Question No. 1 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 01	**1.** Which of these is a ***correct*** statement? (A) Work is found using W=Fd, where F is the total applied force and d is the magnitude of the displacement. The unit of work is $kg.m/s^2$ or N•m or J. (B) Work is found using W=Fd, where F is the component of force in the direction of displacement and d is the magnitude of the displacement. The unit of work is $kg.m^2/s^2$ or $N•m^2$ or J. (C) Work is found using W=Fd, where F is the component of force in the direction of displacement and d is the magnitude of the displacement. The unit of work is $kg.m/s^2$ or N•m or J. (D) Work is found using W=F/d, where F is the component of force in the direction of displacement and d is the magnitude of the displacement. The unit of work is $kg.m/s^2$ or N•m or J. (E) Work is found using W=F/d, where F is the total applied force and d is the magnitude of the displacement. The unit of work is $kg.m/s^2$ or N•m or J.
Feedback on Each Answer Choice	A. Incorrect! You do not use the total applied force to calculate work.
	B. Incorrect! Check the units of work.
	C. Correct! The force used to calculate work is the component of the total force that is in the same direction that the object is displaced. The units for work are $kg.m/s^2$ or N•m or J.
	D. Incorrect! Check the relationship between F and d.
	E. Incorrect! Check the relationship between, F and d and also which force is used to calculate work.
Solution	The force used to calculate work is the component of the total force that is in the same direction that the object is displaced. **The correct answer is (C).**

Question No. 2 of 10

Instruction: (1) Read the problem statement and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 02	**2.** A weightlifter lifts a 500 N weight through 2 m and holds the barbell above their head for 3s. Which of these best describes the work that is done? (A) Work done during the lift is 1000 J, work done during hold is 0 J. (B) Work done during lift is 0 J, work done during the hold is 1000 J. (C) Work done during hold is 1000 J, work done during the hold is 1000 J. (D) Work done during hold is 250 J, work done during the hold is 0 J. (E) Work done during hold is 0 J, work done during the hold is 250 J.
Feedback on Each Answer Choice	A. Correct! Work is done to lift the bar but once the barbell is in place and not moving no work is being done.
	B. Incorrect! Remember the definition of work, W = Fd, when no displacement is occurring no work is being done.
	C. Incorrect! Remember the definition of work, W = Fd, when no displacement is occurring no work is being done.
	D. Incorrect! Remember the definition of work, W = Fd,when no displacement is occurring no work is being done.
	E. Incorrect! Remember the definition of work, W = Fd, when no displacement is occurring no work is being done.
Solution	Remember the definition of work, W = Fd and when no displacement is occurring no work is being done. The work is done while the weight is raised W = 500 N x 2 m = 1000 N•m (1 N•m = 1 J). When the bar is held above the head it is not moving so no work is being done. **The correct answer is (A).**

Question No. 3 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 03	**3.** Look at the picture, which of these expressions could be used to calculate the force, if you wanted to know how much work was being done on the block by an applied force A. (A) B= A sin θ (B) C= A sin θ (C) $A^2 = B^2 + C^2$ (D) C = A cos θ (E) B = A cos θ 
Feedback on Each Answer Choice	A. Incorrect! Look at the diagram, to work out in which direction will the block move.
	B. Incorrect! Check your trig functions.
	C. Incorrect! This is Pythagorean theorem; it does not help in this case.
	D. Correct! With an applied force A the block will move parallel to the ground, the component of force in the direction of motion is C which can be found using the trig function Cos θ =adj/hyp, where the adjacent is C and the hypotenuse is A, so C = A cos θ.
	E. Incorrect! Check your trig functions.
Solution	With an applied force A the block will move parallel to the ground, the component of force in the direction of motion is C which can be found using the trig function Cos θ =adj/hyp, where the adjacent is C and the hypotenuse is A, so C = A cos θ **The correct answer is (D).**

Question No. 4 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 04	**4.** A child drags a sled with a rope that is inclined at an angle of 40 degrees with the horizontal. The child pulls with 150 N of force and moves the sled a total distance of 20m in 10 seconds along the ground. How much work did the child do? (A) 1900 J (B) 2300 J (C) 3000 J (D) 230 J (E) 5.7 J
Feedback on Each Answer Choice	A. Incorrect! This answer used the vertical component of the force applied. Since the sled is moving on the ground, use the horizontal component.
	B. Correct! Be sure to use F x d and use the cosine of the angle too.
	C. Incorrect! This answer doesn't take into account the angle at which the child is pulling the rope. You must only use the component of force in the direction of motion. It may help to draw a diagram.
	D. Incorrect! The quantity work doesn't involve time. It is not necessary to divide by the time that would be used if work was calculated.
	E. Incorrect! Remember that work equals force times distance.
Solution	**Known:** Applied force , F = 150 N Angle of applied force θ = 40° Displacement, d = 20 m  **Unknown:** Work = ? J **Define:** $W = F\ d \cos\theta$ This step accounts for the angle of the rope. **Output:** W = 150 N (20m) cos 40° W = 150 N (20m) .7660 W = 2300 N m One N m equals one Joule, J. W = 2300 J **Substantiate**: Units are correct, sig figs are correct, Magnitude is reasonable. **The correct answer is (B).**

Question No. 5 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 05	**5.** A postman is delivering a 1 kg package to a mail box. It takes her 5 s to carry the package 10 m along the drive way, how much power does she use to deliver the package. (A) 20 W (B) 0 W (C) 490 W (D) 20 J (E) 50 W
Feedback on Each Answer Choice	A. Incorrect! First consider how much work is done.
	B. Correct! Since the package is moving in a direction perpendicular to the applied Force (weight) need to lift the package, no work is done in moving the package. Power is work/time so no power is used.
	C. Incorrect! Consider how much force is applied in the direction of displacement.
	D. Incorrect! Consider how much force is applied in the direction of displacement.
	E. Incorrect! Consider how much force is applied in the direction of displacement.
Solution	Since the package is moving in a direction perpendicular to the applied Force (weight) need to lift the package, no work is done in moving the package. Power is work/time so no power is used. **The correct answer is (B).**

Question No. 6 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 06	**6.** If you use the stairs to get to the top of the 321m high Empire State Building in only 10.0 minutes time, how much power did you generate? Assume your mass to be 80.0 kg, and assume you move at a constant rate. (A) 43 W (B) 420 W (C) 25,000 W (D) 250,000 W (E) 154,00000 W
Feedback on Each Answer Choice	A. Incorrect! Don't forget that the acceleration from gravity must be used since W = Fd = mgd.
	B. Correct! Use P = W/t =mgd/t. Convert 10 minutes into seconds.
	C. Incorrect! The time in minutes must be converted into seconds since Watts is units of Joules per second.
	D. Incorrect! Don't forget that power is work per unit of time. You must divide by the time.
	E. Incorrect! Use P = W/t = mgd/t.
Solution	**Known** : Time, t = 10 mins Mass = 80 kg Displacement, d= 321 m **Unknown**: Power P =? W **Define:** Convert 10 minutes into seconds P = W/t = mgd/t , where g= 9.8 m/s^2 **Output:** $10 \cancel{m} \times \frac{60\ s}{1\ \cancel{m}} = 600\ s$ $P = \frac{80\ kg \times 9.8\ m/s^2 \times 321\ m}{600\ s} = \frac{251664\ kg\ m^2/s^2}{600\ s} = 420\ J/s$ Remember units for power is km $m^2/s^2/ s$, which is J/s or Watts So P = 420 W **Substantiate:** Units are correct, sig figs are correct. Magnitude looks reasonable. **The correct answer is (B).**

Question No. 7 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 07	**7.** What is the kinetic energy of a 15.0 gram bullet that is traveling at 1000 m/s? (A)75 J (B)1500 J (C) 7500 J (D) 7,500,000 J (E)None of the above
Feedback on Each Answer Choice	A. Incorrect! The velocity must be squared in order to calculate kinetic energy.
	B. Incorrect! Don't forget the factor of 1/2 to calculate kinetic energy.
	C. Correct! Use KE = 1/2(mv^2). Be careful to change grams into kilograms too.
	D. Incorrect! For your answer to be in Joules, grams must be converted into kilograms.
	E. Incorrect! Use KE = 1/2(mv^2).
Solution	**Known:** Mass, m = 15 g Speed = 1000 m/s^2 **Unknown:** KE = ? J **Define :** First convert 15.0 grams into kilograms Use $KE = \frac{1}{2}mv^2$ **Output:** $15.0\ g \times \frac{1\ kg}{1000\ g} = .015 kg$ $KE = \frac{1}{2} 0.015\ kg\ (1000\ m/s)^2 = 7500\ kg\ m^2/s^2$ Remember 1 kg m^2/s^2 is 1 J KE = 7500 J **Substantiate:** Units are correct, sig figs are correct. Magnitude looks reasonable. **The correct answer is (C).**

Question No. 8 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 08	**8.** A typical amusement park rollercoaster has a certain mass when empty. When people fill the ride, the total mass is now double the empty cars alone. With double this mass, how will that affect the speed of the rollercoaster when it reaches the bottom of its hill? Assume air resistance and friction are negligible. (A) 1/2 the speed. (B) 2 times the speed. (C) 4 times the speed. (D) Square root of 2 times the speed. (E) It will have no effect.
Feedback on Each Answer Choice	A. Incorrect! Consider the formula for the potential energy at the top of the rollercoaster.
	B. Incorrect! Consider the formula for the kinetic energy at the bottom of the rollercoaster hill.
	C. Incorrect! Remember that the potential energy at the top transforms into the kinetic energy at the bottom.
	D. Incorrect! Remember that energy is conserved.
	E. Correct! The speed is unchanged! Mass is irrelevant to the speed at the bottom.
Solution	Since mass is a term in the initial potential energy, and a term in the kinetic energy at the bottom, the mass cancels out. $PE_{top} = KE_{bottom}$ $mgh = \frac{1}{2} mv^2$ If you solved that equation for v: $v = \sqrt{2gh}$ Since there is no mass in the equation to find v, it doesn't matter at all. **The correct answer is (E).**

Question No. 9 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 09	**9.** Imagine a rollercoaster has a 50m vertical drop. Calculate the speed of the car as it reaches the bottom of that hill. Assume it has virtually no speed at the beginning of the hill. Also assume air resistance and friction are negligible. (A) 31 m/s (B) 50 m/s (C) 9.8 m/s (D) 4.9 m/s (E) Insufficient information
Feedback on Each Answer Choice	A. Correct! The potential energy at the top equals the kinetic energy at the bottom of the hill. Solve this equality for the velocity.
	B. Incorrect! The distance it falls is 50m. This distance is used in the potential energy formula.
	C. Incorrect! This is the magnitude of the acceleration of gravity. This value would be used in the potential energy formula.
	D. Incorrect! The roller coaster has kinetic energy at the bottom of the hill. The roller coaster has potential energy at the top of the hill.
	E. Incorrect! Remember that energy is conserved. Think about where the rollercoaster has kinetic or potential energy.
Solution	**Known:** Height, h = 50 m **Unknown:** Speed, v= ? m/s **Define:** Even without a mass, you can still proceed by using conservation of energy. $PE_{top} = KE_{bottom}$ $mgh = \frac{1}{2} mv^2$ If you solved that equation for v: $v = \sqrt{2gh}$ $g = 9.8\ m/s^2$ **Output:** $v=\sqrt{2(9.8\ m/s^2)(50\ m)}$ $v = \sqrt{980\ m^2/s^2}$ $v = 31\ m/s$ **Substantiate:** Units are correct, sig figs are correct. Magnitude looks reasonable. Note: this problem could also be solved using kinematics equations, but it would take more steps. In the end, you would get the same answer though. **The correct answer is (A).**

Question No. 10 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
Question 10	**10.** "A rock is dropped of a building, which of these best describes energy transfer in this situation? (PE = potential energy, KE = kinetic Energy) (A) The rock initially has no PE or KE, as the rock falls its KE and PE increases, when it hits the floor all the energy is lost. (B) The rock initially has PE, as it falls the PE is converted to KE, once it hits the floor all the energy is lost. (C) The rock initially has PE, as it falls the PE is converted to KE, once it hits the floor all the energy is converted to other forms, such as sound, motion of the ground and heat. (D) The rock initially has KE, as it falls the KE is converted to PE, once it hits the floor all the energy is converted to other forms, such as sound, motion of the ground and heat. (E) The rock initially has KE, as it falls the KE is converted to PE, once it hits the floor all the energy is lost.
Feedback on Each Answer Choice	A. Incorrect! Remember the definition PE =mgh.
	B. Incorrect! Energy is always conserved, the rock no longer has KE or PE but the energy has been transformed.
	C. Correct! Energy is conserved; it is never lost just transformed.
	D. Incorrect! Remember the definitions for KE=1/2 mv^2 and PE = mgh.
	E. Incorrect! Remember the definitions for KE=1/2 mv^2 and PE = mgh and conservation of energy.
Solution	Energy is conserved. Initially the rock has potential energy which depends on its mass, height and acceleration due to gravity. As the rock is dropped the PE is transformed to KE, the faster it goes the more the lower it is so the KE increases and PE decreases, just as it hits the ground all the rocks energy is KE. The KE is not lost on impact it is transformed to different types of energy such as sound, motion of the ground, and heat. **The correct answer is (C).**