**Semester #1 Physics Review Fall 2017**

Are the following quantities scalars or vectors?

1. 20 years A. vector B. scalar
2. 17 m/s east A. vector B. scalar
3. 20 miles south A. vector B. scalar
4. 7.2 km A. vector B. scalar
5. Vector A has a magnitude of 39 km and is directed towards the west. Vector B has a magnitude of 35 km and is directed towards the south. Find the resultant by adding these two vectors.
6. 74 km SW B. 52.4 km SE C. 74 km SE D. 52.4 km SW
7. A boat sails 20 mi due south from Key West, Florida. Then it turns right and sails 60 mi due west. Find the boats resultant vector.
8. 40 mi NW B. 80 mi SW C. 63.2 mi SW D. 63.2mi NW
9. A force of 25N, E and a force of 25N, W act concurrently on a 5.0 kg cart. What is the acceleration of the cart?

(a) 1.0 m/s2 west (b) 5.0 m/s2 east (c) 0.20 m/s2 east (d) 0 m/s2

1. What is the acceleration due to gravity at a location where a 15.0 kg mass weighs 45.0 N?

(a) 675 m/s2  (b) 3.00 m/s2 (c) 9.81 m/s2 (d) 0.333 m/s2

1. A baseball dropped from the roof of a tall building takes 3.1 s to hit the ground. How tall is the building?

(a) 15 m (b) 47 m (c) 30 m (d) 94 m

1. Two forces, *F*1 and *F*2, are applied to a block on a frictionless, horizontal surface as shown below.

If the magnitude of the block’s acceleration is 2.0 m/s², what is the mass of the block?

(a) 1 kg (b) 6 kg (c) 5 kg (d) 7 kg

1. The gravitational PE, with respect to Earth, that is possessed by an object is dependent on the object’s

(a) acceleration (b) position (c) momentum (d) speed

1. As a ball falls freely toward the ground, its total mechanical energy

(a) decreases (b) increases (c) remains the same d) cannot be determined

1. A 70 kg cyclist develops 210 W of power while pedaling at a constant velocity of 7.0 m/s east. What average force is exerted eastward on the bicycle to maintain this constant speed?

(a) 490 N (b) 3.0 N (c) 30 N (d) 0 N

1. A motorcycle being driven on a dirt path hits a rock. Its 60 kg cyclist is projected over the handlebars at 20 m/s into a haystack. If the cyclist is brought to rest in 0.50 s, the magnitude of the average force exerted on the cyclist by the haystack is

(a) 6.0 × 101 N (b) 1.2 × 103 N (c) 5.9 × 102N (d) 2.4 × 103 N

1. What is the maximum amount of work that a 6000 watt motor can do in 10 seconds?

(a) 6.0 J (b) 6,000 J (c) 600 J (d) 60,000 J

***Base your answers to questions 25 and 26 on the graph below, which represents the motion of a car***

***during a 6.0 s time interval.***

1. What is the acceleration of the car at *t* = 5.0 seconds?

(a) 0.0 m/s2 (b) 2.5 m/s2 (c) 2.0 m/s2 (d) 10 m/s2

1. What is the total distance traveled by the car during this 6.0-s interval?

(a) 10 m (b) 40 m (c) 20 m (d) 60 m

***Base your answers to questions 27 and 28 on the information below.***

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A boy pushes his wagon at constant speed along a level sidewalk. The graph below represents the relationship between the horizontal force exerted by the boy and the distance the wagon moves.

1. What is the total work done by the boy in pushing the wagon 4.0 m?

(a) 5.0 J (b) 120 J (c) 7.5 J (d) 180 J

1. The speedometer in a car does *not* measure the car’s velocity because velocity is a

(a) vector quantity and has a direction associated with it

(b) vector quantity and does not have a direction associated with it

(c) scalar quantity and has a direction associated with it

(d) scalar quantity and does not have a direction associated with it

1. A projectile launched at an angle of 45° above the horizontal travels through the air. Compared

to the projectile’s theoretical path with no air friction, the actual trajectory of the projectile with air friction is

(a) lower and shorter (b) higher and shorter (c lower and longer (d higher and longer

1. The speed of an object undergoing constant acceleration decreases from 28.0 m/s to 8.0 m/s in 10 s. What is the car’s acceleration?
2. 2 m/s² b) -2m/s² c) 20m/s² d)-2m/s
3. A 25 N horizontal force north and a 35 N horizontal force south act concurrently on a 15 kg object on a frictionless surface. What is the magnitude of the object’s acceleration?

(a) 0.67 m/s2 (b) 2.3 m/s2 (c) 1.7 m/s2 (d) 4.0 m/s2

1. A car travels at constant speed *v* up a hill from point *A* to point *B*, as shown in the diagram

below. As the car travels from *A* to *B*, its gravitational potential energy



(a) increases and its kinetic energy decreases (b) increases and its kinetic energy remains the same

(c) remains the same and its kinetic energy decreases (d) remains the same and its kinetic energy remains the same

1. An object is thrown vertically upward. Which pair of graphs best represents the object’s kinetic energy and gravitational potential energy as functions of its displacement while it rises?



1.  The table below lists the mass and speed of each of four objects.

Which two objects have the same kinetic energy?

(a) *A* and *D* (b) *A* and *C* (c) *B* and *D* (d) *B* and *C*

1. What is the average power required to raise a 1.81 x104 N elevator 12 m in 22.5 seconds?

(a) 8.04 x 102 W (b) 2.17 x105 W (c) 9.65 x103 W d) 4.89 x106W

1. If the speed of a moving object is doubled, the kinetic energy of the object is

(a) halved (b) unchanged (c) doubled (d) quadrupled

1. How much work is required to lift a 10 N weight from 4 m to 40 m above the surface of Earth?

(a) 2.5 J (b) 360 J (c) 3.6 J (d) 400 J

1. Which situation describes a system with decreasinggravitational potential energy?

(a) a girl stretching a horizontal spring (b) a bicyclist riding up a steep hill

(c) a rocket rising vertically from Earth (d) a boy jumping down from a tree

1. A 60 kg student climbs a ladder a vertical distance of 4 m in 8 s. Approximately how much total work is done against gravity by the student during the climb?

(a) 2,400 J (b) 240 J (c) 2.90 J (d) 30 J

1. What is the maximum amount of work that a 6000 W motor can do in 10 seconds?

(a) 60 J (b) 6,000 J (c) 600 J (d) 60,000 J

1. Student *A* lifts a 50 N box from the floor to a height of 0.40 m in 2.0 s. Student *B* lifts a 40 N box from the floor to a height of 0.50 m in 1.0 second. Compared to student *A*, student *B* does

(a) the same work but develops more power (b) the same work but develops less power

(c) more work but develops less power (d) less work but develops more power

1. While riding a chairlift, a 55 kg skier is raised a vertical distance of 370 m. What is the total change in the skier’s gravitational potential energy?

(a) 54 J (b) 20,000 J (c) 540 J (d) 200,000 J

1. The work done on a slingshot is 40 J to pull back a 0.10 kg stone. If the slingshot projects the stone straight up in the air, what is the maximum height to which the stone will rise? [Neglect friction.]

(a) 0.41 m (b) 410 m (c) 41 m (d) 4.1 m

1. A 2 kg object weighs 19.6 N on Earth. If the acceleration due to gravity on Mars is 3.71 m/s², what is the object’s mass on Mars?

(a) 2.64 kg (b) 19.6 N (c) 2 kg (d) 7.42 N

1.  A pendulum is pulled to the side and released from rest. Which graph best represents the relationship between the gravitational potential energy of the pendulum and its displacement from its point of release?
2. A person weighing 600 N rides an elevator upward at an average speed of 3 m/s for 5.0s. How much does this person’s gravitational potential energy increase as a result of this ride?

(a) 360 J (b) 3,000 J (c) 1,800 J (d) 9,000 J

1. The diagram below shows an ideal simple pendulum. As the pendulum swings from position *A* to position

* B*, what happens to its total mechanical energy? [Neglect friction.]

(a) It decreases. (b) It increases. (c) It remains the same. (d) not enough information

1. During an emergency stop, a 1,500 kg car lost a total of 300,000 J of kinetic energy. What was the speed of the car at the moment the brakes were applied?

(a) 10 m/s (b) 20 m/s (c) 14 m/s (d) 25 m/s

1. Two students of equal weight go from the first floor to the second floor. The first student uses an elevator and the second student walks up a flight of stairs. Compared to the gravitational potential energy gained by the first student, the gravitational potential energy gained by the second student is

(a) less (b) greater (c) the same (d) not enough information

1. A 55 kg diver falls freely from a diving platform that is 3m above the surface of the water in a pool. When she is 1 m above the water, what are her gravitational potential energy and kinetic energy with respect to the water’s surface?

(a) *PE* = 1620 J and *KE* = 0 J (b) *PE* = 1080 J and *KE* = 540 J

(c) *PE* = 810 J and *KE* = 810 J (d) *PE* = 540 J and *KE* = 1080 J

1. A truck weighing 30,000 N was driven up a hill that is 1,600 m long to a level area that is 800 m above the starting point. If the trip took 480 s, what was the *minimum* power required?

(a) 50,000 W (b) 1.2 x 1010 W (c) 1.0 x 105 W (d) 2.3 x1010 W

1. An object falls freely near Earth’s surface. Which graph best represents the relationship between the

object’s kinetic energy and its time of fall?





1. Compared to the work done by the student, the gravitational potential energy gained by the crate is

(a) exactly the same (b) 330 J more (c) 330 J less (d) 150 J more

1. What is the GPE with respect to the surface of the water of a 75 kg diver located 3.0 m above the water?

(a) 21, 700 J (b) 225 J (c) 2,205 J (d) 22.9 J

1. A 60 kg runner has 1920 J of kinetic energy. At what speed is she running?

(a) 5.66 m/s (b) 32.0 m/s (c) 8.00 m/s (d) 64.0 m/s

1. A motor used 120 W of power to raise a 15 N object in 5.0 s. Through what vertical distance was the object raised?

(a) 1.6 m (b) 40 m (c) 8.0 m (d) 360 m

1. A 45 kg boy is riding a 15 kg bicycle with a speed of 8.0m/s. What is the combined kinetic energy of the boy and the bicycle?

(a) 240 J (b) 1440 J (c) 480 J (d) 1920 J

1. As a ball falls freely (without friction) toward the ground, its total mechanical energy

(a) decreases (b) increases (c) remains the same

1. What is the average power developed by a motor as it lifts a 400 kg mass at constant speed through a vertical distance of 10.0m in 8.0 seconds?

(a) 320 W (b) 4,900 W (c) 500 W (d) 32,000 W

1. An object weighing 15 N is lifted from the ground to a height of 0.22 meter. The increase the object’s gravitational potential energy is approximately

(a) 310 J (b) 3.3 J (c) 32 J (d) 0.34 J

1. As an object falls freely, the kinetic energy of the object

(a) decreases (b) increases (c) remains the same

1. A 3.0 kg block is initially at rest on a frictionless, horizontal surface. The block is moved 8.0 m in 2.0 s by the application of a 12-N horizontal force, as shown in the diagram below



1. What is the average power developed while moving the block?

(a) 24 W (b) 48 W (c) 32 W (d) 96 W

1. Ball *A* of mass 5.0 kg moving at 20m/s collides with ball *B* of unknown mass moving at 10 m/s in the same direction. After the collision, ball *A* moves at 10 m/s and ball *B* at 15 m/s, both still in the same direction. What is the mass of ball *B*?
2. (a) 6.0 kg (b) 10. kg (c) 2.0 kg (d) 12 kg
3. A 50.-kilogram student threw a 0.40 kg ball with a speed of 20 m/s. What was the magnitude of the impulse that the student exerted on the ball?

(a) 8.0 Ns (b) 400Ns (c) 78 Ns (d) 1000Ns

1. A 60 kg roller skater exerts a 10N force on a 30 kg roller skater for 0.20s.What is the magnitude of the impulse applied to the 30.-kg roller skater?

(a) 50. N•s (b) 6.0 N•s (c) 2.0 N•s (d) 12 N•s

1. At the circus, a 100 kg clown is fired at 15m/s from a 500kg cannon. What is the recoil speed of the cannon?

(a) 75 m/s (b) 3.0 m/s (c) 15 m/s (d) 5.0 m/s

1. A 0.45kg football traveling at a speed of 22 m/s is caught by an 84 kg stationary receiver. If the football comes to rest in the receiver’s arms, the magnitude of the impulse imparted to the receiver by the ball is

(a) 1800 N.s (b) 4.4 N.s (c) 9.9 N.s (d) 3.8 N.s

1. A carpenter hits a nail with a hammer. Compared to the magnitude of the force the hammer exerts on the nail, the magnitude of the force the nail exerts on the hammer during contact is

(a) less (b) greater (c) the same (d) zero

1. A 1.0kg laboratory cart moving with a velocity of 0.50 m/s due east collides with and sticks to a similar cart initially at rest. After the collision, the two carts move off together with a velocity of 0.25 m/s due east. The total momentum of this frictionless system is

(a) zero before the collision

(b) zero after the collision

(c) the same before and after the collision

(d) greater before the collision than after the collision

1. A force of 6.0 N changes the momentum of a moving object by 3.0 kg m/s. How long did the

force act on the mass?

a) 1.0 s (b) 0.25 s (c) 2.0 s (d) 0.50 s