frac{g_1}{g_2}$ at their surface is
    (1) $\frac{P_1 R_2^2}{P_2 R_1^2}$ (2) $\frac{R_1 P_1}{R_2 P_2}$
    (3) $\frac{R_1 P_2}{R_2 P_1}$ (4) $\frac{R_1 R_2}{P_1 P_2}$
12. The ratio of gravitational potential at the centre & on the surface of a surface of a solid sphere is?
    (1) $\frac{3}{2}:1$ (2) $\frac{1}{2}:1$
    (3) $1:1$ (4) $2:1$
13. If the density of earth increased by 2% & radius by 1% the acceleration due to gravity g will changes as follows-
    (1) Increase 3% (2) Increase 5%
    (3) Decrease 3% (4) Decrease 5%
14. If the earth stop rotating the value of g at the equator will be
    (1) Increase (2) Remain same
    (3) Decrease (4) NOTA
15. Escape velocity of a particle depends on its mass as
    (1) m^{-1} (2) m^2
    (3) m^0 (4) m
16. We know escape velocity of satellite is 11 km/s.
    If the satellite is launched at angle of $30°$ with the vertical, then escape velocity will be-
    (1) $11\sqrt{2}\ km/s$ (2) $11\sqrt{3}\ km/s$
    (3) 11 km (4) $3\ \mu\ km/s$

17. Assuming the radius of earth as R, the change in gravitational potential energy of a body of mass m, when it is taken from the earth's surface to a height 3R above its surface is

(1) 3 mgR (2) $\frac{3}{4}mg\ R$

(3) mg R (4) $\frac{3}{2}\ mg\ R$

18. The period of revolution of planet A around the sun is 8 times that of B.

The distance of A from the sun is how many times greater than that of B from the sun

(1) 2 (2) 3

(3) 4 (4) 5

19. The work done to raise a mass m from the surface of the earth to a height h, which is equal to radius of the earth is

(1) mgR (2) 2 mgR

(3) $\frac{1}{2}\ mgR$ (4) $\frac{3}{2}\ mgR$

20. A new planet having the same density & 3 times bigger than the earth in size.

If the acceleration due to gravity on the surface of new planet g' then $\frac{g'}{g}$ is

(1) $\frac{1}{9}$ (2) 27

(3) $\frac{3}{2}$ (4) 3

21. A body weight 72 N on the surface of the earth. What is the gravitational force on if due to earth at a height equal to half the radius of the earth from the surface

(1) 32 N (2) 28 N

(3) 16 N (4) 72 N

22. The satellites A & B go around a planet p in circular orbit having 4R & R respectively. If the speed if the satellites A is 3V, find the speed of satellite B

(1) 4V (2) 6V

(3) 3V (4) 10 V

23. What will be the effect on the time period of a simple pendulum on taking it to a mountain.

(1) decrease (2) increase

(3) remain same (4) NOTA

24. Two bodies of mass 100kg & 1000 kg are at a distance 1.0 m apart. Calculate Gravitational field intensity.

(1) $2.4 \times 10^{-10}\ N/kg$ (2) $2.4 \times 10^{-7}\ N/kg$

(3) $3.4 \times 10^{-10}\ N/kg$ (4) $3.4 \times 10^{-7}\ N/kg$

25. A satellite is revolving around a planet of radius R, in a circle of radius r with angular speed w.Find the acceleration due to gravity on planet's surface

(1) $\frac{r^3w}{R^2}$ (2) $\frac{r^3w^2}{R^2}$

(3) $\frac{rw}{R}$ (4) $\frac{rw^2}{R^2}$

26. Assuming the earth to be a sphere of uniform means density how much would a body weight half way down the centre of earth if it weighted 250N on the surface?

(1) 500N (2) 250 N

(3) 175N (4) 125 N

27. If the angular momentum of a planet of mass m, moving around the sun in circular orbit is L, about the centre of the sun, its area velocity is?

(1) $\frac{L}{m}$ (2) $\frac{4L}{m}$

(3) $\frac{L}{2m}$ (4) $\frac{2L}{m}$

28. A satellite is moving around the earth with speed v in circular orbit of radius r, if the orbital radius is decrease by 1% its speed will

(1) Increase by 1% (2) Increase by 0.5%

(3) Decrease by 1% (4) Decrease by 0.5%

29. What is the minimum energy required to launch a satellite of mass m from the surface of a planet of mass m & radius R in a circular orbit at an altitude of 2R?

(1) $\frac{5\ GmM}{6\ R}$ (2) $\frac{2\ GnM}{3\ R}$

(3) $\frac{GnM}{2\ R}$ (4) $\frac{GnM}{3\ R}$

30. If V_e is escape velocity and V_0 is orbital velocity of a satellite for orbit close to earth surface then

(1) $V_0 = \sqrt{2}\ Ve$ (2) $V_0 = Ve$

(3) $V_e = \sqrt{2}\ V_0$ (4) $V_e = \sqrt{2}\ V_0$

31. A satellite of mass m is orbiting around the earth in a circular orbit with a velocity v.

What will be its total energy?

(1) $\frac{3}{4}\ mv^2$ (2) $\frac{1}{2}\ mv^2$

(3) mv^2 (4) $-\left(\frac{1}{2}\right)\ mv^2$

32. For a satellite moving in an orbit around the earth, the ratio of kinetic to potential energy is

(1) $\frac{1}{2}$ (2) $\frac{1}{\sqrt{2}}$

(3) 2 (4) $\sqrt{2}$

33. The escape velocity on the surface of earth Ps 11.2 km/s. What would be the escape velocity on the surface of another planet of the same mass but ¼ times the radius of the earth?

(1) 22.4 km/s (2) 44.8 km/s

(3) 5.6 km/s (4) 11.2 km/s

34. The radius of planet is twice the radius of the earth, both have almost equal average mass densities.
If V_p & V_ε are escape velocities of the planet & the earth, respectively, then
(1) $V_\varepsilon = 1.5\, V_p$ (2) $V_p = 1.5\, V_\varepsilon$
(3) $V_p = 2\, V_\varepsilon$ (4) $V_\varepsilon = 3\, V_p$

35. At what height from the surface of earth the gravitational potential & the value of g are $-5.4 \times 10^7\, j/kg$ & $6.0\, m/s^2$ respectively. Take the radius of earth as 6400 km
(1) 2600 km (2) 1600 km
(3) 1400 km (4) 2000 km

36. The escape velocity of a sphere of mass m is given as
(1) $\sqrt{\frac{GM}{R}}$ (2) $\sqrt{\frac{GM}{R^2}}$
(3) $\sqrt{\frac{2GM}{R}}$ (4) $\sqrt{\frac{2GM}{(R+h)}}$

37. What is the gravitational intensity & gravitational potential at all points inside a uniform spherical shell.
(1) both are same
(2) both are zero
(3) both are non-zero
(4) gravitational intensity is zero & potential is non zero

38. Assuming that earth is a sphere of radius R at what altitude the value of acceleration dur to gravity be half its value at the surface of the earth?
(1) $h = R$ (2) $h = \left(\sqrt{2} - 1\right)R$
(3) $h = \sqrt{2}R$ (4) $h = \left(1 - \sqrt{2}\right)R$

39. If the earth has a mass nine times & radius twice that of planet mass.
Calculate the maximum speed repaired by a rocket to pull out of the gravitational force of mass.
Given escape speed of earth is 11.2 km/s?
(1) 5.28 km/s (2) 6 km/s
(3) 9.28 km/s (4) 10 km/s

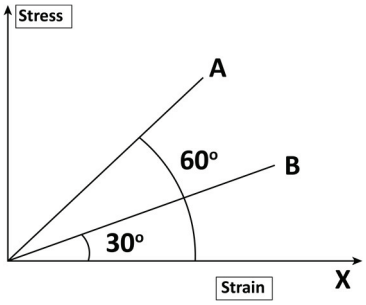
40. How many times the orbital speed of a satellite be increased so that it escape the earth gravitational field/
(1) 1.21 (2) 1.41
(3) 1.73 (4) 2.11

ANSWER KEY									
1	2	3	4	5	6	7	8	9	10
2	1	2	1	2	4	1	1	3	2
11	12	13	14	15	16	17	18	19	20
2	1	1	1	3	3	2	1	3	4
21	22	23	24	25	26	27	28	29	30
1	2	2	2	2	4	3	2	1	4
31	32	33	34	35	36	37	38	39	40
4	1	1	3	1	3	4	2	1	2

CHAPTER-7 MECHANICAL PROPERTIES OF SOLID & FLUIDS

Practice Questions

1. A steel wire of 4m in length is stretched through 2.0 mm. The cross section area of wire is 2.0 mm^2. If young modules of steel is $2 \times 10^{11}\ N/m^2$
   Find the energy density of wire?
   (1) 2.5×10^4 (2) 2.5×10^7
   (3) 2.5×10^8 (4) 2.0×10^3
2. Shearing stress causes change in
   (1) length (2) breadth
   (3) shape (4) volume
3. A uniform cube is subjected to volume compression. If each slide is decrease by 1%, then bulk strain is
   (1) 0.01 (2) 0.06
   (3) 0.02 (4) 0.03
4. The young modules of wire of length L & radius r us y. If the length & radius are reduced to $\frac{L}{2}$ & $\frac{r}{2}$, then its young modules will be
   (1) $\frac{y}{2}$ (2) y
   (3) 2y (4) 4y
5. The ratio of length of two wire A & B of same material is 1:2 & the ratio of their diameter is 2:1.
   They are stretched by the same force, then ratio of increase in length will be
   (1) 2: 1 (2) 1: 4
   (3) 1: 8 (4) 8: 1
6. Modulus of rigidity of ideal liquid is
   (1) ∞ (2) zero
   (3) unity (4) infinite
7. The stress versus strain graphs for wires of two materials A & B are as shown in fig If Y_A & Y_B are the young modulus of materials then



   (1) $Y_B = 2Y_A$ (2) $Y_A = Y_B$
   (3) $Y_B = 3Y_B$ (4) $Y_A = 3Y_B$
8. The density of a mental at normal pressure is P.
   Its density when it is subjected to an excess pressure p is p'. If B is the bluk modules of the metal, then $\frac{p'}{p}$ is
   (1) $\left(1 - \frac{p}{B}\right)$ (2) $\left(1 + \frac{B}{P}\right)$
   (3) $(2p - B)$ (4) $\left(1 + \frac{P}{B}\right)$
9. The length of a metal is l_1 when the tension in it is T_1 & l_2 when the tension is T_2.
   Find the original length of the wire.
   (1) $\frac{T_1 l_1 - T_2 l_2}{T_2 - T_1}$ (2) $\frac{T_2 l_1 - T_1 l_2}{T_2 - T_1}$
   (3) $\frac{T_2 l_1 - T_1 l_2}{T_2 - T_1}$ (4) $\frac{T_1 T_2 - l_1 l_2}{T_2 - T_1}$
10. The wire of length L l corss-sectional area A is made of material of young's modulus y. What is the work done in stretching wire by an amount x?
    (1) $\frac{y\,A\,x}{2L}$ (2) $\frac{y\,A\,x^2}{2L}$
    (3) $\frac{A\,x}{y2L}$ (4) $\frac{A\,x^2}{2L}$
11. How much should the pressure in a liter of water be changed to compress if by changed to compress if by 0.10 % ? Bulk modulus of elasticity of water = 2.2×10^9
    (1) $2.2 \times 10^6\ pa$ (2) $2.2 \times 10^8\ pa$
    (3) $3.2 \times 10^6\ pa$ (4) $3.2 \times 10^8\ pa$
12. The Bulk modulus of a spherical object is B. If it is subjected to uniform pressure p, the fractional decrease in radius is
    (1) $\frac{P}{B}$ (2) $\frac{B}{3P}$
    (3) $\frac{3P}{B}$ (4) $\frac{P}{3B}$
13. The following four wires are made of the same material, which of these will have the largest extension, when the same tension is applied?
    (1) Length = 100 cm, diameter = 1 mm
    (2) Length = 200 cm, diameter = 2 mm
    (3) Length = 300 cm, diameter = 3 mm
    (4) Length = 50 cm, diameter = 0.5 mm
14. When an elastic material with young's modulus y is subjected to stretching stress, elastic energy stored per unit volume of the material
    (1) $\frac{ys}{2}$ (2) $\frac{s^2 y}{2}$
    (3) $\frac{s^2}{2y}$ (4) $\frac{s}{2y}$

15. A material has Poisson ratio 0.5. If a uniform rod of it undergoes a longitudinal strain of 2×10^{-3}, what is the percentage increase in its volume?
(1) 2% (2) 3%
(3) 0% (4) 5%

16. What will be density of lead under a pressure of 3×10^8
Given normal density of lead is 11.4 g/cm^3 & bulk modulus of lead is $8 \times 10^9\ N/m^2$?
(1) 15 g/cm^3 (2) 15.5 g/cm^3
(3) 10.5 g/cm^3 (4) 11.8 g/cm^3

17. Copper of fixed volume V is drawn into a wire of length l, when this wire is subjected to a constant force F, the extension produced in the wire is subjected to a constant force F, the extension produced in the wire is Δl.
Which of the following graph is straight line?
(1) Δl versus $\frac{1}{l}$ (2) Δl versus l^2
(3) Δl versus $\frac{1}{l^2}$ (4) Δl versus l

18. Young modulus of two wires A & B are in the ratio 7: 4, wire A is 2m long ϕ & has a radius R.
Wire B is 1.5 m long & has radius 2mm.
If the two wire stretched by the same length for a given load, then the value of R is close to?
(1) 1.3 mm (2) 1.5 mm
(3) 1.7 mm (4) 1.9 mm

19. A/c to Hooks law of elasticity, If stress is increased, the ratio of stress to strain
(1) Increase (2) decrease
(3) Remain constant (4) Become zero

20. The bulk modulus of perfectly rigid body is?
(1) Infinite (2) zero
(3) some finite value (4) Non-zero constant

21. Young modulus of elasticity with rise in temperature.
(1) decrease
(2) increase
(3) No change
(4) first increase then decrease

22. What is pressure on a swimmer 10m below the surface of lake $g = 10\ m/s^2$ atmospheric pressure
(1) 1 atm (2) 2 atm
(3) 3 atm (4) 5 atm

23. Two soap bubble of radii 4 cm & 6 cm are in contact with each other, what is the radius of common boundary?
(1) 12 cm (2) 10 cm
(3) 15 cm (4) 20 cm

24. What is the change in surface energy, when a mercury drop of radius R splits up into 1000 droplet of radius r? Surface tension of mercury is S.
(1) $8\pi R^2 s$ (2) $16\,\pi R^2 s$
(3) $24\,\pi R^2 s$ (4) $36\,\pi R^2 s$

25. With the increase in Temperature the coefficient of viscocity of liquid
(1) increase (2) decrease
(3) remain same (4) NOTA

26. Construction of submarine is based on
(1) Archimede's principle (2) Bernoulli's theorem
(3) pascal's law (4) Newton law

27. Equal masses of two substances of densities P_1 & P_2 mixed together.
What is the density of mixture?
(1) $\frac{2\,P_1\,P_2}{P_2}$ (2) $\frac{2\,P_1\,P_2}{P_1+P_2}$
(3) $\frac{P_1\,P_2}{P_1+P_2}$ (4) $\frac{P_1\,P_2\,(P_1+P_2)}{P_1P_2}$

28. A liquid of density P & surface Tension S rises to a height h in a capillary tube A diameter D.
What is weight of liquid in capillary table?
Angle of constant is is $O°$?
(1) $\pi^2 DS$ (2) $\pi\ DS$
(3) $\frac{\pi DS}{2}$ (4) $\pi^3 DS$

29. A cylindrical tube of spray pump has radius R, one end of which has n fine holes, each of radius r.
If the speed of liquid in tube is V, the speed of the ejection of the liquid through hole is
(1) $\frac{V^2R}{nr}$ (2) $\frac{VR^2}{n^2r^2}$
(3) $\frac{VR^2}{nr^2}$ (4) $\frac{VR^2}{n^3r^2}$

30. Two solid sphere of same metal but of mass M & 8M fall simultaneously on a viscous liquid & their terminal velocity are V & nv then value of n is?
(1) 16 (2) 4
(3) 8 (4) 2

31. The velocity of oil in a 5 cm internal diameter pipe is 0.63 m/s.
The velocity in a 3cm internal diameter pipe that connects the first one is
(1) 1.75 m/s (2) 1.5 m/s
(3) 3 m/s (4) 9 m/s

32. The correct expression for the critical velocity is
(1) $V_C = \frac{Kn}{pr}$ (2) $V_c = \frac{k\,pn}{r}$
(3) $V_c = \frac{k\,pn}{n}$ (4) $V_c = \frac{k\,p}{n\,r}$

33. With rise in temperature, the coefficient of viscosity of gas?
(1) Increase
(2) Decrease
(3) Does not change
(4) May increase or decrease depending upon the range of temperature

34. The terminal velocity of a spherical ball of radius r falling through a viscous liquid is proportional to
(1) r (2) r^3
(3) r^2 (4) r^4

35. The diameter of a ball A is half that of another ball B. The ratio of their terminal velocity in water will be
(1) 1: 2 (2) 1: 1
(3) 1: 4 (4) 2: 1

36. The rate of flow of liquid through a capillary tube under a constant pressure head is Q.
If the diameter of tube reduced to half & its length is doubled, then new rate of flow of liquid will be
(1) $\frac{Q}{4}$ (2) $\frac{Q}{8}$
(3) $\frac{Q}{32}$ (4) $16\,Q$

37. Equation of Bernoulli's theorem is
(1) $P + PV^2 + Pgh =$ constant
(2) $P + MV^2 + mgh =$ constant
(3) $P + \frac{1}{2}\,Pv^2 + pgh =$ constant
(4) $P + \frac{1}{2}\,Mv^2 + Pgh =$ constant

38. Bernoulli's principle based on the law of conservation of
(1) Mass (2) energy
(3) Linear momentum (4) Angular momentum

39. The excess pressure in a soap bubble of 2 mm radius, its surface tension is 0.03 N/m is
(1) 60 N/m^2 (2) 50 N/m^2
(3) 45 N/m^2 (4) 30 N/m^2

40. When the temperature increased the surface tension of liquids
(1) Remain unchanged
(2) Increase
(3) Decrease
(4) Increase only when the rise in temperature is more than $25°C$

41. Pressure inside two soap bubble are 1.01 & 1.02 atmosphere respectively.
The ratio B/w their volume is
(1) 102 : 101 (2) 8: 1
(3) $(102)^3 : (101)^3$ (4) 2: 1

42. 27 small droplets of water combine to form one big drop. The ratio of surface energies of one big drop to one small drop will be
(1) 1: 9 (2) 3: 1
(3) 1: 3 (4) 9: 1

43. The energy required in breaking of liquid drop of radius R into n small equal radii drop is
(1) $4\pi\,R^2\left(n^{1/3}-1\right)s$ (2) $4\pi\,R^2\,(n^2-1)s$
(3) $4\pi\,R^2\left(n^{2/3}-1\right)s$ (4) $4\pi\,R^2\,(n-1)s$

44. Air is pushed into soap bubble of radius r to double its radius. If the surface tension of the oap solution is S, the work done in the process is?
(1) $8\pi^2\,rs$ (2) $8\pi\,r^2 s$
(3) $16\pi\,r^2 s$ (4) $24\,\pi r^2 s$

45. In a process of coalescence of small droplets A water to a big drop the surface energy of the system
(1) Increase (2) decrease
(3) remain unchanged (4) NOTA

46. Water is flowing through two horizontal pipes A & B of diameter 2 & 4 cm respectively.
If velocity of water in A is 8 m/s the velocity in B will be (in m/s)
(1) 8 (2) 16
(3) 2 (4) 4

47. If the diameter of capillary tube is increased by two times, then the height of liquid rise in it will be
(1) two times (2) half
(3) remain same (4) one –fourth

48. The level of liquid in capillary will rise if angle of contat is
(1) 270° (2) 180°
(3) 45° (4) 110°

49. On increasing the temperature of liquid, angle of contact
(1) decrease
(2) No change
(3) increase
(4) first increase than decrease

50. Two water droplets merge with each other to form a large droplet, in this process
(1) energy is liberated
(2) energy neither absorbed
(3) energy neither liberated nor absorbed
(4) some mass is converted into energy

51. Two soap bubble have radii in the ratio of 4: 3. What is the ratio of work done to blow these bubbles
(1) 4: 3 (2) 16: 9
(3) 9: 16 (4) 3: 4

52. Consider stream line flow of liquid through a capillary if both diameter & length of the capillary are made 2 folds other factor remain unchanged the flow rate would become

(1) 2^5 fold (2) 2^4 fold

(3) 2^9 fold (4) 2^2 fold

ANSWER KEY									
1	2	3	4	5	6	7	8	9	10
1	3	3	2	3	2	4	4	3	2
11	12	13	14	15	16	17	18	19	20
1	4	4	3	3	4	2	3	3	1
21	22	23	24	25	26	27	28	29	30
1	2	1	4	2	1	2	2	3	2
31	32	33	34	35	36	37	38	39	40
1	1	1	3	3	3	3	2	1	3
41	42	43	44	45	46	47	48	49	50
2	4	1	4	2	3	2	3	3	1
51	52								
2	3								

CHAPTER-8 THERMODYNAMICS

Practice Questions

1. Calculate the amount of heat required to convent 1.00 kg of ice at -10° C. into stream 100° C at normal pressure. Specific heat of $= 2100 J\ kg^{-1}K^{-1}$; latent heat of ice $= 3.36 \times 10^5\ J\ kg^{-1}$. Specific heat capacity of water $= 4200\ J\ kg^{-1}K^{-1}$ & latent heat of vaporization of water $= 2.25 \times 10^6\ J\ kg^{-1}$?
   (1) $3.027 \times 10^6\ J$ (2) $4 \times 10^8 J$
   (3) $3.027 \times 10^9 J$ (4) $5.027 \times 10^6 J$
2. How much should the temperature of Brass rod be increased so as to increases is length by 1%? Given X for brass
   (1) $400°C$ (2) $500°C$
   (3) $700°C$ (4) $250\ °C$
3. The SI unit of heat is
   (1) J (2) Calorie
   (3) torr (4) pascal
4. The Temperature at which the solid & liquid stats of a substances co-exist in equilibrium with each other is called
   (1) Boiling point (2) Melting point
   (3) Regulation (4) Curie Temperature.
5. What is specific heat of gas in an adiabatic process;
   (1) ∞ (2) 0
   (3) 1 (4) finite number
6. Two bodies of specific heat S_1 and S_2 having same heat capacities are combined to from a single composite body. Find the specific heat of the composite body?
   (1) $\frac{S_1S_2}{S_1+S_2}$ (2) $\frac{S_1+S_2}{S_1-S_2}$
   (3) $\frac{2S_1S_2}{S_1+S_2}$ (4) $S_1 + S_2$
7. A Blackbody at 2000K, emits maximum energy at a wavelength of 1.56 cm. at what temperature will it emit maximum energy at a wavelength of 1.8 rm.
   (1) 1733 K (2) 2000 K
   (3) 1500 K (4) 1633 K
8. Coefficient of linear expansion of brass & steel rods are X_1 & X_2. Length of brass & steel rods are ℓ_1 & ℓ_2 respectively. If $(\ell_2 - \ell_1)$ is maintained same at all temperatures which one of the following relations holds good?
   (1) $X_1\ell_2 = X_2\ell_1$ (2) $X_1\ell_2^2 = X_2\ell_1^2$
   (3) $X_1^2\ell_2 = X_2^2\ell_1$ (4) $X_1\ell_1 = X_2\ell_2$
9. An ideal gas expand such that $PT^2 = a$ constant. The coefficient of volume expansion of the gas is
   (1) $\frac{1}{T}$ (2) $\frac{2}{T}$
   (3) $\frac{3}{T}$ (4) $\frac{4}{T}$
10. The rate of cooling at 600K If surrounding temperature is 300 K is R.
    The Rate of cooling at 900 K is
    (1) $\frac{16}{3}R$ (2) 2 R
    (3) 3 R (4) $\frac{2}{3}R$
11. Certain quantity of water cools From 70°C to 60°C in the first 5 minutes & to 54°c in the next 5 minutes The temperature of surroundings is
    (1) 45°c (2) $20°c$
    (3) 42 ° c (4) $10°c$
12. A centigrade & a Fahrenheit Thermometer are dipped in Boiling water. The water temperature lowered until the Fahrenheit Thermometer registered 140°.
    What is the fall in temperature registered by the centigrade Thermometer
    (1) 80° (2) 60°
    (3) 40° (4) 30°
13. The Freezing point on thermometer marked as -20° & the Boiling point is 130°. A temperature of human body $(34°C)$ on this thermometer will be read as?
    (1) 31° (2) 51°
    (3) 20° (4) NOTA
14. An object temperature is raised by 150°c. The Resulting increase in its absolute Temperature is
    (1) 32 K (2) 150 K
    (3) 180 K (4) 200 K
15. The temperature of a body on kelvin scale is found to be X K. while on Fahrenheit scale it is found to X°f. then the value of x is
    (1) 301.25 (2) 574.25
    (3) 313 (4) 40
16. In Celsius & Fahrenheit thermometers the two shows equal readings of Temperature at?
    (1) 40° (2) 0°
    (3) -40° (4) 32°

17. The pressure of a gas is increased by 50% at constant Temperature The decrease in volume should be –
(1) 66% (2) 33%
(3) 17% (4) 8%

18. Which of these following cylindrical rods conduct maximum amount of heat. When the ends are maintained at same steady temperature?
(1) $\ell = 1m, r = 0.01\ m$ (2) $\ell = 1m, r = 0.02\ m$
(3) $\ell = 2m, r = 0.01\ m$ (4) $\ell = 2m, r = 0.02m$

19. Equivalent thermal conductivity of conductor connected in Parallel is
(1) $K = \frac{K_1A_1+K_2A_2}{A_1+A_2}$ (2) $K = \frac{\ell_1+\ell_2}{\frac{\ell_1}{k_1}+\frac{\ell_2}{k_2}}$
(3) $k = \frac{k_1\ell_2+k_2\ell_1}{k_1+k_2}$ (4) $k = \frac{k_1+k_2}{k_1\ell_2+k_2\ell_1}$

20. A spherical black body with a radius of 12cm radiates 450w power at a temperature of 500 K. if the radius were halved & the power radiated in wall would be –
(1) 225 (2) 450
(3) 900 (4) 1800

21. Good emitters are good absorbers" is a statement conclude from
(1) Newton's law of cooling
(2) Stefan's law of cooling
(3) Prevost theory
(4) Kirchoff's law

22. A Black body is maintained at 27°C & 927°C what will be the ratio of radiation emitted?
(1) 1 : 4 (2) 1 : 16
(3) 1 : 64 (4) 1 : 256

23. The emmisive power of Black body is proportional to –
(1) $E \times T^0$ (2) $E \times T^2$
(3) $E \times T^4$ (4) $E \times T^5$

24. Two stars S_1 & S_2 radiate maximum energy at 4800 & 6400 respectively. The ratio of absolute temperature of S_1 & S_2 is
(1) 3 : 4 (2) 4 : 3
(3) 256 : 81 (4) 9 : 16

25. A black body emit radiation of maximum intensity wave length of 5000Å at a temperature of 1227°C, when the temperature is raised by 1000°C, the wavelength corresponding to maximum intensity would be
(1) 2754 Å (2) 3000 Å
(3) 3500 Å (4) 5900 Å

26. The intensity of scattered light is proportional to?
(1) λ (2) λ^4
(3) λ^{-1} (4) λ^{-4}

27. The planck's radiation formula reduces to Rayleigh jean's law for?
(1) shorter wave length
(2) longer wave length
(3) For both shorter & longer wavelength
(4) neither for shorter nor for longer wavelength

28. A Body cools from 90° to 80°C in 10 minutes under the same condition, the time taken by the body to cool from 80°C to 70°C will be
(1) exactly 10 minutes (2) less than 10 minutes
(3) more than 10 minutes (4) NOTA

29. In a bucket with not water at 80°c, the water cools from 80°c to 75°c in T_1 seconds, 75°C to 70°C in T_2 seconds & 70°C to 65°C in T_3 seconds, then
(1) $T_1 > T_2 > T_3$ (2) $T_1 < T_2 < T_3$
(3) $T_1 = T_2 = T_3$ (4) $T_1 < T_2 = T_3$

30. A body cools in 5 minutes from 60° c to 40°C The temperature of the surroundings is 10°c The temperature of the body after the next minute will be:
(1) 28°C (2) 29°C
(3) 30°C (4) 31°C

31. The emmisive power of a black body at 400k is 1.0×10^5 Joule per sec per m^2. Temperature at the black body at which its emmisive power Become 16.01×10^5 Joule per sec $per\ m^2$ is
(1) 400 k (2) 800 k
(3) 1200 k (4) 200 k

32. The two ends of a metal rod are maintained at temple raptures 100°c & 110°C. The rate of heat flow in the rod is found to be 4.0 J/s. If the ends are maintained at temperature at 200° c & 210°c, the rate of heat flow will be:
(1) 16.8 J/s (2) 10 J/s
(3) 15 J/s (4) 4.0 J/s

33. An object kept in a large room having air temperature of 25°C takes 12 minutes to cool from 80°C to 70°C. The time taken to cool for the same object from 70°C to 60°C would be nearly.
(1) 15 min (2) 10 min
(3) 12 min (4) 20 min

34. When the temperature of rod increases from $'\ell'$ to $'t + \Delta t'$ its moment of inertia Increases from I to $L + \Delta I$. If X is the coefficient of linear expansion of the rod, then the value of $\frac{\Delta I}{I}$ is
(1) $2x\ \Delta t$ (2) $x\ \Delta t$
(3) $\frac{x\Delta t}{2}$ (4) $\frac{\Delta t}{x}$

35. The value of coefficient of volume expansion of glycerine is $5 \times 10^{-4} x^{-1}$. The fraction charge in the density of glycerine for a rise of 40°c in the its temperature is
(1) 0.010 (2) 0.015
(3) 0.020 (4) 0.025

36. Consider a compound slab consisting of two different materials having equal thickness of thermal conductivities K & 2k respectively connected in series. The equilibrium thermal conductivity of the slab is –
(1) $\left(\frac{2}{3}\right) K$ (2) $\sqrt{2}k$
(3) 3k (4) $\left(\frac{4}{3}\right)$k

37. When one mole of monoatomic gas is mixed with 3 mole of diatomic gas, then find f & r for mixture?
(1) 6, $\frac{4}{3}$ (2) 6, $^2/_3$
(3) 5, $^7/_5$ (4) 4, $^3/_2$

38. A cylinder containing one gram of molecule of the gas was compressed adiabatically until its temperature rose from 27°c to 97°C. Calculate the work done?
(1) $-11.62 \times 10^2 J$ (2) $11.62 \times 10^2 J$
(3) $12.58 \times 10^2 J$ (4) $-12.58 \times 10^2 J$

39. A carnot engine whose sink is at 27°C has an efficiency of 40%. By how many depree should the temp of sink be changed to increases the efficiency by 10% of the original efficiency
(1) 40 k (2) 60 k
(3) 20k (4) 100 k

40. The efficiency of carnot's engine operating reservoirs, maintained at temperatures 27°C & -123°C is
(1) 50% (2) 24%
(3) 0.75% (4) 0.4%

41. A gas absorbs 100 Calorie of heat & performs 150J of work. Increases in internal energy of the gas in the process is
(1) 420 J (2) 570 J
(3) 270 J (4) NOTA

42. An engine has been designed to work below source & sink at temperatures 177°C & 27°C respectively, if the energy input is 3600J, the work done by the engine is?
(1) 1400 J (2) 1200 J
(3) 1100 J (4) 1300 J

43. Real gas behaves as ideal gas at
(1) low temp, low pressure
(2) low temp, high pressure
(3) high temp, low pressure
(4) high temp, high pressure

44. A refrigerator is to maintain establish kept inside at 9°C If Room temperature is 36°C calculate the coefficient of performance
(1) 15 (2) $10 \cdot 4$
(3) $12 \cdot 5$ (4) $15 \cdot 5$

45. Consider a carnot cycle operating between $T_1 = 500\ K$ & $T_2 = 300\ K$ providing 1kJ of mechanical work per cycle find the heat transferred to the engine by the reservoirs?
(1) 1500 J (2) 2000 J
(3) 3000 J (4) 2500 J

46. An ideal gas is compressed to half its initial volume by means of several process which of the process results in the maximum work done on the gas?
(1) Isothermal (2) Adiabatic
(3) Isobaric (4) Isochoric

47. During an adiabatic process the pressure of gas is found to be proportional to the cube of its temperature the ratio of $\frac{C_p}{C_v}$ for the gas is
(1) $\frac{3}{2}$ (2) $\frac{4}{3}$
(3) 2 (4) $^5/_3$

48. An ideal gas at 27°C is compressed adiabatically to $\frac{8}{27}$ of its original volume. The Rise in Temperature is $\left(r = {}^5/_3\right)$
(1) 475°C (2) 402°C
(3) 275°C (4) 175°C

49. At 27°C a gas is compressed suddenly such that its pressure becomes $\left(\frac{1}{8}\right)$ of original pressure final temperature will be $\left(r = {}^5/_3\right)$
(1) 420 k (2) 300 k
(3) $-142°C$ (4) 327°C

50. A sample of gas expand from V_1 to V_2. The amount of work done by the gas is greatest. When the expansion is
(1) adiabatic (2) Isobaric
(3) Isothermal (4) equal in all cases

51. An ideal carnot engine, whose efficiency is 40% receives heat at 500k if its efficiency is 50% then the intake temperature for the same exhaust temperature
(1) 600 k (2) 700 k
(3) 800 k (4) 900 k

52. The temperature of source of sink of a heat engine are 127°C & 27°C respectively. A person claims its efficiency to be 26% then

(1) It is possible
(2) It is possible with high probability
(3) If is possible with low probability
(4) Not possible

53. A monoatomic gas at pressure p, having a volume V expands isothermally to a volume 2V. & then adiabatically to a volume 16V. The final pressure of the gas is
(1) 64 p (2) 32 p
(3) $\frac{p}{64}$ (4) 16 p

54. The internal energy changes in a system that has absorbed 2 Kcals of heat & done 500J of work is
(1) 6400 J (2) 5400 J
(3) 7900 J (4) 8900 J

55. First law of thermodynamics is consequence of conservation of
(1) momentum (2) energy
(3) Work (4) pressure

56. An ideal gas undergoes a quasi – static reversible process in which its molar heat capacity C remains constant, If during this process constant, If during this process, in which its molar heat capacity C remains constant, If during this process, the relation below pressure p & volume V is given by pV^n = constant,
Then n is given as
(1) $n = \frac{C_p}{C_v}$ (2) $n = \frac{C-C_V}{C_C_p}$
(3) $n = \frac{C-C_p}{C-C_V}$ (4) $n = \frac{C_p-C}{C-C_v}$

57. 5.6 litre of helium gas at STP is adiabatically compressed to 0.7 litre. Taking the initial temperature to be T_1.
The work done in the process is
(1) $\frac{9}{8}RT_1$ (2) $\frac{3}{2}RT_1$
(3) $\frac{15}{8}RT_1$ (4) $\frac{9}{2}RT_1$

58. If Q. E & W denote respectively the heat added, change in internal energy & the work done in a closed cyclic process. Then
(1) $w = 0$ (2) $Q = w = 0$
(3) $E = 0$ (4) $Q = 0$

59. An ideal gas A & a real gas B have their volume increased in internal energy
(1) will be same in both A & B
(2) will be zero in both the gases
(3) of B will be more that of A
(4) of A will be more than that of B

60. A sample of gas $(r = 1 \cdot 5)$ is compressed adiabatically from a volume of 1600 cc to 400 cc. If the final pressure is 150 kpa. What is the final pressure
(1) 1200 kpa (2) 1400 kpa
(3) 1000 kpa (4) 2000 kpa

61. A sample of ideal gas $(r = 1 \cdot 4)$ is heated at constant pressure If 140 J of heat is supplied to the gas find change in internal energy of the gas?
(1) 50 J (2) 100 J
(3) 80 J (4) 60 J

62. At what temperature is the Rms velocity of hydrogen molecule equal to that of an oxygen molecule at 47°C?
(1) 50 k (2) 100 k
(3) 100 k (4) 20 k

63. Calculate the temperature at which rms velocity of gas is one third its value of 0°C, pressure remaining constant?
(1) 30.3 k (2) 50 k
(3) 70.5 k (4) 40.5 k

64. Find r for a mixture of gases containing n_1 moles of a monotonic gas & n_2 moles of diatomic to be rigid?
(1) $r = \frac{7n_1n_2}{3n_1+5n_2}$ (2) $r = \frac{n_1n_2}{3n_1+5n_2}$
(3) $r = \frac{5n_1+7n_2}{3n_1+5n_2}$ (4) $\frac{n_1+7n_2}{3n_1+5n_2}$

65. The mean free path of gas molecule depends on
(1) d (2) d^2
(3) d^{-2} (4) d^{-1}

66. The mean kinetic energy per unit volume of a gas is 3, what is the average pressure exerted by the gas
(1) 4 (2) 5
(3) 9 (4) 2

67. Most probable speed, Cmp. Average speed cav. Root mean square speed, Crms of gas molecule are related as
(1) $\sqrt{3}:\sqrt{2}:\sqrt{8/\pi}$ (2) $2:\sqrt{3}:\sqrt{\pi/8}$
(3) $\sqrt{2}:\sqrt{3}:\sqrt{\frac{8}{\pi}}$ (4) $\sqrt{2}:\sqrt{\frac{8}{\pi}}:\sqrt{3}$

68. A Box contains equal number of molecules of hydrogens & oxygen. If there is a fine hole in the Box then which gas will leak rapidly?
(1) Hydrogen
(2) Oxygen
(3) Both will lak by same rate
(4) NOTA

69. The root mean square speed of oxygen molecule (o_2) at a certain Temperature T is V. If the temperature is doubled & oxygen gas dissociates into atomic oxygen, what is the speed of atomic oxygen?