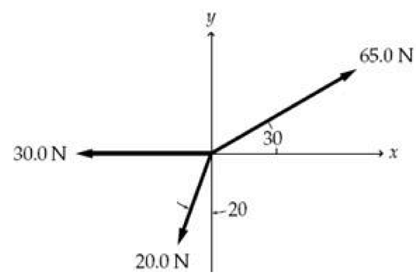
Name: ______________________________ ID: ________________________

Take g = 9.8 ms^{-2} wherever needed

Q	Multiple choice questions
1	From Hook's law, $F=-kx$, where F is the force with dimension of (**MLT^{-2}**), and x is spring extended length. The dimension of the spring constant k is: A) $ML^{-2}T^{-2}$ B) MT^{2} C) MT^{-2} D) $ML^{-2}T^{2}$
2	A person walks first at a constant speed of **7.00 m/s** along a straight line from point ***A*** to point ***B*** and then back along the line from ***B*** to ***A*** at a constant speed of **3.00 m/s**. The average speed over the entire trip is: A) 1.2 m/s B) 4.2 m/s C) 6.3 m/s D) 9.5 m/s
3	A particle starts from rest at $x_i = 0$ and moves for **10 s** with an acceleration of **+2.0 cm/s^2**. For the next **20 s**, the acceleration of the particle is **-1.0 cm/s^2**. The position of the particle at the end of this motion is: A) 4 m B) 8 m C) 3 m D) 9 m
4	The three forces shown in the figure act on a particle. What is the magnitude of the resultant of these three forces?  A) 23.8 N B) 18.7 N C) 55.0 N D) 38.0 N
5	A person walks **25° north of east** for **3.1 km**. How far would he have to walk due north and due east to arrive at the same location? A) 2.8 km north, 1.3 km east B) 4.2 km north, 5.3 km east C) 5.3 km north, 4.2 km east D) 1.3 km north, 2.8 km east
6	A projectile is fired in such a way that its horizontal range is equal to **two** times its maximum height. The angle of projection is equal to: (*Hint:* $\sin 2\theta = 2\sin\theta\cos\theta$) A) 45.1° B) 63.4° C) 50.5° D) 72.8°
7	The maximum range of a projectile on flat ground is **2000 m**. If the same projectile is fired straight up, how high can it reach? A) 1800 m B) 1500 m C) 1200 m D) 1000 m

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8 A block lies on a frictionless incline of angle $\boldsymbol{\theta}$ and is released from rest. The acceleration of the block is:

A) $2g/sin\theta$ B) $g/sin\theta$ C) $g\ sin\theta$ D) $g\ cos\theta$

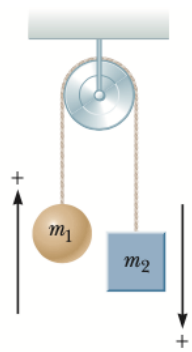
9 The inertia of a body tends to cause the body to:

A) resist any change in its motion. B) fall toward Earth C) slow down. D) speed up.

10 Two forces $\mathbf{F_1}$ and $\mathbf{F_2}$ act on a **4.00 kg** object, which slides on a horizontal frictionless surface (in *xy* plane). Taking $\mathbf{F_1} = \mathbf{10.0\ N}$ in the *x* direction, and $\mathbf{F_2} = \mathbf{15.0\ N}$ directed at $\boldsymbol{\theta} = \mathbf{45.0^o}$ above the *x* axis. The magnitude of accelerations is:

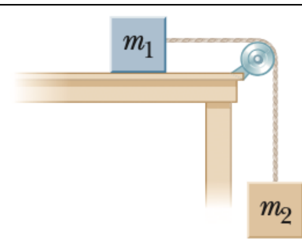
A) 4.15 m/s^2 B) 5.79 m/s^2 C) 2.65 m/s^2 D) 7.25 m/s^2

11 In the Atwood machine, two masses $\mathbf{m_1=3.00\ kg}$ and $\mathbf{m_2= 6.00\ kg}$ are connected by a string. If we ignore friction and the mass of the pulley and string, the tension in the string is:



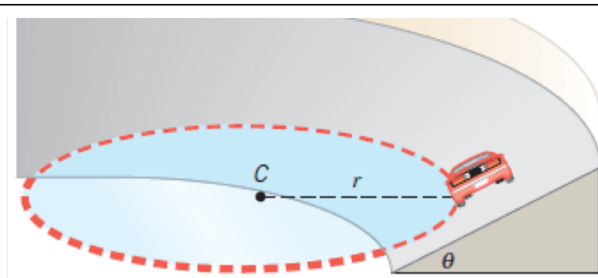
A) 6.53 N B) 9.80 N C) 19.6 N D) 39.2 N

12 A **10.0 kg** hanging mass is connected by a string over a pulley to a **4.00 kg** block that is sliding on a flat table as shown in the figure. If the coefficient of kinetic friction is **0.200**, find the tension in the string.



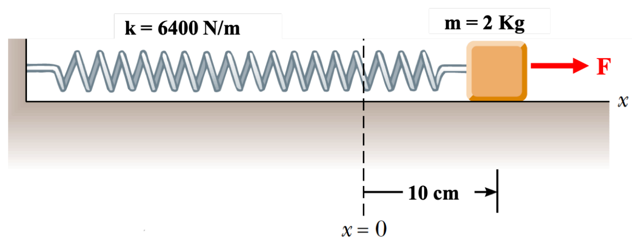
A) 25.7 N B) 33.6 N C) 72.3 N D) 90.2 N

13 On a frictionless banked curved road, which has a radius of **316 m** and a banking angle of **31°**. The maximum possible speed without slipping (بدون انزلاق) for a car moving on it is:



A) 43.1 m/s B) 31.3 m/s C) 22.5 m/s D) 18.2 m/s

Name: _______________________________ ID:________________________

14	What happens to the kinetic energy of a moving object if the net work done is positive? A) The kinetic energy increases B) The kinetic energy decreases C) The kinetic energy remains the same D) The kinetic energy is zero
15	A spring hanging vertically is attached to **4.10 kg** object to its lower end. The other end of this spring is firmly fixed to the ceiling. Taking the spring constant **400 N/m,** calculate the work done by the spring. A) -12 J B) 5.3 J C) -2 J D) 7.4 J
16	A box of mass **2.00 kg** is attached to a spring constant **k = 6400 N/m**. If this box is pulled to the right on a horizontal frictionless surface for **10 cm**, then it released from the rest. What is the speed of this box when it passes through the equilibrium position (***x* = 0**) of the spring?  A) 5.7 m/s B) 8.7 m/s C) 3.2 m/s D) 9.1 m/s
17	A man weighing **600N** climbs a **10 m** vertical rope at a constant speed in **8 s**. His power output is: A) 500 W B) 750 W C) 1000 W D) 1500 W
18	When a box of mass, **m**, is pulled a distance, **d**, along a rough horizontal surface with coefficient of kinetic friction, μ_k, then pulled back along the same path to its original position. The total energy lost due to friction is: A) Zero B) μ_k mgd C) 2 μ_k mgd D) Not enough information to know
19	A **0.40 kg** particle moves under the influence of a single conservative force. At point ***A*** where the particle has a speed of **10 m/s**, 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***? A) 65 J B) 15 J C) 35 J D) 45 J
20	A **0.60 kg** object is suspended from the ceiling at the end of a **2.0 m** string. When pulled to the side and released, it has a speed of **4.0 m/s** at the lowest point of its path. What maximum angle does the string make with the vertical as the object swings up? A) 61.2° B) 53.7° C) 69.5° D) 77.4°

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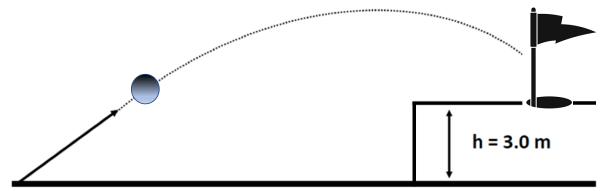
21

A golf ball is struck by a golf club and falls on a green (المنطقة المحيطة بحفرة الجولف) three meters above the point where the ball is struck. The potential energy of the Earth-ball system is greatest:



A) just before the ball is struck

B) just after the ball is struck

C) just after the ball lands on the green

D) when the ball reaches the highest point in its flight

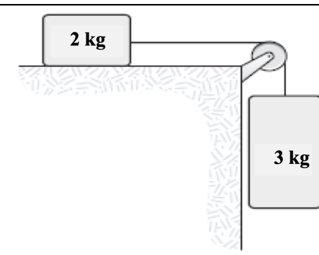
22

An object which weighs **10N** is dropped from rest, a height of **4 m** above the ground. when it has free-fallen **1m** its total mechanical energy with respect to the ground is:

A) 25 J B) 10 J C) 40 J D) 30 J

23

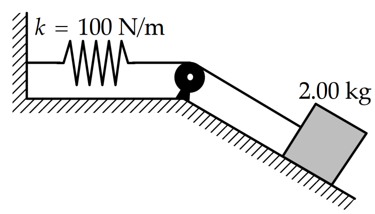
The two masses in the figure are released from rest. After the **3.0 kg** mass has fallen **1.5 m**, it is moving with a speed of **3.8 m/s**. How much work is done during this time interval by the frictional force on the **2.0 kg** mass?



A) -8 J B) -12 J C) -18 J D) -20 J

24

A **2.00 kg** block situated on a rough incline is connected to a spring of negligible mass having a spring constant of **100 N/m** (see Figure). The pulley is frictionless. The block is released from rest when the spring is unstretched. The block moves **20.0 cm** down the incline before coming to rest. Then the coefficient of kinetic friction between block and incline is (take $\theta=37^o$):



A) 0.309 B) 0.042 C) 0.115 D) 0.250

25

A **60 kg** man stands at rest on frictionless ice and throw an object of **5 kg** horizontally at **3 m/s**. With what velocity does the man move across the ice after throwing the object?

A) 4 m/s B) 2 m/s C) - 0.5 m/s D) - 0.25 m/s

26

A **3.00 kg** stone is dropped from a high building. When the stone strikes the floor, at a velocity **20 m/s**, it bounces up, at a velocity equal to **1 m/s**, What is the impulse exerted on the stone by the floor?

A) - 63 kg m/s B) – 31 kg m/s C) 16 kg m/s D) 62 kg m/s

27

Two objects are at rest on a frictionless surface. **Object 1** has a **greater** mass than **object 2**. When a force is applied to **object 1**, it accelerates for a time interval (**Δt**). The force is removed from **object 1** and is applied to **object 2**. After **object 2** has accelerated for the same time interval (**Δt**), which statement is true? (P: momentum, K: kinetic energy)

A) P1 < P2 B) P1 = P2 C) K1 > K2 D) K1 = K2

The End