

Physics: A Mathematical Science Chapter 1

A. Completing Concepts

In the space to the left, write the answer that best completes each statement.

- _____ 1. _____ is the science that examines the fundamental laws relating matter and energy.
- _____ 2. _____ was one of the first scientists to base conclusions on experimental evidence.
- _____ 3. Mass, _____, and time are considered fundamental quantities.
- _____ 4. In SI, the fundamental unit of mass is the _____.
- _____ 5. The _____ of an object is the quantity of matter it contains.
- _____ 6. The units for speed and volume are examples of _____ units.
- _____ 7. An error due to _____ is possible if a meter scale is not read from directly in front.
- _____ 8. When using scientific notation, it is customary to have _____ digit(s) to the left of the decimal point.
- _____ 9. In using scientific notation, measurements can be added or subtracted only if the exponents are _____.
- _____ 10. To multiply measurements expressed in scientific notation, the exponents must be _____ to obtain the correct power of 10 for the product.
- _____ 11. To find the exponent of the answer when dividing measurements expressed in scientific notation, _____ the exponent in the denominator from the exponent in the numerator.
- _____ 12. _____ is the extent to which a measured value agrees with the accepted value for a quantity.
- _____ 13. The _____ of a measuring device is limited by the finest division on its scale.
- _____ 14. The figures written for a measurement are called _____ digits.
- _____ 15. A(n) _____ that serves only to locate a decimal point is not significant.
- _____ 16. The result of a mathematical operation on measured quantities cannot be more precise than the _____ precise of the quantities involved.
- _____ 17. In the metric system, _____ are used to change the value of standard units by powers of ten.

B. Understanding Concepts

In the space to the left, write the letter of the answer to each question.

- _____ 1. Which of the following SI prefixes means 1/100?
a. milli b. centi c. kilo d. micro
- _____ 2. Which of the following SI prefixes means 1000?
a. milli b. centi c. kilo d. micro
- _____ 3. Which quantity listed below has a derived unit?
a. length b. area c. mass d. time
- _____ 4. In scientific notation, 1 000 000 m should be written as
a. 1×10^5 m b. 1×10^{-5} m c. 1×10^{-6} m d. 1×10^6 m
- _____ 5. In scientific notation, 0.000 04 s should be written as
a. 4×10^{-5} s b. 4×10^5 s c. 4×10^{-6} s d. 4×10^6 s
- _____ 6. 4.0×10^4 cg plus 3×10^3 cg equals
a. 7×10^7 cg b. 4.3×10^4 cg c. 7×10^3 cg d. 4.3×10^{12} cg
- _____ 7. 6.8×10^9 mm minus 5.0×10^8 mm equals
a. 1.3×10^1 mm b. $1.3 \times 10^{8.5}$ mm c. 6.3×10^9 mm d. 0.63×10^0 mm
- _____ 8. 4.0×10^{12} m times 8.0×10^6 m equals
a. 3.2×10^{18} m² b. 3.2×10^{17} m² c. 3.2×10^2 m² d. 3.2×10^{19} m²
- _____ 9. 3×10^8 s divided by 1×10^{-7} s equals
a. 3×10^{15} b. 3×10^1 c. 3×10^{-56} d. 3×10^{56}
- _____ 10. Using significant digits, the solution to the addition problem ($43.2 \text{ m} + 6.97 \text{ m} + 12 \text{ m} + 0.008 \text{ m}$) should be written as
a. 62 m b. 62.2 m c. 62.18 m d. 62.187 m
- _____ 11. Which of the following measurements has two significant zeros?
a. 0.70 g b. 8.006 km c. 1800 m d. 0.0009 kg
- _____ 12. Which of the following measurements has three significant digits?
a. 880 m b. 0.008 m c. 0.0880 m d. 880.0 m
- _____ 13. If multiplying 35.24 m by 0.13 m, the answer recorded to the correct number of significant digits would be
a. 5 m² b. 4.6 m² c. 4.58 m² d. 4.581 m²
- _____ 14. 300 cm equals
a. 0.03 m b. 0.3 m c. 3 m d. 30 000 m

Mathematical Relationships Chapter **2**

A. Completing Concepts

In the space to the left, write the answer that best completes each statement.

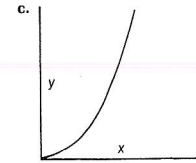
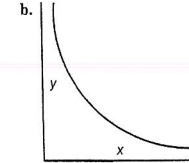
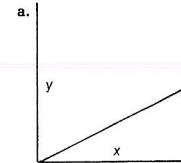
- _____ 1. When an operation is performed on one side of an equation, the _____ operation must be performed on the other side of the equation.
- _____ 2. It is customary to isolate the _____ on the left side of an equation.
- _____ 3. In performing an experiment, the values of the _____ variable are carefully changed and the corresponding values of the _____ variable are then measured.
- _____ 4. In graphing, the values for the _____ variable usually are plotted on the horizontal (x) axis.
- _____ 5. The graph of a(n) _____ variation is a straight line passing through the origin.
- _____ 6. The shape of the graph which shows the dependent variable in inverse variation with the independent variable is a(n) _____.
- _____ 7. A graph whose shape is a(n) _____ indicates that the dependent variable varies as the square of the independent variable.
- _____ 8. When one quantity varies directly with another, the second quantity will _____ as the first increases.
- _____ 9. When one quantity varies inversely with another, the second quantity will _____ as the first increases.
- _____ 10. The general equation for a graph which is a straight line passing through the origin is _____.
- _____ 11. The general equation of a parabola is _____.
- _____ 12. The general equation of a hyperbola is _____.
- _____ 13. The _____ of an angle in a right triangle equals the opposite side divided by the adjacent side.
- _____ 14. The trigonometric function _____ is equal to the adjacent side divided by the hypotenuse.
- _____ 15. The trigonometric function _____ is equal to the opposite side divided by the hypotenuse.

B. Understanding Concepts

In the space to the left, write the letter of the answer to each question.

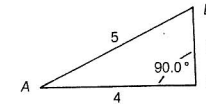
- _____ 1. If $x = gt$, then t equals
a. g/x b. gx c. x/g d. $1/gx$
- _____ 2. If $x = abc/d$, then b equals
a. acx/d b. ac/dx c. axd/c d. xd/ac
- _____ 3. Which of the following equations are dimensionally correct?
a. speed = distance \times time c. distance = speed/time
b. distance = speed \times time d. distance = time/speed

Questions 4 through 6 refer to the three graphs below.



- _____ 4. Which graph indicates that y varies as the square of x ?
- _____ 5. Which graph indicates that y varies inversely as x ?
- _____ 6. Which graph indicates that y varies directly with x^2 ?

Questions 7 through 9 refer to the figure below.



- _____ 7. The sine of angle B equals
a. $3/5$ b. $3/4$ c. $4/5$ d. $4/3$
- _____ 8. The cosine of angle A equals
a. $4/5$ b. $3/5$ c. $4/3$ d. $3/4$
- _____ 9. The measure of angle A , to the nearest degree, equals
a. 53° b. 11° c. 49° d. 37°

Motion in a Straight Line Chapter 3




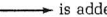





A. Completing Concepts

In the space to the left, write the answer that best completes each statement.

- _____ 1. A(n) _____ quantity is completely described by its magnitude.
- _____ 2. A(n) _____ quantity has both magnitude and direction.
- _____ 3. Velocity and displacement are examples of _____ quantities.
- _____ 4. The sum of two vector quantities is determined by their _____ and magnitudes.
- _____ 5. The length of an arrow-tipped line segment drawn to represent a vector is proportional to the _____ of the vector.
- _____ 6. Vectors can be added by placing the _____ of one vector at the head of another vector.
- _____ 7. When vectors are added, the _____ is drawn from the tail of the first vector to the head of the second vector.
- _____ 8. A person takes a walk around a city. The vector drawn from the starting position to the final position represents a(n) _____.
- _____ 9. Speed represents the magnitude of _____.
- _____ 10. The rate of change of velocity is called _____.
- _____ 11. A car travels 750 kilometers in 10 hours. The _____ speed of this car is 75 kilometers per hour.
- _____ 12. The _____ velocity of an object in motion is its velocity at any given instant of time.
- _____ 13. _____ can be computed by dividing an object's change in velocity by the time necessary to make that change.
- _____ 14. The SI unit for acceleration is _____.
- _____ 15. An object that is slowing down is said to have a(n) _____ acceleration.
- _____ 16. The final velocity of a uniformly accelerating object which started from rest is equal to its acceleration multiplied by the _____.
- _____ 17. The acceleration due to gravity has a value in SI units of _____.
- _____ 18. The average velocity of an object undergoing _____ acceleration can be calculated by adding the initial and final velocities and dividing by two.

B. Understanding Concepts

In the space to the left, write the letter of the answer to each question.

- _____ 1. Which of the following represents a vector?
 a.  b. _____ c.  d. 
- _____ 2. The resultant vector when  is added to  is
 a.  b.  c.  d. 
- _____ 3. Which of the following represents a speed?
 a. 6 m b. 4 h/km/s c. 2 m/s² d. 8 m/s
- _____ 4. Which of the following represents an acceleration?
 a. 16 m²/s² b. 4 h/km/s c. 8 km/hr d. 2 m/s²
- _____ 5. Which of the following equations relates the change in velocity of an object during a time interval to its acceleration?
 a. $v = d/t$ b. $d = v_f t + \frac{1}{2} a t^2$ c. $v_f^2 = v_i^2 + 2 a d$ d. $v_f = v_i + a t$
- _____ 6. Neglecting air resistance, an object thrown straight up has the same _____ on the way down as it had on the way up.
 a. acceleration b. velocity c. terminal velocity d. instantaneous velocity
- _____ 7. If a car travels 30 km during the first half hour of a trip and then travels 50 km during the next half hour of a trip, the average speed for the hour is
 a. 20 km/h. b. 40 km/h. c. 60 km/h. d. 80 km/h.
- _____ 8. An object is thrown straight up at 10 m/s. At the top of its rise, the magnitude of the object's acceleration is
 a. 20 m/s². b. 10 m/s². c. 5 m/s². d. 0 m/s².

Questions 9 and 10 refer to the situation below.

A young boy walks 150 meters due east and then turns around and walks 30 meters due west.

- _____ 9. The boy walked a total distance of
 a. 30 meters b. 150 meters c. 120 meters d. 180 meters
- _____ 10. The boy's displacement is
 a. 30, m E. b. 150 m, E. c. 120 m, E. d. 180 m, W.

Graphical Analysis of Motion Chapter 4

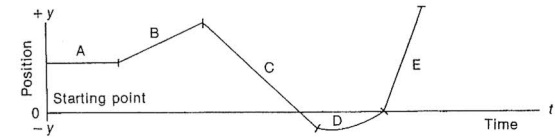
A. Completing Concepts

In the space to the left, write the answer that best completes each statement.

- _____ 1. For an object moving at a(n) _____ speed, the distance traveled is directly proportional to the elapsed time.
- _____ 2. The steepness of a graph line is called the _____ of the graph.
- _____ 3. The slope of a position-time graph yields the _____ of the moving object.
- _____ 4. The slope of a straight line is _____.
- _____ 5. As the velocity of an object increases, the slope of the line on the position-time graph _____.
- _____ 6. When the slope of the line on a distance-time graph is _____, the object involved is at rest.
- _____ 7. On a(n) _____-time graph, the area between the line of the graph and the horizontal axis represents the displacement of the object.
- _____ 8. With constant acceleration, the curve of a(n) _____-time graph is a half parabola.
- _____ 9. The slope of the line on a velocity-time graph shows the _____ of a moving object.
- _____ 10. With constant acceleration, the distance an object travels varies directly with the _____.
- _____ 11. If the position-time graph is a curved line, the slope of the _____ yields the instantaneous speed at the point of the curve it touches.
- _____ 12. The area between the graph line and the horizontal axis on a(n) _____-time graph represents the change of velocity of the object in a given time interval.
- _____ 13. A negative acceleration might mean that an object is speeding up while going in the _____ direction.
- _____ 14. Straight lines on a position-time graph indicate that no _____ occurs.

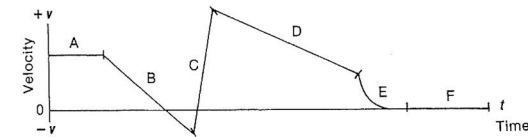
B. Understanding Concepts

In the space to the left, write the letter of the answer to each question.



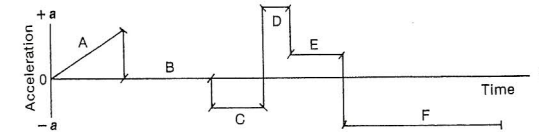
Questions 1 through 4 refer to the position-time graph above.

- _____ 1. Which section represents accelerated motion?
- _____ 2. Which section shows the object at rest?
- _____ 3. The object always moves toward the starting point in section _____.
- _____ 4. Which section represents a constant negative velocity?



Questions 5 through 8 refer to the velocity-time graph above.

- _____ 5. Which section represents a constant velocity other than zero?
- _____ 6. Which section represents the greatest acceleration?
- _____ 7. Which section represents a changing acceleration?
- _____ 8. Which section represents the greatest displacement?



Questions 9 through 12 refer to the acceleration-time graph above.

- _____ 9. Which section represents the greatest change in velocity?
- _____ 10. Which section represents an acceleration of zero?
- _____ 11. Which section represents the greatest positive acceleration?
- _____ 12. Which section represents a changing acceleration?

Forces Chapter 5

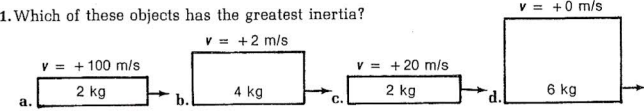
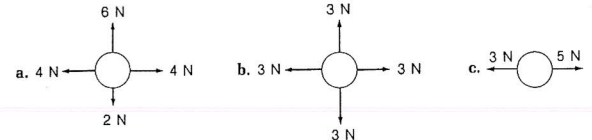
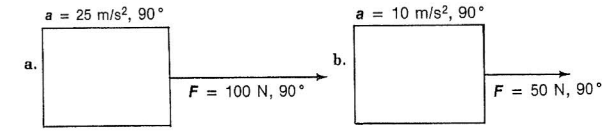
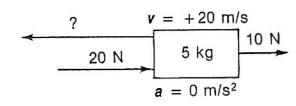
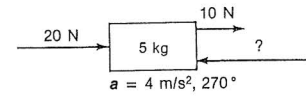
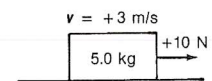
A. Completing Concepts

In the space to the left, write the answer that best completes each statement.

- _____ 1. _____ and Galileo contributed most to our understanding of motion.
- _____ 2. A change in the state of motion of an object is caused by a(n) _____.
- _____ 3. _____ is the study of motion without regard to forces.
- _____ 4. _____ is the study of the relationships that exist between forces and the motion of objects.
- _____ 5. Electromagnetic forces are _____ than gravitational forces.
- _____ 6. _____ is the property of an object which causes it to resist all changes in its state of motion.
- _____ 7. Unless acted upon by a(n) _____, an object at rest or in a state of uniform motion will remain at rest or in uniform motion.
- _____ 8. An object is _____ when an unbalanced force acts on it.
- _____ 9. A net force of one _____ gives a mass of 1 kg an acceleration of 1 m/s^2 .
- _____ 10. Acceleration of an object varies directly with the applied force and inversely with the _____ of the object.
- _____ 11. _____ is the measurement of the gravitational force acting on an object.
- _____ 12. _____ depends upon the amount of matter in an object and is independent of the location of the object.
- _____ 13. The _____ method of measuring mass is easier and more widely used than the inertial method.
- _____ 14. _____ is a force that opposes the motion of an object.
- _____ 15. The force of friction depends upon the type of surfaces in contact and the _____ force.
- _____ 16. Static friction is _____ than sliding friction.
- _____ 17. Complete the following statement: "Every force is accompanied by a(n) _____."

B. Understanding Concepts

In the space to the left, write the letter of the answer to each question.

- _____ 1. Which of these objects has the greatest inertia?

- _____ 2. Which object can be moving with uniform motion in a straight line if the only forces acting are those shown in the diagram?

- _____ 3. A certain force F gives a mass M an acceleration of a . Therefore, force F will give a mass of $2M$ an acceleration of
 a. $2a$ b. a c. $a/2$ d. $a/4$
- _____ 4. Which of the following objects is more massive?

- _____ 5. What is the magnitude of the missing force in the figure below?

- _____ 6. What is the missing force in the figure below?

- _____ 7. What is the magnitude of the normal force in the figure below?


Vectors Chapter 6







A. Completing Concepts

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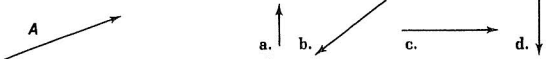
- _____ 1. Force, like velocity and displacement, is a _____ quantity.
- _____ 2. A _____ quantity can be represented by an arrow-tipped line segment.
- _____ 3. Vectors can be _____ by placing the tail of one vector at the head of the other vector.
- _____ 4. When adding two vectors, neither the length nor the _____ of either vector is changed.
- _____ 5. The sum of two vectors, or the _____, is found by drawing a third vector from the tail of the first to the head of the second.
- _____ 6. If two vectors act in the same or in _____ directions, their vector sum can be found algebraically.
- _____ 7. If two vectors act perpendicularly, the magnitude of the resultant vector can be found using the _____ theorem.
- _____ 8. _____ forces are forces which act on the same point simultaneously.
- _____ 9. If three different 7.0 N forces act simultaneously on the same object, the resultant can be no greater than _____ N.
- _____ 10. An object is in _____ when the vector sum of the forces acting on it is zero.
- _____ 11. A single force that can place two or more other forces acting on a single point in equilibrium is called the _____.
- _____ 12. The _____ force is equal in magnitude to the resultant, but opposite in direction.
- _____ 13. Any vector can be resolved into _____ which, when added, give a resultant equal to the original vector.
- _____ 14. The process of finding the effective value of a vector in a given direction is called _____.
- _____ 15. The component of the gravitational force which acts perpendicular to the surface of an inclined plane is called the _____ force.
- _____ 16. Another component of the gravitational force, $F_{||}$, acts _____ to the surface of an inclined plane.

B. Understanding Concepts

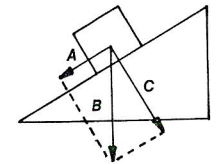
In the space to the left, write the letter of the answer to each question.

- _____ 1. The resultant vector when  is added to  is
 a.  b.  c.  d. 
- _____ 2. Four vectors of the same magnitude are added, one pointing east, one west, one south, and one north. The magnitude of the resultant vector is
 a. 0 b. 1 c. 2 d. 4
- _____ 3. Two vectors acting at right angles to each other and having magnitudes of 6 and 8 have a resultant with a magnitude of
 a. 2 b. 10 c. 14 d. 16
- _____ 4. Two vectors having magnitudes of 5 and 8 that act on a single point cannot have a resultant with a magnitude of
 a. 3 b. 7 c. 13 d. 15
- _____ 5. The equilibrant force for the two vectors shown in the figure below is



- _____ 6. Which of the following represents the y component of vector A shown in the figure below?


Questions 7 to 9 refer to the crate resting on the inclined plane diagrammed at right.



- _____ 7. Which force vector represents the weight of the crate?
 a. A b. B c. C
- _____ 8. Which force vector represents the perpendicular force?
 a. A b. B c. C
- _____ 9. If the incline becomes steeper, which force vector will increase?
 a. A b. B c. C
- _____ 10. Three forces act concurrently on an object. The first is a 5 N force acting due east, the second a 3 N force acting due west, and the third is a 4 N force acting due east. What is the equilibrant force?
 a. 12 N, E b. 12 N, W c. 6 N, E d. 6 N, W

Motion in Two Dimension Chapter 7

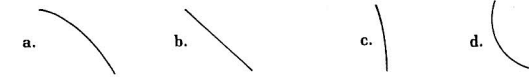

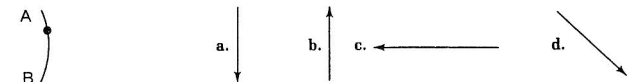
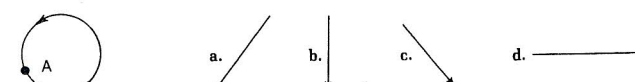

A. Completing Concepts

In the space to the left, write the answer that best completes each statement.

- _____ 1. Any object that is thrown or otherwise projected into the air is called a(n) _____.
- _____ 2. A(n) _____ is the path taken by an object thrown into the air.
- _____ 3. The vertical and horizontal motions of a projectile shot into the air are _____ of one another.
- _____ 4. Because of inertia, the _____ velocity of a projectile is constant.
- _____ 5. The time required for a projectile to strike the ground depends on the original height, the initial _____ velocity and the acceleration due to gravity.
- _____ 6. Two golf balls are released at the same time from the same height. One ball is dropped vertically while the other is projected horizontally. The _____ of the two balls is always the same.
- _____ 7. A(n) _____ force is needed to make an object move in a circular path.
- _____ 8. If a golf club head comes loose during a swing, it flies off on a path _____ to the circle at its point of release.
- _____ 9. In uniform circular motion, the direction of the centripetal force is always _____ to that of the instantaneous velocity.
- _____ 10. The acceleration is always directed toward the _____ for an object moving in uniform circular motion.
- _____ 11. The _____ of a satellite provides the centripetal force that causes the satellite to move in a curved path.
- _____ 12. The orbital velocity of a satellite is independent of the satellite's _____.
- _____ 13. The time necessary for an object moving with simple harmonic motion to complete one back and forth motion is called its _____.
- _____ 14. The _____ of vibration is the distance from the object's rest position to the point of greatest displacement.
- _____ 15. In SHM, acceleration varies _____ with displacement.
- _____ 16. A pendulum's period depends only on the _____ of the pendulum and the acceleration of gravity.

B. Understanding Concepts

In the space to the left, write the letter of the answer to each question.

- _____ 1. Which path below most accurately describes the motion of an object projected horizontally from a height?

 - _____ 2. At which angle would a projectile travel the farthest horizontally?

 - _____ 3. An object is moving with uniform speed along path AB as shown below. Which arrow shows a possible direction for centripetal acceleration?

 - _____ 4. An object vibrates 100 times in 20 s. What is the object's period?
 a. 1/5 s b. 20 s c. 1/20 s d. 5 s
 - _____ 5. An object on a string is moving around the circle as shown below. If the string breaks when the object is at point A, the object will fly off in the direction of which arrow?

 - _____ 6. A weight attached to a spring is vibrating up and down in simple harmonic motion. At which place is the weight undergoing minimum acceleration?
 a. top of the vibration c. middle of the vibration
 b. bottom of the vibration d. same acceleration at all points
- Questions 7 and 8 refer to the figure below which represents a strobe photo taken of a ball projected horizontally from a height.
- 
- _____ 7. Which diagram best describes the vertical component of the ball's displacement?
 - _____ 8. Which diagram best describes the horizontal component of the ball's displacement?

Universal Gravitation Chapter 8

A. Completing Concepts

In the space to the left, write the answer that best completes each statement.

- _____ 1. _____ was best known as an accurate observer of the heavens.
- _____ 2. _____, an excellent mathematician, formulated three laws of planetary motion.
- _____ 3. The paths of the planets around the sun are _____.
- _____ 4. An imaginary line between a planet and the sun sweeps out equal _____ in equal periods of time.
- _____ 5. The average _____ of a planet's orbit cubed divided by the planet's period squared is equal to a constant.
- _____ 6. _____ was the first person to believe strongly that the behavior of all material bodies is governed by the same universal laws.
- _____ 7. Every body in the universe attracts every other body with a force that varies _____ with the product of the masses.
- _____ 8. Gravitational attraction varies _____ with the square of the distances between masses.
- _____ 9. Newton was able to use information concerning the moon to test and verify his _____.
- _____ 10. _____ determined the numerical value for the universal gravitational constant.
- _____ 11. _____ is another name for the attractive gravitational force between an object and the earth.
- _____ 12. The _____ of gravity is the same for all objects near the surface of the earth.
- _____ 13. The _____ of an object varies inversely with the square of its distance from the center of the earth.
- _____ 14. _____ first proposed the concept of gravity as a peculiarity of space itself.

B. Understanding Concepts

In the space to the left, write the letter of the answer to each question.

- _____ 1. Whose work was part of the basis for Newton's law of gravitation?
a. Aristotle b. Roemer c. Kepler d. Einstein
- _____ 2. Planets move around the sun in _____ orbits.
a. elliptical b. parabolic c. circular d. hyperbolic
- _____ 3. According to Kepler's second law, a planet must move fastest when it is _____ the sun.
a. closest to b. farthest from c. at its average distance from
- _____ 4. If the earth is one astronomical unit of distance from the sun and has a period of one year, approximately how far is Jupiter from the sun in astronomical units? Jupiter has a period of 12 years.
a. 2 b. 5 c. 10 d. 15
- _____ 5. The gravitational constant was measured by
a. Kepler b. Newton c. Cavendish d. Einstein
- _____ 6. You weigh 526 N on Earth. Planet X has twice the mass of Earth and twice the radius of Earth. What is your weight in newtons on planet X?
a. 53 N b. 263 N c. 526 N d. 1040 N
- _____ 7. An imaginary dense Star Z has 1/5 the radius of Earth, but 1000 times the earth's mass. How much would a mass weighing 1.0 N on Earth weigh on Star Z?
a. 1/5000 N b. 200 N c. 5000 N d. 25 000 N
- _____ 8. If a satellite moves in a circular orbit around a planet, the satellite has a constant
a. momentum b. velocity c. acceleration
- _____ 9. An object weighing 40 N on the earth's surface would weigh only 10 N when its distance from the center of the earth is
a. doubled b. halved c. tripled d. quadrupled
- _____ 10. Which of the following are the correct units for G, the gravitational constant?
a. N·m/kg² b. N·m²/kg c. N·kg²/m² d. N·m²/kg²

Momentum and Its Conservation Chapter 9

A. Completing Concepts

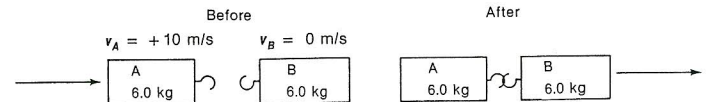
In the space to the left, write the answer that best completes each statement.

- _____ Momentum is the product of an object's _____ and velocity.
- _____ The quantity Ft is called _____.
- _____ The unit of momentum in SI is _____.
- _____ The change of momentum for an object is equal to and caused by the _____ given to the object.
- _____ Any gain of momentum by an object occurs only by the _____ of a corresponding amount of momentum by another object.
- _____ Complete the equation $Ft =$ _____.
- _____ In a system consisting of objects upon which no external force is acting, the momentum of the system is _____.
- _____ Two objects of equal mass approach each other head-on with the same speed. The total momentum of the system before the collision takes place equals _____.
- _____ A(n) _____ force cannot change the momentum of a system.
- _____ Because both _____ and magnitude must be taken into account when adding momenta, momentum is a vector quantity.
- _____ If the momentum of a cannon is considered positive after it fires a shell, the momentum of the shell is considered _____.
- _____ A moving object containing a bomb explodes. If the object had a total of 20 units of momentum just before the explosion, its pieces would have a total of _____ units of momentum just after the explosion.

B. Understanding Concepts

In the space to the left, write the letter to each question.

- _____ 1. Which object has the least momentum?
 a. 1 kg $v = +12 \text{ m/s}$
 b. 10 kg $v = +100 \text{ m/s}$
 c. 0.5 kg $v = +1000 \text{ m/s}$
 d. 100 kg $v = +2 \text{ m/s}$
- _____ 2. If a $54\text{-N}\cdot\text{s}$ impulse is given to a 6.0-kg object, the change of momentum for the object is
 a. $6 \text{ N}\cdot\text{s}$ b. $9 \text{ N}\cdot\text{s}$ c. $54 \text{ N}\cdot\text{s}$ d. $324 \text{ N}\cdot\text{s}$
- _____ 3. Which quantities do not always occur in equal and opposite pairs when an interaction takes place within a system?
 a. impulses b. accelerations c. forces d. momenta changes
- _____ 4. A firecracker is placed in the midst of a motionless cluster of billiard balls on a table. When the firecracker explodes, the balls scatter in all directions. The total momentum of the balls immediately after the explosion is
 a. more than before the explosion b. less than before the explosion
 c. the same as before the explosion d. cannot tell from this information
- _____ 5. Object A has a momentum of $60 \text{ N}\cdot\text{s}$. Object B, which has the same mass, is standing motionless. Object A strikes object B and stops. If the mass of object B is 6 kg , the velocity of object B after the collision is
 a. 0 m/s b. 10 m/s c. 60 m/s d. 360 m/s
- _____ 6. Billiard ball A collides with billiard ball B, which is motionless on a table. During the collision, ball A loses $10 \text{ N}\cdot\text{s}$ of momentum. Which of the following is a possible condition for ball B after the collision?
 a. $m = 5 \text{ kg}, v = 5 \text{ m/s}$ b. $m = 10 \text{ kg}, v = 5 \text{ m/s}$
 c. $m = 10 \text{ kg}, v = 1 \text{ m/s}$ d. $m = 1 \text{ kg}, v = 20 \text{ m/s}$
- _____ 7. What is the velocity of object AB below after the collision? The masses are then locked together.
 a. 0 m/s b. 5 m/s c. 10 m/s d. 20 m/s



- _____ 8. What is the velocity of object B shown below after the collision?
 a. 4 m/s b. 8 m/s c. -4 m/s d. -8 m/s



Work, Power, and Simple Machines Chapter 10

A. Completing Concepts

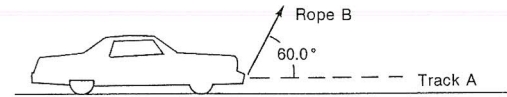
In the space to the left, write the answer that best completes each statement.

- _____ 1. When a force is exerted through a distance, _____ is done.
- _____ 2. To compute work, multiply force by _____.
- _____ 3. In SI, the unit of work is the _____.
- _____ 4. In order to calculate work done, use the _____ of the force which is in the direction of motion.
- _____ 5. If a force acts _____ to the direction of motion, no work is done.
- _____ 6. Power is the _____ at which work is done.
- _____ 7. In SI, power is measured in _____.
- _____ 8. A kilowatt is equal to _____ watts.
- _____ 9. You push against a car stuck in the mud. You will do _____ work unless you are successful in moving the car.
- _____ 10. A job is done slowly and an identical job is done quickly. Both jobs required the same total amount of _____ but used different amounts of _____.
- _____ 11. In using a machine, the work you do is the _____ work and the work the machine does is the _____ work.
- _____ 12. The _____ of a machine is the ratio of output work to input work.
- _____ 13. The _____ of a machine indicates the number by which the machine multiplies the effort force.
- _____ 14. In a real machine, the output work is always _____ than the input work.

B. Understanding Concepts

In the space to the left, write the letter of the answer to each question.

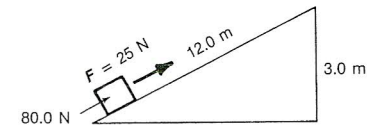
- _____ 1. Work is done when
 - a. an object is at rest.
 - b. a force is applied to an object.
 - c. a force causes an object to move.
 - d. a force is applied to an object.
- _____ 2. Which of the following is a unit for work?
 - a. newton
 - b. joule
 - c. watt
 - d. joule per second
- _____ 3. Which of the following is a unit for power?
 - a. newton-meter
 - b. watt
 - c. joule
 - d. newton
- _____ 4. You are trying to drag the car shown below along track A for a distance of 5 m. You are pulling only along rope B with a force of 40 N. How much work do you do?
 - a. 50 J
 - b. 100 J
 - c. 200 J
 - d. 400 J



- _____ 5. A crate is pushed to the top of a frictionless inclined plane 15 m long with a force of 25 N. If the crate weighs 125 N, how high is the inclined plane?
 - a. 0.5 m
 - b. 1 m
 - c. 3 m
 - d. 5 m
- _____ 6. A person prevents a 7500-N car with its brakes released from rolling down a hill by pushing on the car with a force of 250 N. How much work has the person done?
 - a. 0 J
 - b. 5000 J
 - c. 150 000 J
 - d. 300 000 J
- _____ 7. Electric bills are paid on the basis of kilowatt-hours of electricity used. The kilowatt-hour is a unit of
 - a. force.
 - b. work.
 - c. power.
 - d. time.

Questions 8 through 12 relate to the situation below.

A force of 25.0 N is required to push a box weighing 80.0 N up the inclined plane diagrammed.



- _____ 8. What is the IMA of the plane? a. 1.25 b. 3 c. 3.2 d. 4
- _____ 9. What is the MA of the plane? a. 1.25 b. 3 c. 3.2 d. 4
- _____ 10. What is the input work? a. 300 J b. 240 J c. 80 J d. 75 J
- _____ 11. What is the output work? a. 300 J b. 240 J c. 80 J d. 75 J
- _____ 12. What is the efficiency of the plane? a. 40% b. 60% c. 80% d. 120%

Energy Chapter 11

A. Completing Concepts

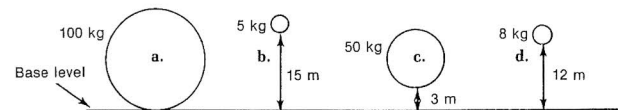
In the space to the left, write the answer that best completes each statement.

- _____ 1. Recent studies indicate that there may be only three basic forms of energy. These are _____, _____, and _____.
- _____ 2. Energy is the capacity to do _____.
- _____ 3. Energy is _____ readily from one form to another.
- _____ 4. _____ is stored energy or energy of position.
- _____ 5. _____ is the energy that an object possesses because of its motion.
- _____ 6. A falling stone has the ability to do _____.
- _____ 7. The potential energy that an object has due to its position above the surface of the earth is called _____ potential energy.
- _____ 8. The path that an object follows as it is raised does not affect the _____ of the object.
- _____ 9. The increase in potential energy of any system is equal to the output _____.
- _____ 10. Under ideal conditions, if 300 J of work are required to lift a mass to a certain height, the same mass should provide _____ J to do work as it falls back to Earth.
- _____ 11. A _____ is an arbitrary reference position which depends on the situation.
- _____ 12. Energy is always _____ when it is changed from one form to another.
- _____ 13. An object is falling toward the earth. The loss of _____ energy from the object is equal to its gain in _____ energy.
- _____ 14. _____ is conserved during an inelastic collision, although kinetic energy decreases.
- _____ 15. The sum total of _____ plus _____ in the universe is a constant.

B. Understanding Concepts

In the space to the left, write the letter of the correct answer.

- _____ 1. Like work, energy is a _____ quantity.
a. vector b. scalar c. fundamental
- _____ 2. Which of the following is an energy unit?
a. watt b. joule c. newton-second d. joule/second
- _____ 3. Which object below has the most potential energy relative to the base level indicated?



- _____ 4. Which of the objects below has the most kinetic energy?

$v = +20 \text{ m/s}$	$v = -30 \text{ m/s}$	$v = +3 \text{ m/s}$	$v = +1 \text{ m/s}$
10 kg (a)	2 kg (b)	100 kg (c)	500 kg (d)
- _____ 5. During a certain time interval, a 20-N object falls 10 m. The object gains _____ J of kinetic energy during this interval.
a. 10 b. 20 c. 200 d. 2000
- _____ 6. A 5-kg object has 250 J of kinetic energy. The speed of the object is
a. 5 m/s. b. 10 m/s. c. 250 m/s. d. 1250 m/s.
- _____ 7. In an inelastic collision _____ is not conserved.
a. momentum b. kinetic energy c. total system energy
- _____ 8. A 4.0-kg cart moving at 6.0 m/s collides with a series of other carts. The total momenta (p) and kinetic energies (KE) of all the carts after the collision are shown below. Which case represents an elastic collision?

a. $p = 24 \text{ kg}\cdot\text{m/s}$ KE = 24 J	b. $p = 12 \text{ kg}\cdot\text{m/s}$ KE = 48 J	c. $p = 24 \text{ kg}\cdot\text{m/s}$ KE = 72 J
--	--	--
- _____ 9. A car's speed increases from 10 m/s to 30 m/s. At 30 m/s the car will slide _____ times farther once the brakes are applied uniformly than it would have at 10 m/s.
a. 3 b. 4 c. 7 d. 9

Midterm Packet Solutions

CHAPTER 1			CHAPTER 2			CHAPTER 3			CHAPTER 4		
#	A	B	#	A	B	#	A	B	#	A	B
1	Physics	B	1	Same	C	1	Scalar	C	1	Constant	D
2	Galileo	C	2	Unknown	D	2	Vector	D	2	Slope	A
3	Length	B	3	Independent, Dependent	B	3	Vector	D	3	Velocity	D
4	Kilogram	D	4	Independent	C	4	Directions	D	4	Constant	C
5	Mass	A	5	Direct	B	5	Magnitude	D	5	Increases	A
6	Derived	B	6	Hyperbola	C	6	Tail	A	6	Zero	C
7	Parallax	C	7	Parabola	C	7	Resultant	D	7	Velocity	E
8	One	D	8	Increase	A	8	Displacement	B	8	Position	D
9	Equal	A	9	Decrease	D	9	Velocity	D	9	Acceleration	F
10	Added	A	10	$y = kx$		10	Acceleration	C	10	Square of the time	B
11	Subtract	B	11	$y = kx^2$		11	Average		11	Tangent Line	D
12	Accuracy	C	12	$y = k/x$		12	Instantaneous		12	Acceleration	A
13	Precision	B	13	Tangent		13	Acceleration		13	Opposite	
14	Significant	C	14	Cosine		14	m/s^2		14	Acceleration	
15	Zero		15	Sine		15	Negative		15		
16	Least		16			16	Time		16		
17	Prefixes		17			17	$-9.8 m/s^2$		17		
18			18			18	Uniform		18		
CHAPTER 5			CHAPTER 6			CHAPTER 7					
#	A	B	#	A	B	#	A	B			
1	Newton	D	1	Vector	B	1	Projectile	A			
2	Force	B	2	Vector	A	2	Trajectory	B			
3	Kinematics	C	3	Added	B	3	Independent	C			
4	Dynamics	B	4	Direction	D	4	Horizontal	A			
5	Stronger	C	5	Resultant	D	5	Vertical	C			
6	Inertia	C	6	Opposite	A	6	Vertical Position	C			
7	External force	C	7	Pythagorean	B	7	Centripetal	B			
8	Accelerated		8	Concurrent	C	8	Tangent	D			
9	Newton (N)		9	21 N	A	9	Perpendicular				
10	Mass		10	Equilibrium	D	10	Center				
11	Weight		11	Equilibrant		11	Weight				
12	Mass		12	Equilibrant		12	Mass				
13	Gravitational		13	Components		13	Period				
14	Friction		14	Resolution		14	Amplitude				
15	Normal		15	Normal Force		15	Directly				
16	Greater		16	Parallel		16	Length				
17	Equal and opp. force		17			17					
18			18			18					

Midterm Packet Solutions

CHAPTER 8			CHAPTER 9			CHAPTER 10			CHAPTER 11		
#	A	B	#	A	B	#	A	B	#	A	B
1	Brahe	C	1	Mass	A	1	Work	C	1	Gravitational, Electromag., Nuclear	B
2	Kepler	A	2	Impulse	C	2	Displacement	B	2	Work	B
3	Ellipses	A	3	kg·m/s	B	3	Joule	B	3	Transformed	C
4	Area	B	4	Impulse	C	4	Component	B	4	Potential Energy	A
5	Radius	C	5	Loss	B	5	Perpendicular	C	5	Kinetic Energy	C
6	Newton	B	6	mav	C	6	Rate	A	6	Work	A
7	Directly	D	7	Conserved	B	7	Watts	C	7	Gravitational	B
8	Inversely	C	8	Zero	B	8	1000	D	8	GPE	C
9	Law of Un. Grav.	A	9	Internal		9	No	C	9	Work	D
10	Cavendish	D	10	Direction		10	Work, Power	A	10	300	
11	Weight		11	Negative		11	Input, Output	B	11	Base Level	
12	Acceleration		12	20		12	Efficiency	C	12	Conserved	
13	Weight		13			13	MA		13	Gravitational Potential	
14	Einstein		14			14	Less		14	Momentum	
15			15			15			15	KE, PE	
16			16			16			16		
17			17			17			17		
18			18			18			18		