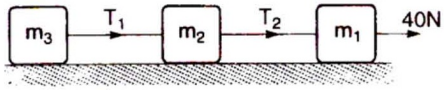
1. Three blocks of masses m_1, m_2 and W_3 are connected by massless strings as shown on a frictionless table. They are pulled with a force of 40 N. If $10kg, m_2 = 6kg$ and $m_3 = 6kg$ then tension T^ will be :



(a) 10 N (b) 20 N
(c) 32 N (d) 40 N

2. A rocket of mass 1000 kg is to be projected vertically upwards. The gases are exhausted vertically downwards with velocity 100 m/s with respect to the rocket. What is the minimum rate of burning of fuel, so as to just lift the rocket upwards against the gravitational attraction ? (Take $g = 10\ m/s^2$).

(a) 50 kg/s (b) 100 kg/s
(c) 200 kg/s (d) 400 kg/s

3. A force of 10 N acts on a body of mass 20 kg. for 10 seconds. The change in its momentum is :

(a) 50 kg-m/s (b) 100 kg-m/s
(c) 300 kg-m/s (d) 1000 kg-m/s

4. If an iron ball and a wooden ball of the same radius are released from a height *h* in vacuum, then time taken by both of them, to reach the ground will be :

(a) zero (b) unequal
(c) roughly equal (d) exactly equal

5. A ball of mass 0.25 kg attached to the ends of a string of length 1.96 m is rotating in a horizontal circle. The string will break, if tension is more than 25 N. What is the maximum velocity with which the ball can be rotated?

(a) 3 m/s (b) 5 m/s
(c) 9 m/s (d) 14 m/s

6. In uniform circular motion, the factor that remains constant is :

(a) acceleration (b) momentum
(c) kinetic energy (d) linear velocity

7. A projectile is fired at 30° with momentum *p*. Neglecting friction, the change in kinetic energy, when it returns back to the ground, will be :

(a) zero (b) 30%
(c) 60% (d) 100%

8. If a car at rest accelerates uniformly and attains a speed of 72 km/hr in 10 s, then it covers a distance of :

(a) 50 m (b) 100 m
(c) 200 m (d) 400 m

9. Suppose refractive index μ is given as $\mu = A + B/\lambda^2$, where *A* and B are constants and is wavelength then the dimensions of *B* are same as that of :

(a) wavelength (b) pressure
(c) area (d) volume

10. We wish to see inside an atom. Assuming the atom to have a diameter of 100 pm, this means that one must be able to resolve a width of say 10 pm. If an electron microscope is used, the minimum electron energy required is about :

(a) 15 keV (b) 1.5 keV
(c) 150 keV (d) 1.5 MeV

11. A particle is moving under the influence of a force which is fixed in magnitude and acting at

an angle '9' in the direction of motion. The path described by the particle is :

(a) a circle (b) an ellipse
(c) a parabola (d) a straight line

12. 300 J of work is done in sliding a 2 kg block up an inclined plane of height 10 m. The work done against friction is (Take 8= 10 m/s^2)

(a) zero (b) 100 J
(c) 200 J (d) 300 J

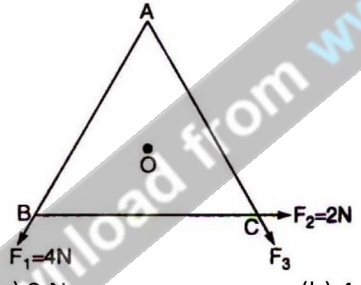
13. The torque of force $\vec{F}=(2\hat{i}-3\hat{J}+4\hat{k})$ newton acting at a point $\vec{r}=(3\hat{i}+2\hat{J}+3\hat{k})$ metre about origin is:

(a) $6\vec{i}-6\vec{J}+12\vec{k}$N-m (b) $-6\vec{i}+6\vec{J}-12\vec{k}$N-m
(c) $17\vec{i}-6\vec{J}-13\vec{k}$N-m (d) $-17\vec{i}-6\vec{J}-13\vec{k}$N-m

14. A machine which is *75%* efficient, uses 12 J of energy in lifting 1 kg mass through a certain distance. The mass is then allowed to fall through the same distance. The velocity at the end of its fall is :

(a) $\sqrt{12}$ m/s (b) $\sqrt{18}$ m/s
(c) $\sqrt{24}$ m/s (c) $\sqrt{32}$ m/s

15. In an equilateral triangle *ABC* F_1 F_2 and F_3 are three forces acting along the sides *AB, BC* and *AC* as shown in the given figure. What should be the magnitude of F_3 so that the total torque about O is zero?



(a) 2 N (b) 4 N
(c) 6 N (d) 8 N

16. The rotational kinetic energy of a body is K_{rot} and its moment of inertia is J. The angular momentum of body is :

(a) IK_{rot} (b) $2\sqrt{IK_{rot}}$
(c) $\sqrt{21K_{rot}}$ (d) $2IK_{rot}$

17. A small steel sphere of mass *'m' is* tied to a string of length *'r' and is* whirled in a horizontal circle with a uniform angular velocity 2 ω The string is suddenly pulled, so that radius of the circle is halved. The new angular velocity will be:

(a) 2 ω (b) ω
(c) 6 ω (d) 8 ω

18. A uniform disc of mass *M* and radius *R is* mounted on an axle supported in friction less bearings. A light cord is wrapped around the rim of the disc and a steady downward pull T is exerted on the cord. The angular acceleration of the disc is :

(a) $\frac{MR}{2T}$ (b) $\frac{2T}{MR}$
(c) $\frac{T}{MR}$ (d) $\frac{MR}{T}$

19. If the rotational speed of earth is increased then weight of a body at the equator :

(a) increases (b) decreases
(c) becomes double (d) does not change

20. The earth revolves around the sun in one year. If distance between them becomes double, the new time period of revolution will be :

(a) $4\sqrt{2}$ years (b) $2\sqrt{2}$ years
(c) 4 years (d) 8 years

21. The orbital velocity of an artificial satellite in a circular orbit just above the earth's surface is υ The orbital velocity of a satellite orbiting at an altitude of half of the radius, is :

(a) $\frac{3}{2}\upsilon_0$ (b) $\frac{2}{3}\upsilon_0$
(c) $\frac{\sqrt{2}}{3}\upsilon_0$ (d) $\frac{\sqrt{3}}{2}\upsilon_0$

22. The amplitude of an oscillating simple pendulum is 10 cm and its time period is 4 s. Its speed after 1 s when it passes through its equilibrium position is :

(a) zero (b) 2.0 m/s
(c) 0.3 m/s (d) 0.4 m/s

23. A simple second pendulum is mounted in a rocket. Its time period will decrease when the rocket is :

(a)moving up with uniform velocity
(b)moving up with uniform acceleration
(c) moving down with uniform acceleration

(d) moving around the earth in geostationary orbit

24. A child swinging on a swing in a sitting position, stands up, then the time period of the swing will:
(a) increase
(b) decrease
(c) remain the same
(d) increase if the child is long and

25. decrease if the child is short The phenomena arising due to the superposition of waves is/are:
(a) beats (b) stationary waves
(c) Lissajous figures (d) all of these

26. A vehicle with horn of frequency *v* is moving with a velocity of 30 m/s in a direction perpendicular to the line joining the observer and the vehicle. The observer perceives the sound to have a frequency ($v+v_1$). If the sound velocity in air is 300 m/s, then.
(a) $v_1 = 0$ (b) $v_1 = 0.1v$
(c) $V_1 = -0.1\ v$ (d) $V_1 = 10\ v$

27. A ball falling in a lake of depth 200 m shows 0.1% decrease in its volume at the bottom. What is the Bulk modulus of the ball material ? (Take density of water = 1000 kg/m^3)
(a) 19.6×10^{8} N/m^2 (b) 19.6×10^{-10} N/m^2
(c) 19.6×10^{10} N/m^2 (d) 19.6×10^{-8} N/m^2

28. At what temperature, hydrogen molecules will escape from the earth's surface? (Take mass of hydrogen molecule = 0.34×10^{-26} kg, Boltzmann constant = 1.38×10^{-23} JK, Radius of earth = 6.4×10^{6} m and acceleration due to gravity = 9.8 m/s^2)
(a) 10 K (b) 10^2 K
(c) 10^3 K (d) 10^4 K

29. Real gases obey ideal gas laws more closely at :
(a) low pressure and low temperature
(b) low pressure and high temperature
(c) high pressure and low temperature
(d) high pressure and high temperature

30. Carnot engine cannot give 100% efficiency, because we cannot :
(a) eleminate friction
(b) find ideal sources
(c) prevent radiation
(d) reach absolute zero temperature

31. Two cylinders fitted with pistons contain equal amounts of an idea! diatomic gas at 300 K. The piston of *A* is free to move, while that of *B* is held fixed. The same amount of heat is given to the gas in each cylinder. If the rise in temperature of gas in A is 300 K, then rise in temperature of gas in B is :
(a) 30 K (b) 18 K
(c) 50 K (d) 42 K

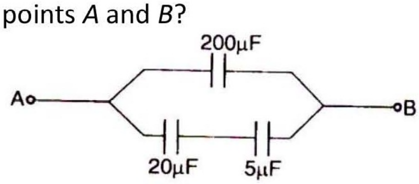
32. A thin square plate with each side equal to 10 cm, is heated by a blacksmith. The rate of radiated energy by the heated plate is 1134 watts. The temperature of hot square plate is (Stefan's constant $\sigma = 5.67 \times 10^{-8}$ W-m^2 K^{-4}; Emissivity of plate = 1)
(a) 1000 K (b) 1189 K
(c) 2000 K (d) 2378 K

33. A beaker of hot water cools from 75°C to 70°C in t_1 minutes, from 70°C to 65°C in t_2 minutes and from 65°C to 60°C in t_3 minutes. Then :
(a) $t_1 = t_2 = t_3$ (b) $t_1 < t_2 < t_3$
(c) $t_1 > t_2 > t_3$ (d) $t_1 < t_2 > t_3$

34. If the ratio of specific heats of a gas at constant pressure to that at constant volume is γ, the change in internal energy of a gas, when the volume changes from *V* to *2V* at constant pressure P, is :
(a) PV (b) $\frac{R}{\gamma-1}$
(c) $\frac{PV}{\gamma-1}$ (d) $\frac{\gamma PV}{\gamma-1}$

35. When a charged oil drop moves upwards in an electric field of strength £, the electric force acting on the drop is :
(a) equal to the gravitational force
(b) less than the gravitational force
(c) greater than the gravitational force
(d) greater than the mass of the oil drop

36. What is the resultant capacitance between points *A* and *B*?



(a) 51 πF (b) 102 πF

(c) 204 πF (d) 408 πF

37. If a uniform wire of resistance *R is* uniformly stretched to *n* times the original length, then new resistance of the wire becomes :

(a) $n\,R$ (b) n^2R

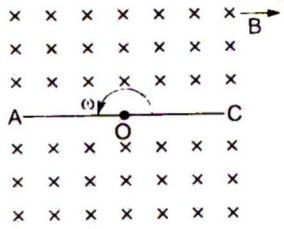
(C) $\frac{R}{n}$ (d) $\frac{R}{n^2}$

38. A 2°C rise in temperature is observed in a conductor by passing a current. When the current is tripled, the rise in temperature will be:

(a) 9°C (b) 18°C

(c) 27°C (d) 36°C

39. A conducting rod *AC* of length $4l$ is rotated about $\frac{a}{B}$ point O in a uniform magnetic field B directed into the paper. $AO = l$ and $OC = 3l$ then :



(a) $VA - Vo = \frac{B\omega l^2}{2}$ (b) $Vo - Vc = \frac{9}{2}B\omega l^2$

(c) $Vo - Vc = 4B\omega l^2$ (d) $Vo - Vc = \frac{9}{2}B\omega l^2$

40. If two wires are carrying currents in opposite directions, then they will :

(a) repel each other

(b) attract each other

(c) become inclined to each other

(d) neither repel nor attract each other

Answer – Key

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