

MTP-11

1. when a bullet passes through a wooden plank, it losses $1/10$ th of its speed. How many such planks are required to stop the bullet. Assume a constant retardation.
 - A. 6
 - B. 8
 - C. 4
 - D. 10
2. The orbital velocity of a satellite orbiting around the earth is 4 km/s. Find its height. ($G = 6.67 \times 10^{-11}$) S.I. units. $R=6400$ km . Mass of earth = 6×10^{24} kg.
 - A. 8600
 - B. 12600
 - C. 15600
 - D. 18600
3. Figure shows an aluminium rod joined to a copper rod. Each of the rods has a length of 20 cm and area of cross-section 0.2cm^2 . The amount of heat taken out from the cold junction in one minute after the steady state is reached is
 - A. 0.8 J
 - B. 1.63 J
 - C. 241 J
 - D. 144 J
4. A wooden box is placed on a table. The normal force on the box from the table is N_2 Now another identical box is kept on first box and the normal force on lower block due to upper block is N_2 and normal force on lower block by the table is N_3 For this situation, mark out the correct statement(s)
 - A. $N_1 = N_2 = N_3$
 - B. $N_1 < N_2 = N_3$
 - C. $N_1 = N_2 < N_3$
 - D. $N_1 = N_2 > N_3$
5. A two wheeler is moving on a curved road. The angle that the two wheeler makes with the road is 60° . Find the frictional force on the two wheeler if mass of the vehicle and rider is 1732 kg The radius of the circle is 40 m.
 - A. 5000 N
 - B. 10000 N
 - C. 15000 N
 - D. 20000 N
6. Find the work done in stretching a wire of length 2m and of sectional area 1mm^2 through 1mm if the Young's modulus of the material of the wire is $2 \times 10^{11}\text{N/m}^2$
 - A. 0.03 J
 - B. 0.05 J
 - C. 0.07 J
 - D. 0.09 J
7. Find the value of X

- A. 630
B. 1260
C. 1890
D. 2520
8. A vector \vec{OP} makes an angle of α , β and γ with positive direction of X,Y and Z axes respectively then $\cos 2\alpha + \cos 2\beta + \cos 2\gamma + 1$
A. 0
B. 2
C. 1
D. -1
9. Find the lateral shift CD. Refractive index of the glass slab is 1.5 and thickness 20m.
A. 5m
B. 10m
C. 15m
D. 20m
10. For the following diagram the galvanometer shows zero deflection then what is the value of R?
A. 25
B. 50
C. 75
D. 100
11. A body is dropped from a height of h. It covers 36% of the total height in last second. calculate $h(g = 10m/s^2)$
A. 125m
B. 25m
C. 225m
D. 200m
12. The weight of a body changes by one percent when it is taken from the surface of the earth to a depth d. Find d .Given radius of the earth=6400 km
A. 16km
B. 32km
C. 64km
D. 128km
13. Consider the situation shown in the figure. Find the maximum angle ' θ ' for which the light ray suffers total internal reflection at the vertical surface. The refractive index of material of slab is 1.25.
A. 25°
B. 35°
C. 48°
D. 67°
14. A painter of mass M stands on a platform of mass m and pulls himself up by two ropes which hang over pulley as shown in figure. He pulls each rope with force F and moves upward with a uniform acceleration
a. Find a, neglecting the fact that no one could do this for long time.

- A. $\frac{4F+(2M+m)g}{M+2m}$
 B. $\frac{4F+(M+m)g}{M+2m}$
 C. $\frac{4F-(M+m)g}{M+m}$
 D. $\frac{4F-(M+m)g}{2M+m}$
15. At a height 0.4 m from the ground, the velocity of a projectile in vector form is $\vec{v} = (6^i + 2^j)ms^{-1}$. The angle of projection is
 A. 45°
 B. 50°
 C. 30°
 D. $\tan^{-1}(\frac{3}{4})$
16. A car is going eastwards with a velocity of 8 m/s. To the passengers in the car, a train appears to be moving north wards with a velocity of 15 m/s. What is the actual velocity of the train:
 A. 7 m/s
 B. 17m/s
 C. 23m/s
 D. None of these
17. A coin kept on a rotating disc is placed at a distance of 8 cm from the centre. The angular velocity of the disc is now doubled. The maximum distance upto which the coin will remain on the rotating disc is
 A. 1cm
 B. 4cm
 C. 1.6cm
 D. 2cm
18. Find the equivalent resistance of the circuit shown in figure across terminals A and B. Each resistance in this circuit is of resistance R.
 A. $\frac{R}{4}$
 B. $\frac{R}{2}$
 C. R
 D. $\frac{3R}{2}$
19. A ray of light is incident perpendicular to the surface of a right angular prism as shown in the figure. If the refractive index of the material of the prism is $\sqrt{3}$ find the angle of the prism A.
 A. 25°
 B. 35°
 C. 45°
 D. 55°
20. Two particles, one with constant velocity 50 m/s and the other with uniform acceleration $10m/s^2$. start moving simultaneously from the same place in the same direction. They will be at a distance of 125 m from each other after.
 A. 5 sec
 B. $5(1 + \sqrt{2})sec$.
 C. 10 sec

- D. $10(\sqrt{2} + 1)sec$.
21. An object is moving towards the mirror with a speed 10 m/s. The mirror is moving towards the object with a speed 15 m/s. Find the velocity of the image from ground frame.
- 10 m/s
 - 25 m/s
 - 35 m/s
 - 40 m/s
22. Figure represents a light inextensible string ABCDE in which $AB=BC=CD=DE$ to Which are attached masses M, m and M at the points B, C, and D, respectively. The system hangs freely in equilibrium with ends A and E of the string fixed in the same horizontal line. It is given $\tan\alpha = \frac{3}{4}$ and $\tan\beta = \frac{12}{5}$. Then the tension in the string BC is
- $2mg$
 - $\frac{13}{10}mg$
 - $\frac{3}{10}mg$
 - $\frac{20}{11}mg$
23. Equivalent resistance between A and B in the figure is
- $\frac{8r}{7}$
 - $\frac{7r}{8}$
 - $\frac{3r}{4}$
 - R
24. A copper cube has each side of length 1 m. The bottom edge of the cube is fixed and a tangential force of $4.2 \times 10^8 N$ is applied to the top surface. Calculate the lateral displacement of the top surface. $n = 14 \times 10^{10} N/m^2$
- 1mm
 - 2mm
 - 3mm
 - 4mm
25. Calculate the drift speed of the electrons when 1 A of current exists in a copper wire of cross section $2mm^2$. The number of free electrons in $1cm^3$ of copper is 8.5×10^{22} .
- 0.018mm/s
 - 0.036mm/s
 - 0.054mm/s
 - 0.072mm/s
26. ABCDEF is a regular hexagon. The centre of hexagon is a point O. Then the value of $\overline{AB} + \overline{AC} + \overline{AD} + \overline{AE} + \overline{AF}$ is
- $2\overline{AO}$
 - $3\overline{AO}$
 - $6\overline{AO}$
 - Zero
27. A point source of light is placed in front of a plane mirror.

- A. All the reflected rays meet at a point when produced backward
 - B. Only the reflected rays close to the normal meet at a point when produced backward
 - C. Only the reflected rays making a small angle with the mirror meet at a point when produced backward.
 - D. Light of different colours make different images
28. Find current in the branch CD of the circuit shown in figure.
- A. 5A
 - B. 10A
 - C. 15A
 - D. 20A
29. Block A having mass 2 kg is kept on a rough horizontal floor having $\mu = 0.2$. It is connected to another block B having mass 6 kg and hanging in air. Initially the system is at rest. The height 'h' of block B above the ground is 56 m. Find the total distance covered by block A before it once again comes to rest. Assume the distance between block A and pulley to be huge. 2
- A. 56m
 - B. 140m
 - C. 196m
 - D. 252m