Stu	Num	Question	Unit	Solution	Answer
T	1	A car accelerates from zero to 30 m/s in 10 seconds. Its acceleration is	m/s^2	$a = v/t = (30\ m/s)/(10\ s) = 3\ m/s^2$	3
A	1	There is a 50 kg block on a frictionless, horizontal surface. A man pushes it with a force of 300 N. What is the acceleration of the block?	m/s^2	$F=ma \rightarrow a = F/m = (300\ N)/(50\ kg)$	6
A	2	A man stands on a bathroom scale in an elevator, which reads 80 kg when the elevator is stationary. What would the reading be while the elevator is accelerating upward at 6 m/s^2? (Use g=10 m/s^2 for the free-fall acceleration.)	kg	Total acceleration $=a=g+ 6\ m/s^2=16\ m/s^2$ $80\ kg*(a/g)=128\ kg$	128
A	3	A river 200 m wide flows with a current of 2.0 km/h. A woman rows her kayak across the river. Relative to the water, the kayak moves at 4.0 km/h in the direction perpendicular to the river current. How far downstream does the river carry the kayak while being crossed?	m	Time to cross the river: $(0.2\ km)/(4.0\ km/h)=0.05\ h$ $2000\ m/h*0.05\ h=100\ m$	100
A	4	A car of mass 1800 kg is parked on a hill inclined at angle 30 degrees from the horizontal. What is the force of static friction on the car? (Use g=10 m/s^2 for the free-fall acceleration.)	N	Friction force cancels gravity component along plane, mg sin(theta) = 1800 * 10 * 0.5 = 9000	9000
B	1	A meter stick has a mass of 100 g. A small 200 g mass is attached at the 80 cm mark. At which mark is the center of mass?	cm	(100 g* 50 cm+200 g * 80 cm)/(100g +200 g) = 70 cm	70
B	2	A block with mass of 1 kg moving at a speed of 6 m/s collides and sticks to a 2 kg block that is initially at rest. What is the speed of the two blocks after the collision?	m/s	m_1*v_1 = (m_1+m_2)*v 1 kg * 6 m/s =(1 kg +2 kg)*v v=2 m/s	2

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B	3	A ball is dropped from a height of 1.8 m onto a hard surface. What is the speed of the ball when it hits the surface? (Use g=10 m/s² for the free-fall acceleration.)	m/s	Potential energy is converted to kinetic energy: $mgh=(1/2)\ m\ v^2$ → $v^2=g*h*2=10*1.8*2=36$	6
B	4	Two blocks, having masses 6 kg and 4 kg, respectively, hang vertically and are connected by a massless string that passes over a massless and frictionless pulley. When the blocks are released, what is the magnitude of the acceleration of the 4 kg block? (Use g=10 m/s² for the free-fall acceleration, and neglect air resistance.)	m/s²	F=(6 kg+4 kg)*a, F=(6 kg-4 kg)*10 m/s² →a =2 m/s²	2
C	1	If 200 g of water at 100 ºC is mixed with 50 g of water at 50 ºC, calculate the equilibrium temperature of the mixture.	ºC	Heat flow = mcΔT. Total inward flow=0 50g*c*(T-50ºC) + 200g*c*(T-100ºC)=0 →T=90ºC	90
C	2	A planet has the same density as Earth and 9 times the Earth's radius. What is the acceleration of gravity on the planet? (Use g=10 m/s² for the free-fall acceleration.)	m/s²	$g = G\ M/R^2$ $g\_2/g\_1 = (M\_2/M\_1)* (R\_1/R\_2)^2$ $M\_i = (4\ pi/3)\ rho\ (R\_i)^2\ R\_i$	90
C	3	A solid metallic object, if dropped into a bath of mercury, becomes 60 % submerged. What is the density of the metal? The density of the mercury bath is 13.6 g/cm^3	g/cm^3	13.6 g/cm^3 times 0.6=8.16 g/cm^3	8.16
C	4	A ball is thrown at a vertical wall 30 meters away, with a velocity 30 m/s at an angle of 45º. At what height above the starting point will it strike the wall? (Use g=10 m/s² for the free-fall acceleration.)	m	$v_x = 30\ m/s * \cos 45 = 15\ sqrt[2]$ → $t = x/v_x = sqrt[2]$ s $h = v_y * t - gt^2/2 = 30 - 10 = 20$	20
D	1	A vehicle traveling at 36 m/s slows at a constant rate of 4 m/s² until it stops. How much time elapses to stop?	s	36 m/s-(4 m/s²) t = 0 → t = 9 s	9

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D	2	A ball is thrown upward from the ground with an initial speed of 10 m/s. What is the maximum height it reaches? (Use g=10 m/s² for the free-fall acceleration, and neglect air resistance.)	m	10 m/s-(10 m/s²)t = 0 → t = 1 s h = (10 m/s)(1 s)-0.5(10 m/s²)(1 s)^2 h = 5 m	5
D	3	A block with mass of 2 kg that is moving at a speed of 6 m/s collides with a 1 kg block initially at rest. After the collision, the 2 kg block moves at a speed of 2 m/s along the same direction. What is the speed of the 1 kg block?	m/s	Momentum conservation (2 kg)(6 m/s) =(2 kg)(2 m/s)+(1 kg)*v v=8 m/s	8
D	4	An object with mass 10 kg is moving at a speed of 2 m/s. A constant force F is suddenly applied to accelerate it to a final speed of 4 m/s over a distance of 3 m. What is the magnitude of F?	N	Work: W=F*distance=F*3m Change in Kinetic Energy: K=0.5*10kg*(4m/s)²-0.5*10kg*(2m/s)² W=K → F=20 N	20
S	1	A 200 lb astronaut goes to a planet whose mass is 3 times that of the earth, and whose radius is twice that of earth. What is his weight on that planet?	lb	F(earth) = GMm/r² = 200 lb F(planet) = G(3M)m/(2r)² = ¾(GMm/r²) = (3/4) F(earth)	150
S	2	A block with mass 6 kg is released from rest from the top of a slope with a coefficient of kinetic friction 0.1. The slope is tilted at an angle of 60^o from the horizon. What is the friction force acting on the block while it is rolling down the surface? (Use g=10 m/s² for the free-fall acceleration.)	N	Normal force N = (6 kg)(10 m/s²) cos(60^o) = 30 N Friction f = (0.1)(30 N) = 3 N	3
S	3	An object of mass 2 kg is at rest on a frictionless table while attached to a wall via a massless spring. The spring has a spring constant of 2 N/m^2. The object is then pushed towards the wall by a distance of 1 m and then released. What will be the maximum speed of the object?	m/s	Potential energy is converted to kinetic energy: (1/2)k x^2 =(1/2) m v² → v = 1 m/s	1
S	4	Two resistors, 4 ohms each, are connected in parallel with each other across a 4 Volt battery. What is the total	W	$1/R_{tot}=1/R+1/R=1/2$ $I=V/R_{tot}$ =4 V/2 ohms=2 A	8

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		power dissipation by the two resistors?		$P = V I = (4\ V)(2\ A) = 8\ W$	