KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

COURSE: PH101 (942)

EXAM: PH101 FINAL EXAM

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QUESTION NO: 1

The position of a particle moving along the X-axis depends on time according to the equation x=a*t**2 - b*t**3. What are the respective SI units of a and b?

0 A. m/s**2, m/s**3.

B. m/s, m/s**2.

C. m/s**2, m/s**2.

D. m/s**3, m/s.

E. m/s, m/s.

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QUESTION NO: 2

A student throws a ball vertically upward to his friend in a window at a height h above. The initial velocity of the ball is 15 m/s. The ball was caught 2 seconds later by his friend. What is the height, h, of the window?

0 A. 10.4 m

B. 17.5 m

C. 15.0 m

D. 21.6 m

E. 13.3 m

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QUESTION NO: 3

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A race car is moving at a constant speed of 35 m/s, passes a stationary police car. The police car starts moving with a constant acceleration of 4 m/s**2. Find the distance at which the police car overtakes the race car.

0 A. 612.5 m

B. 510.7 m

C. 128.0 m

D. 987.3 m

E. 888.8 m

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QUESTION NO: 4

*****************0

A ball leaves off the edge of a horizontal table top 1.2 m above the floor and strikes the floor at a point 1.8 m horizontally from the edge of the table. Find the speed of the ball at which it leaves the table.

0 A. 3.6 m/s.

B. 6.5 m/s

C. 7.9 m/s

D. 1.1 m/s

E. 9.8 m/s

QUESTION NO: 5

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A boat heading due east crosses a wide river with a speed of 10 km/h relative to the water. The river has a uniform speed of 5 km/h due south. Find the speed of the boat with respect to a stationary ground observer.

0 A. 11.2 km/h.

B. 15.0 km/h.

C. 5.0 km/h.

D. 7.9 km/h.

E. 6.3 km/h.

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QUESTION NO: 6
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A block of mass 10 kg rests on a horizontal rough surface. The block is then accelerated under the effect of a constant force F. If it reaches a speed of 4 m/s in 2 s, and the force of kinetic friction between the surface and the block is 5 N, find the force F.

0 A. 25 N.
B. 10 N.
C. 32 N.
D. 17 N.
E. 5 N.

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QUESTION NO: 7
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A 3 kg box is placed on the top of a 10 kg box. The bottom box is pushed with a force F as shown in figure 1. The two boxes move together with acceleration of 1 m/s**2. What horizontal force does the bottom box exerts on the upper box?

0 A. 3 N.
B. 7 N.
C. 1 N.
D. 5 N.
E. 9 N.

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QUESTION NO: 8
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A ball of mass 2 kg moves around a circle of radius 5 m in 10 s. The centripetal force on the ball is:

0 A. 3.95 N.
B. 1.87 N.
C. 4.92 N.
D. 7.00 N.
E. 6.02 N.

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QUESTION NO: 9
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The angle between the following two vectors

$\vec{A} = 3\vec{j} + 4\vec{k}$ and $\vec{B} = -6\vec{i} + 3\vec{k}$ is:

0 A. 69 degrees.
B. 24 degrees.
C. 77 degrees.
D. 10 degrees.
E. 90 degrees.

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QUESTION NO: 10

0 A horizontal force of 200 N is used to push a 50 kg box on a rough, horizontal surface through a distance of 6 m. If the box moves at a constant speed, the coefficient of kinetic friction is:

0 A. 0.41 B. 0.25 C. 0.12 D. 0.53 E. 0.20

QUESTION NO: 11
*****************0
The launching mechanism of a toy gun consists of a spring of force constant 25 N/m. By compressing the spring a distance of 0.05 m, a mass of 9.5 g is fired horizontaly as shown in figure 2 Assuming no friction, what will be the speed of the ball just as it leaves the gun?

0 A. 2.6 m/s.
B. 4.4 m/s
C. 3.9 m/s
D. 6.0 m/s

E. 5.1 m/s

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QUESTION NO: 12

*****************0

A rifle man, who together with his rifle has a mass of 100 kg, stands on ice and fires 10 shots horizontally from an automatic rifle. Each bullet has a mass of 10 g and a muzzle velocity of 800 m/s. If the shots were fired in 10 seconds, what was the average force exerted on him?

0 A. 8 N.
B. 3 N.
C. 11 N.
D. 15 N.
E. 5 N.

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QUESTION NO: 13

*****************0

A stationary bomb explodes into three fragments, m1=0.1 kg moves along the positive x-axis with 5 m/s and m2=0.5 kg moves along the negative y-axis with 3 m/s. What would be the speed of the third particle if m3=0.6 kg?

0 A. 2.64 m/s
B. 1.85 m/s
C. 3.92 m/s
D. 5.55 m/s
E. 7.00 m/s

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QUESTION NO: 14

*****************0

A wheel 0.6 m in diameter starts from rest and accelerates uniformly to an angular velocity of 100 rad/s in 20 s. Find the angle the wheel turns through?

0 A. 1000 rad.
B. 750 rad.
C. 245 rad.
D. 854 rad.
E. 432 rad.

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QUESTION NO: 15

*****************0

Four identical particles each of mass o.24 kg are placed at the corners of a rectangle of sides length 2.0 m and 3.0 m and held in position by four light rods which form the sides of the rectangle (figure 3). What is the moment of inertia of the rigid body (four particles) about an axis passing through the center of mass of the rigid body and parallel to the shorter side of the rectangle?

0 A. 2.16 kg m**2.
B. 1.10 kg m**2.
C. 4.78 kg m**2.
D. 6.20 kg m**2.
E. 5.12 kg m**2.

QUESTION NO: 16

*****************0

A particle of mass 2 kg moves in the xy plane with a constant speed of 3 m/s in the x-direction along the line y=5. What is the angular momentum relative to the origin?

0 A. -->
-30 k kg m**2/s.
B. -->
10 k kg m**2/s.
C. -->
+30 j kg m**2/s.
D. -->
40 i kg m**2/s.
E. -->
+50 i kg m**2/s.

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QUESTION NO: 17
*****************0
A coin with radius R=1.5 cm rolls up a 30 degrees inclined plane
The coin starts out with an initial angular speed of 60.0 rad/s
and rolls without slipping. If the moment of inertia of the coin
is 1/2 MR**2, how far will the coin roll up the inclined plane?

0 A. 12.4 cm
B. 7.8 cm
C. 10.4 cm
D. 6.0 cm
E. 3.2 cm

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QUESTION NO: 18
*****************0
A uniform beam 10.0 m long, weighing 200 N, rests symmetrically
on two supports 6 m apart as shown in figure 4. A man weighing
800 N starts at point A and walks toward the right. How far past
point B can the man walk before the beam tips up from support A?

0 A. 0.75 m.
B. 1.02 m.
C. 0.23 m.
D. 0.10 m
E. 0.45 m

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QUESTION NO: 19
A mass of 1.0 kg connected to a light spring of force constant
30 N/m oscillates on a horizontal frictionless surface with
magnitude 3 cm. Find the kinetic energy of the system when the
displacement equals 2 cm.

0 A. 7.5*10**(-3) J.
B. 2.9*10**(-3) J.
C. 4.7*10**(-2) J.
D. 6.1*10**(-4) J.
E. 3.7*10**(-3) J.

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QUESTION NO: 20
A simple pendulum has a length of 3.00 m. Determine the change
in its period if it is taken from a point where g=9.80 m/s**2 to
a higher elevation, where the acceleration due to gravity
g=9.75 m/s**2.

0 A. increases by 8.9 ms.
B. decrease by 5.3 ms.
C. increase by 1.8 ms.
D. decrease by 4.4 ms.
E. increase by 2.0 ms.

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QUESTION NO: 21
A 200 g mass is attached to a spring and executes simple
harmonic motion with a period of 0.25 s. If the total energy of
the system is 2 J, Find the amplitude of motion.

0 A. 18 cm. B. 26 cm. C. 40 cm. D. 3 cm. E. 11 cm.

QUESTION NO: 22
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If the amplitude of a system moving with simple harmonic motion
is doubled, the total energy will be:

0 A. 4 times larger. B. doubled.
C. 1/2 of the original value. D. 2 times smaller. E. 3 times larger.

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QUESTION NO: 23
A satellite circles planet Zeron every 98 minutes. The mass of this planet is known to be 5.0*10**(24) kg.
What is the radius of the orbit? (G=6.76*10**(-11) N.M**2/kg**2)

0 A. 6.6*10**6 m. B. 2.4*10**6 m.

C. 4.0*10**8 m. D. 1.8*10**5 m. E. 2.9*10**5 m.

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QUESTION NO: 24

Consider a collision between an isolated system of two particles
Which of the following statements is TRUE in this case ?

0 A. The total linear momentum is always conserved.

B. The total kinetic energy as well as the total linear momentum are both conserved if the collision is perfectly inelastic.

C. The total linear momentum is conserved only if the collision is perfectly elastic.

D. The total kinetic energy is conserved only if the collision is perfectly inelastic

E. The total kinetic energy is always conserved.

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QUESTION NO: 25

Three 5 kg masses are located at points A, B, and C in the xy plane as shown in figure 5. What is the magnitude of the resultant force (caused by the other two masses) on the mass at point C

0 A. 1.1*10**(-8) N. B. 5.3*10**(-8) N.

C. 7.2*10**(-6) N. D. 3.2*10**(-6) N.

E. 7.8*10**(-6) N.

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QUESTION NO: 26

What is the gravitational force on a 20 kg satellite circling the earth with a period of 5.0 hours? (Mass of the earth is 6.0*10**(24) kg).

0 A. 36 N B. 21 N. C. 48 N. D. 14 N. E. 30 N.

- **

QUESTION NO: 27

A satellite of mass m circles a planet of mass M and radius R in an orbit at height 2R above the surface of the planet. What minimumenergy is required to change the orbit to one for which the satellite is 3R above the surface of the planet?

0 A. GmM/24R B. GmM/15R

C. GmM/17R D. 2GmM/21R E. 3GmM/5R

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QUESTION NO: 28

Water flowing at 4 m/s in a non uniform circular pipe at point A. If the diameter of the pipe at point B is 1/2 its value at A, what is the velocity of water at point B?

A. 16 m/s. B. 10 m/s. C. 6 m/s. D. 12 m/s. E. 4 m/s.

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QUESTION NO: 29

0 A very small hole is made 1.0 m below the top of a large tank full of water. If the tank is open, what is the initial velocity of water coming out of the hole?

0 A. 4.4 m/s. B. 2.6 m/s C. 3.4 m/s D. 3.0 m/s E. 1.2 m/s

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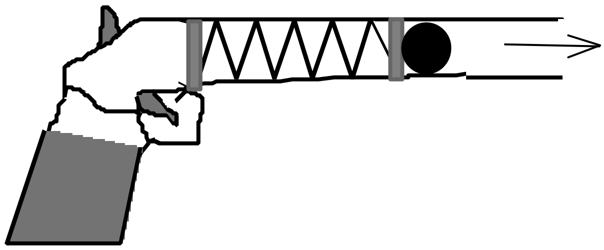
QUESTION NO: 30

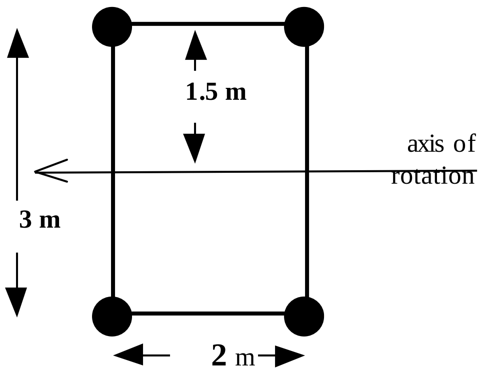
Find the minimum area of a flat ice slab 1 m thick if it is to support a 2000 kg car above sea water. (density of ice is 920 kg/m**3, density of sea water is 1020kg/m**3)

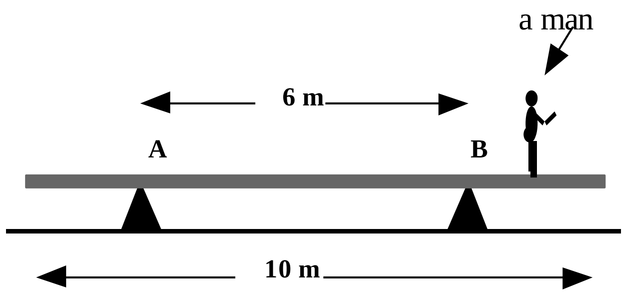
A. 20 m**2. B. 12 m**2.

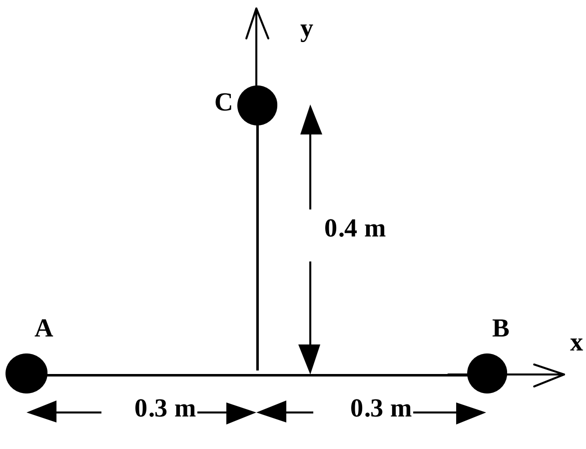
C. 32 m**2. D. 16 m**2. E. 28 m**2.


F
$m_2 = 3$ kg
$m_1 = 10$ kg




1.5 m
axis of rotation
3 m
2 m


a man
6 m
A
B
10 m


y
C
0.4 m
A
B
x
0.3 m
0.3 m