Exam 3-031

Q1 The system in Fig 2 is in equilibrium. A mass (M) of 5.0 kg hangs from the end of the uniform beam of mass = 10.0 kg. The tension in the cable is:

A1: 190 N
A2: 210 N
A3: 69 N
A4: 51 N
A5: 98 N

Q2 Two scales are 2.0 m apart. A uniform 40 kg beam of the same length is placed on top of them (see Fig 3). A 10 kg block is placed on the beam after which the right scale reads 22 kg and the left scale reads 28 kg. How far from the right scale is the center of gravity of the block located?

A1: 1.6 m
A2: 0.2 m
A3: 1.3 m
A4: 1.4 m
A5: 0.8 m

Q3 A 500 kg mass is hung from the ceiling with a steel wire. The wire has a length = 45.0 cm, radius = 4.00 mm and has negligible mass. Calculate the change in the length of the wire. (Youngs modulus of steel E = 2.00* 10**11 N/m**2)

A1: 0.22 mm
A2: 0.15 mm
A3: 0.75 mm
A4: 0.50 mm
A5: 0.05 mm

Q4 A space ship is going from the Earth to the Moon along the line joining their centers. At what distance from the center of the Earth will the net gravitational force on the space ship be zero? Assume that Me = 81 Mm, where Me is the mass of the Earth and Mm is the mass of the Moon. (The distance from the center of the Earth to the center of the Moon is 3.8*10**5 km).

A1: 3.4*10**5 km
A2: 3.8*10**5 km
A3: 3.0*10**5 km
A4: 4.3*10**5 km
A5: 1.9*10**5 km

Q5 A satellite circles the Earth at an altitude equal to 3 times the radius of Earth. Find the gravitational acceleration due to Earth at the satellite. (g on the surface of Earth is 9.8 m/s**2)

A1: 0.61 m/s**2
A2: 0.22 m/s**2
A3: 9.8 m/s**2
A4: 3.3 m/s**2
A5: 0.0 m/s**2

Q6 Two moons orbit a planet in circular orbits. Moon (A) has 14 Q0 orbital radius R and moon (B) has orbital radius 4R. Moon A takes 20 days to complete its orbit. How long does it take moon (B) to complete its orbit?

A1: 160 days
A2: 20 days
A3: 80 days
A4: 320 days
A5: 100 days

Q7 What is the escape speed from the surface of a planet whose radius is 5000 km, if the gravitational acceleration on its surface is 4.0 m/s**2?

A1: 6.3 km/s
A2: 2.8 km/s
A3: 2.0 km/s
A4: 4.0 km/s
A5: 8.0 km/s

Q8 Two different solid metal pieces experience the same buoyant force when completely submerged in the same liquid. Which of the following statements is CORRECT?

A1: Their volumes are equal.
A2: Their densities are equal.
A3: Their masses are equal.
A4: They displace different volumes of the liquid.
A5: All of the other answers are wrong.

Q9 How deep into a lake would you have to dive so that the increase in pressure you experience is one atmosphere? (The density of water = 10**3 kg/m**3).
(1 atmosphere = 1.01 * 10**5 N/m**2)

A1: 10.3 m
A2: 9.8 m
A3: 4.9 m
A4: 2.01 m
A5: 100 m

Q10 A pipe 16 cm in diameter is used to fill a tank of volume 5000 liters in 5 minutes. What is the speed at which the water leaves the pipe? (1 liter = 10**-3 m**3)

A1: 50 m/min
A2: 40 m/min
A3: 200 m/min
A4: 25 m/min
A5: 100 m/min

Q11 Consider a large, closed, cylindrical tank with oil inside it. There is a small hole at a height of 1 m from the bottom of the tank. The air above the oil is maintained at a pressure 1.5 x 10**5 Pa (see Fig 7). Find the speed at which oil leaves the hole, when the oil level is 20 m above the bottom of the tank. (The density of oil is 850 kg/m**3).

A1: 22 m/s
A2: 11 m/s
A3: 44 m/s
A4: 33 m/s
A5: 55 m/s

Q12 A 5.0 kg mass stretches a spring by 10 cm when the mass is attached to the spring. The mass is then displaced downward an additional 5.0 cm and released. Its position (y) in m from its equilibrium position as a function of time (t) is:

A1: y = 0.05 cos (10 * t)
A2: y = 0.10 cos (10 * t)
A3: y = 0.10 sin (10 * t)
A4: y = 0.10 cos (5 * t)
A5: y = 0.05 sin (5 * t)

Q13 A particle (m = 0.2 kg) is attached to a spring. The motion of the particle is described by x = 0.10 cos (10*t +PI/3) where x is m and t is in s. What is the mechanical energy of the particle?

A1: 0.1 J
A2: 0.8 J
A3: 0.6 J
A4: 1.0 J
A5: 10 J

Q14 The frequency of small oscillations of a simple pendulum of length (L) on the surface of Earth is (f). What will be its frequency on the surface of the Moon if we increase its length to become (2L)? (Take: g(Moon) = 0.17 g(Earth))

A1: 0.29 * f
A2: 3.4 * f
A3: f
A4: 2*f
A5: 0.085 * f

Q15 A mass m = 2 kg is attached to a spring having a force constant k = 300 N/m. The mass is displaced from its equilibrium position and released. Its period of oscillation (in s) is approximately:

A1: 0.5
A2: 10
A3: 2.0
A4: 0.01
A5: 0.08

Q16 The average density of blood is 1.06 x 10**3 kg/m**3. If you donate one pint of blood, what is the mass of the blood you have donated, in grams?
(1 pint = 1/2 Liter, 1 Liter = 1000 cm**3)

A1: 530
A2: 5.30 x 10**3
A3: 0.530
A4: 5.30 x 10**5
A5: 1060

Q17 A car travels along a straight road with a speed of v1=15 m/s for half the distance between two cities and with a speed v2=30 m/s for the other half. What is the average velocity of the car for the entire trip?

A1: 20.0 m/s
A2: 22.5 m/s
A3: 25.0 m/s
A4: 18.5 m/s
A5: 24.0 m/s

Q18 Which of the following is a unit vector?

A1: j x i
A2: (1/2) (i - j)
A3: (1/2) (i + j)
A4: (1/sqrt(2)) (i + j + k)
A5: 0.3 j + 0.4 k

Q19 An object (A) is shot horizontally with a speed Vo from the top of a building of height (h). It takes a time tA for it to reach the ground. Another object (B) is dropped from the same height and reaches the ground in time tB. Which of the following statements is CORRECT?

A1: tA = tB
A2: tA > tB
A3: tA < tB
A4: Both objects will hit the ground with the same speed.
A5: The acceleration of object (A) is zero.

Q20 Two forces F1 = 20 N and F2 = 15 N, act on a block of mass 5.0 kg as shown in Fig 4. Find the magnitude of the acceleration of the block.

A1: 6.1 m/s**2
A2: 5.5 m/s**2
A3: 2.6 m/s**2
A4: 1.3 m/s**2
A5: 8.1 m/s**2

Q21 A box slides down an inclined plane at constant velocity. Which of the following statements is CORRECT?

A1: A frictional force must be acting on it.
A2: A net force is acting on it.
A3: Its acceleration is half the acceleration of gravity.
A4: Gravity is not acting on it.
A5: Its potential energy is constant.

Q22 Fig 1 shows a force Fx, directed along the x-axis, acting on a particle. The particle begins from rest at x = 0. What is particle's position when it has the greatest speed?

A1: 10 m
A2: 5 m
A3: 15 m
A4: 8 m
A5: 2 m

Q23 A particle moves under the influence of a single conservative force. At point (A) the potential energy associated with the conservative force is +40 J. As the particle moves from

(A) to (B), the force does +25 J of work on the particle. What is the value of the potential energy at point B?

A1: +15 J
A2: +65 J
A3: +35 J
A4: +45 J
A5: +40 J

Q24 A 5.0 kg block starts up a 30 degrees incline with 150 J of kinetic energy. How far will it slide up the incline if the coefficient of kinetic friction between the block and the incline is 0.30?

A1: 4.0 m
A2: 3.5 m
A3: 7.0 m
A4: 8.2 m
A5: 2.4 m

Q25 Block (A) of mass 0.2 kg, travelling on a frictionless horizontal plane at 3.0 m/s, hits block (B) of mass 0.4 kg which is initially at rest. After the collision the center of mass of the two blocks has a speed of:

A1: 1.0 m/s
A2: 2.0 m/s
A3: 3.0 m/s
A4: 0 m/s
A5: 4.0 m/s

Q26 A 1500 kg car tavelling east with a speed of 25 m/s collides with a 2500 kg van traveling north with a speed of 20 m/s at an intersection. The two cars stick together after the collision and move in the direction shown in Fig 6. What is the speed of the two cars after the collision?

A1: 15.6 m/s
A2: 20.8 m/s
A3: 17.7 m/s
A4: 18.2 m/s
A5: 25.1 m/s

Q27 A certain force accelerates a 5 kg object from a velocity of (2i+4j) m/s to a velocity (-2i+4j) m/s in 2 s. Find the average force acting on the object during this time interval.

A1: (-10 i) N
A2: (10 j) N
A3: (-20 i) N
A4: (20 j) N
A5: zero

Q28 Increasing the angular speed of a rotating body will NOT cause an increase in:

A1: the rotational inertia
A2: angular momentum
A3: linear speed
A4: rotational kinetic energy
A5: translational kinetic energy

Q29 A merry-go-round, of radius R=2.0 m and rotational inertia Q0 I = 250 kg.m**2, is rotating at 19 rev/min about its axle. A 25 kg boy jumps onto the edge of the merry-go-round. What is the new angular speed of the merry-go-round?

A1: 13.6 rev/min
A2: 26.6 rev/min
A3: 19.0 rev/min
A4: 11.2 rev/min
A5: 9.51 rev/min

Q30 A wheel of radius 0.5 m rolls without slipping on a horizontal surface as shown in Fig 5. Starting from rest, the wheel moves with constant angular acceleration of 6.0 rad/s**2. Q0 The distance traveled by the center of the wheel from t=0 to t=3.0 s is:

A1: 13.5 m
A2: 18.1 m
A3: 27.4 m
A4: 0 m
A5: 9.8 m

PHYS101 - FINAL EXAM – FIGURES Term-031

FIGURE-1

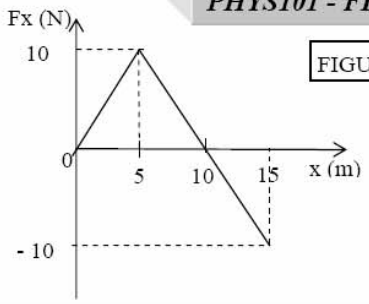
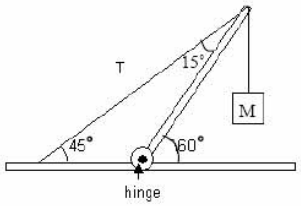
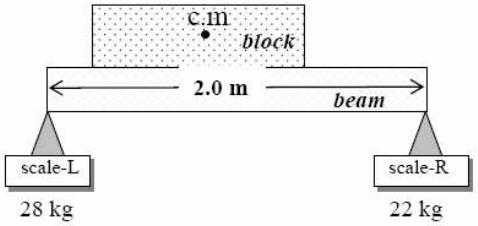


FIGURE-2





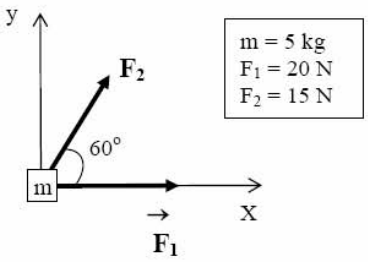


FIGURE-5

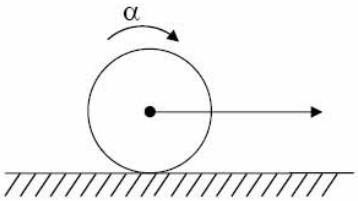


FIGURE-6

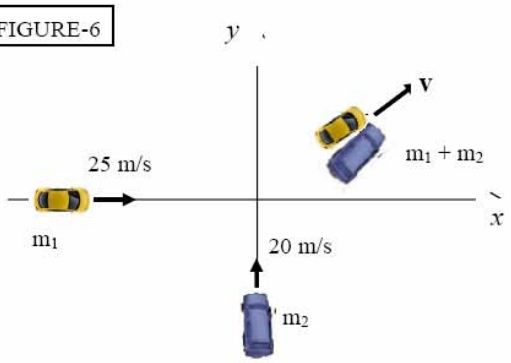


FIGURE-7