King Fahd University of Petroleum and Minerals
Department of Physics

Final Exam – 041

Answer key - First choice is the correct answer

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Q1 Q0 A 20 kg uniform ladder is leaning against a frictionless wall
ch Q0 and makes an angle of 60 degrees with the horizontal. The ladder
   Q0 being at rest find the magnitude of the frictional force exerted
   Q0 on the ladder by the floor ?
   Q0
   A1 57 N
   A2 70 N
   A3 39 N
   A4 25 N
   A5 10 N
   Q0
Q2 Q0 A uniform beam is held in a vertical position by a pin at
ch Q0 its lower end and a cable at its upper end (see Fig 4).
13 Q0 The tension in the cable is 72 N. Find the horizontal force
   Q0 F acting on this beam.
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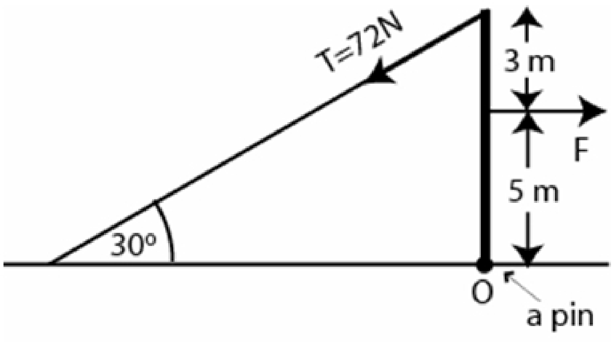


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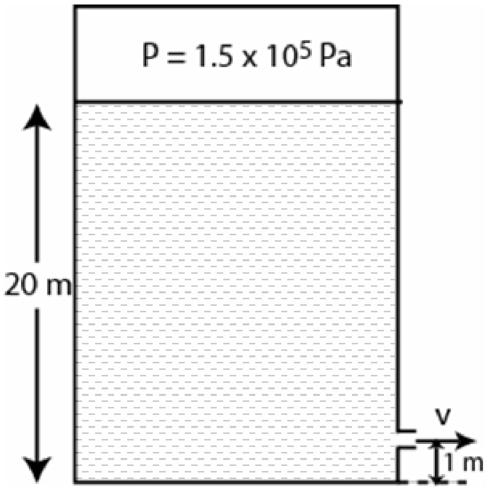
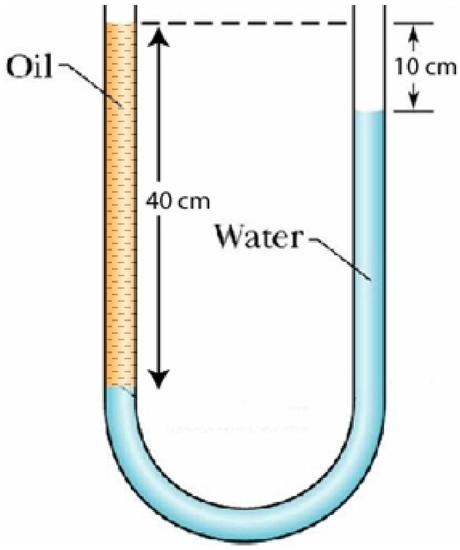
   Q0
   A1 100  N
   A2 200  N
   A3 390  N
   A4 900  N
   A5 0    N
   Q0
Q3 Q0 A certain wire stretches 1.0 cm when a force F is applied to it.
   Q0 The same force is applied to a second wire of the same material
   Q0 but with twice the diameter and twice the length. The second
   Q0 wire stretches:
   Q0
   A1 0.50  cm
   A2 0.25  cm
   A3 1.0   cm
   A4 2.0   cm
   A5 4.0   cm
   Q0
```

Q4 Q0 Two particles with masses M and 4*M are separated by
Q0 a distance D . What is the distance from the mass M
Q0 for which the net gravitaional force on a mass m is zero?
Q0
A1 D/3
A2 D/2
A3 3*D/4
A4 4*D/3
A5 2*D/3
Q0
Q5 Q0 A 100-kg spaceship is in a circular orbit of radius 2*Re
Q0 about the Earth . How much energy is required to transfer
Q0 the spaceship to an orbit of radius 4*Re ? (Re=radius of
Q0 Earth= 6.37*10**6 m, mass of the Earth= 5.98*10**24 kg)
Q0
A1 7.8 * 10**8 J.
A2 6.5 * 10**9 J.
A3 3.9 * 10**8 J.
A4 2.9 * 10**9 J.
A5 1.6 * 10**8 J.
Q0
Q6 Q0 The planet Mars has a satellite that travels in a circular
Q0 orbit of radius 9.40*10**6 m with a period of 2.754*10**4 s.
Q0 Calculate the mass of Mars from this information.
Q0
A1 6.48 * 10**23 kg
A2 4.56 * 10**26 kg
A3 3.95 * 10**23 kg
A4 5.90 * 10**26 kg
A5 1.00 * 10**3 kg
Q0
Q7 Q0 An object is fired vertically from the surface of Earth. It
Q0 reaches a maximum height of 2*Re above the surface of
Q0 Earth. What is the initial speed of the object? (Re= radius
Q0 of Earth = 6.37*10**6 m, mass of Earth = 5.98*10**24 kg)
Q0
A1 9.1 * 10**3 m/s
A2 2.6 * 10**4 m/s
A3 1.2 * 10**4 m/s
A4 7.5 * 10**3 m/s
A5 9.8 m/s
Q0
Q8 Q0 A solid sphere of mass 5.0 kg is floating in water with half
Q0 of its volume submerged. The density of water is 1000 kg/m**3.
Q0 The buoyant force on the sphere is
Q0
A1 49 N
A2 98 N
A3 75 N
A4 10 N
A5 25 N
Q0
Q9 Q0 Fig 5 shows a very large, closed, oil tank with a hole at
Q0 a height of 1.0 m from the bottom of the tank. The oil vapor
Q0 pressure in the tank is maintained at 1.5*10**5 Pa. Find the
Q0 speed at which oil leaves the hole, when the oil level is 20 m
Q0 from the bottom of the tank. The density of oil is 850 kg/m**3.
Q0

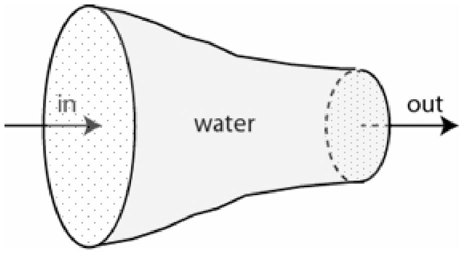


A1 22 m/s
A2 70 m/s
A3 90 m/s
A4 14 m/s
A5 10 m/s
Q0
Q10Q0 A U-tube of uniform cross-section, open at both ends, is filled
Q0 with water (density 1000 kg/m**3) and oil as shown in Fig 2.
Q0 Water and oil do not mix. Find the density of oil.



Q0
A1 750 kg/m**3
A2 654 kg/m**3
A3 250 kg/m**3
A4 980 kg/m**3
A5 500 kg/m**3
Q0

Q11Q0 Water flows through a horizontal pipe. The diameter of the
Q0 pipe is reduced gradually as shown in Fig 3. Assume water is
Q0 an ideal fluid. Which of the following statements is true?
Q0



A1 The water flow rate is constant everywhere.
A2 The speed of water is decreased as it comes out
A2 of the smaller section of the pipe.
A3 The speed of water is constant everywhere.
A4 Bernoulli's equation is not applicable.
A5 Equation of continuity is not applicable.
Q0
Q12Q0 A simple pendulum of length 1.55 m has a period (T) on the
Q0 surface of Earth. What is the length of the pendulum to have the
Q0 same period (T) on the surface of Moon where g = 1.67 m/s**2?
Q0
A1 0.26 m
A2 2.64 m
A3 0.53 m
A4 1.32 m
A5 5.28 m
Q0
Q13Q0 A block-spring system oscillates with simple harmonic motion
Q0 according to the equation x = 0.20 cos(10 * t + Pi/2),
Q0 where x is in m and t is in s. The mass of the block is 2.0 kg.
Q0 Find the total energy of the system.
Q0
A1 4.0 J
A2 100 J
A3 8.0 J
A4 10 J
A5 15 J
Q0
Q14Q0 A 2.0-kg mass connected to a spring of force constant 8.0 N/m is
Q0 displaced 5.0 cm from its equilibrium position and released. It
Q0 oscillates on a horizontal, frictionless surface. Find the
Q0 speed of the mass when it is at 3.0 cm from its equilibrium
Q0 position.
Q0
Q0 0.08 m/s
Q0 0.04 m/s
Q0 0.12 m/s
Q0 0.20 m/s
Q0 0.32 m/s
Q0
Q15Q0 Which of the following equations represent a simple harmonic
Q0 motion [F is the force and x is a displacement]?
Q0 1) F = -2 x

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   Q0 2) F =  5 x
   Q0 3) F = - 10 x
   Q0 4) F = 3 x**2
   Q0 5) F = -3 x**2
   Q0
   A1 1 & 3
   A2 1, 3 & 5
   A3 2 & 4
   A4 2 only
   A5 All of them
   Q0
Q16Q0 The largest planet in our solar system, Jupiter,  consists of
   Q0 gaseous material. It has a radius of 7.15*10**5 km and a mass
   Q0 of 1.9 * 10**27 kg. Find the density of Jupiter in g/cm**3.
   Q0
   A1 1.2 * 10**-3 g/cm**3
   A2 2.7 * 10**-3 g/cm**3
   A3 3.5 * 10**-3 g/cm**3
   A4 4.1 * 10**-3 g/cm**3
   A5 7.2 * 10**-3 g/cm**3
   Q0
Q17Q0 A car with an initial velocity of 18 m/s is accelerated
ch Q0 uniformly at the rate of 0.50 m/s**2 for 10 s. What is its
2. Q0 final velocity?
   Q0
   A1 23 m/s
   A2 30 m/s
   A3 34 m/s
   A4 11 m/s
   A5 75 m/s
   Q0
Q18Q0 What is the magnitude of your total displacement when you
ch Q0 follow directions that tell you to walk 120 m north,
3. Q0 then 50 m east?
   Q0
   A1 130 m
   A2 100 m
   A3  70 m
   A4 149 m
   A5 170 m
   Q0
Q19Q0 A projectile is fired from the ground with an initial velocity
   Q0 vo= (30.0i+20.0j) m/s. Find the horizontal distance the
   Q0 projectile travels before hitting the ground.
   Q0
   A1 122 m
   A2 20  m
   A3 380 m
   A4 38  m
   A5 500 m
   Q0
Q20Q0 A crane operator lowers a 1600 kg steel ball with a downward
ch Q0 acceleration of 4.8 m/s**2. The tension in the cable is:
5. Q0
   A1 8000  N
   A2 4900  N
   A3 11000 N
   A4 1700  N
   A5 4800  N
   Q0
```
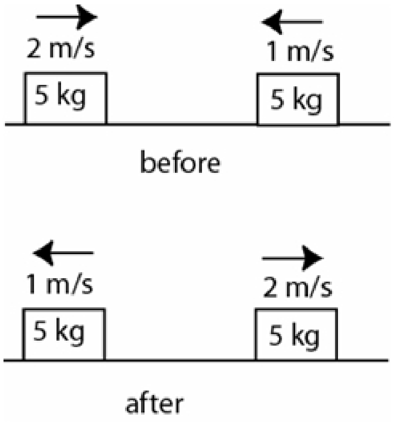
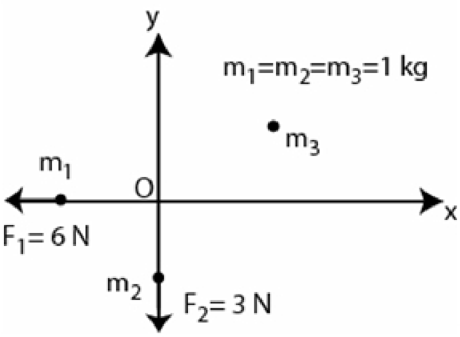

Q21Q0 A car goes around a flat circular track of radius R at
Q0 a constant speed of 10 m/s. The net force exerted on the
Q0 car has a magnitude of 100 N. What is the magnitude of
Q0 the net force exerted on the car if the speed is increased
Q0 to 20 m/s?
Q0
A1 400 N
A2 200 N
A3 100 N
A4 50 N
A5 25 N
Q0
Q22Q0 The initial velocity of 2.0 kg projectile is
Q0 v0 = 6.0i + 8.0j (m/s). How much work is done by the
Q0 gravitational force on the projectile as it moves to
Q0 the maximum height?
Q0
A1 -64 J
A2 -36 J
A3 -100 J
A4 -28 J
A5 +28 J
Q0
Q23Q0 A 3.0 kg object is pulled along a horizontal surface at constant
Q0 speed by a 20 N force acting 37 degrees above the horizontal.
Q0 How much work is done by this force as the object moves 5.0 m?
Q0
A1 80 J
A2 -80 J
A3 60 J
A4 75 J
A5 -75 J
Q0
Q24Q0 A 40 g bullet, with a horizontal velocity of 500 m/s, comes
Q0 to a stop 20 cm within a solid wall. What is the magnitude
Q0 of the force from the wall stopping it? (Assume this force
Q0 to be constant)
Q0
A1 25000 N
A2 50000 N
A3 12500 N
A4 100000 N
A5 0
Q0

Q25Q0 In Fig 6, determine the type of the collision. The masses
Q0 of the blocks, the velocities before and after collision are
Q0 given. The collision is:
Q0



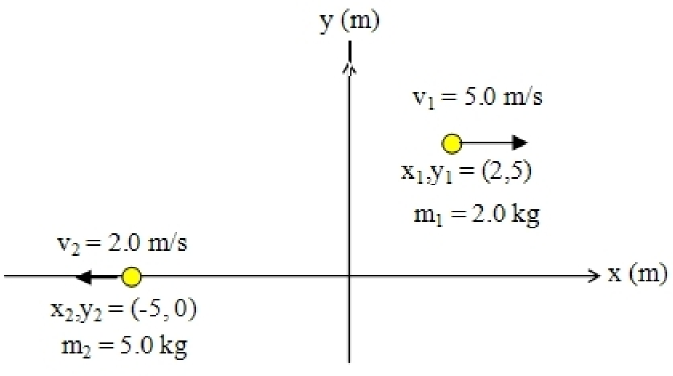
A1 elastic.
A2 completely inelastic.
A3 not possible because momentum is not conserved.
A4 inelastic.
A5 characterized by an increase in kinetic energy.
Q0
Q26Q0 Fig 1 shows an overhead view of three particles on which
Q0 external forces act. The forces on two of the particles (m1,m2)
Q0 are indicated. What is the force acting on the third particle
Q0 (m3) if the center of mass of the system is moving at a
Q0 constant velocity of 5.0 i m/s ?
Q0



A1 (6i + 3j) N
A2 (-2i - j) N
A3 (2i + 2j) N
A4 (3i + 6j) N
A5 (i - j) N
Q0
Q27Q0 Blocks A and B are moving toward each other. A has a mass of
Q0 2.0 kg and a velocity of 50 m/s, while B has a mass of 4.0 kg
Q0 and a velocity of -25 m/s. They undergo a completely inelastic
Q0 collision. The kinetic energy dissipated during the collision is:
Q0
A1 3750 J

A2 1250 J
A3 0
A4 5000 J
A5 5600 J
Q0
Q28Q0 A small mass is placed on a rotating disk at a distance (r)
Q0 from the center with constant angular velocity. The linear
Q0 acceleration of the mass:
Q0
A1 increases if r is increased.
A2 decreases if r is increased.
A3 has a direction perpendicular to the line joining the mass
A3 and the center of rotation.
A4 is zero.
A5 is independent of the position of the mass on the disk.
Q0
Q29Q0 A wheel of rotational inertia of 5.00 kg*m**2 about a fixed
Q0 axle, starts from rest and accelerates under constant torque
Q0 of 3.00 N*m for 8.00 s. What is the rotational kinetic energy
Q0 of the wheel at the end of 8.00 s?
Q0
A1 57.6 J
A2 64.0 J
A3 78.8 J
A4 122 J
A5 95.5 J
Q0

Q30Q0 Fig 7, shows two particles of mass m1 and m2 having velocities
Q0 5.0 m/s in the +x-direction and 2.0 m/s in the -x-direction.
Q0 Find the total angular momentum of this system of particles
Q0 about the origin.
Q0



A1 -50 k (kg.m**2/s)
A2 0
A3 +10 k (kg.m**2/s)
A4 -10 k (kg.m**2/s)
A5 +20 k (kg.m**2/s)