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CK-12 Physics - Intermediate Quizzes and Tests



CK-12 Physics - Intermediate Quizzes and Tests

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1.6 What is Science? Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives

1. A scientific theory
 - a. is a guess about how or why something happens
 - b. is a broad explanation of how the natural world works based on evidence
 - c. can never be altered
 - d. none of the above
2. Scientists use mathematical equations because they
 - a. Represent physical quantities
 - b. Can help make predictions
 - c. Show a precise relationship between variables
 - d. All of the above
3. Why is it important for a hypothesis to be testable?
4. Which statement below correctly identifies the difference between a hypothesis and a theory?
 - a. A hypothesis is a prediction, while a theory is an explanation
 - b. A hypothesis is an explanation, while a theory is just an opinion
 - c. A hypothesis is a guess, while a theory is a fact
 - d. A hypothesis is a fact, while a theory is a guess
5. Explain how scientific theories can influence the work that future scientists may do.
6. Discuss why following the scientific method will not enable scientists to answer all questions.
7. Is this statement true or false: The meter is a fundamental unit in physics. Explain the reason for your choice.
8. What is the standard unit for mass?
 - a. Meters
 - b. Newtons
 - c. Seconds

- d. Kilograms
9. Use dimensional analysis to calculate how many dozen donuts you would have to order to feed a school of 456 students.
10. Jane is a college freshmen and needs to do laundry. If it costs \$1.75 to wash one load, how many quarters does Jane need to do four loads?
11. A cat has a mass of 13608 grams (30 lbs). What is the mass of the cat in kilograms, expressed in scientific notation?
12. Which one of the following is a reasonable measurement for the temperature of a refrigerator?
- 450°C
 - 45°C
 - 4.5°C
 - 0.45°C
13. Why do we need significant figures?
14. How should a scientist record a measurement of 5000 g in two significant figures?
- 5000 g
 - 5 kg
 - 5.0×10^3 g
 - 5.00×10^3 g
15. Multiply the following numbers and round your answer to the correct number of significant figures: $72,000 \times 45$
16. On average, an African elephant is 12,125 lbs. What is the mass of an African elephant in kilograms, expressed in scientific notation (1 lb = 0.4536 kg)?
17. A systematic error
- Occurs when a scientist uses the wrong measuring tool
 - Can be corrected by calculation
 - Both A B
 - None of the above
18. A random error
- Cannot be avoided
 - Cannot be corrected by calculation
 - Both A B

- d. None of the above

Refer to the following experiment to answer questions 19-20

TABLE 1.1:

Student:	Trial 1	Trial 2	Trial 3	Trial 4
Sam	30.4 N	30.1 N	29.9 N	30.2 N
Tyler	31.8 N	34.1 N	41.5 N	35.1 N
Tara	39.2 N	39.3 N	39.2 N	39.1 N

Three physics students have made multiple measurements of the force needed to stretch a rubber band 12 cm. Their results are summarized in the table below. The correct value for the force is 30 N.

19. Which student's measurements have high precision but low accuracy?
- Sam
 - Tyler
 - Tara
 - None of the students
20. Which student's measurements are both accurate and precise?
- Sam
 - Tyler
 - Tara
 - None of the students

2.6 One Dimensional Motion Chapter Test

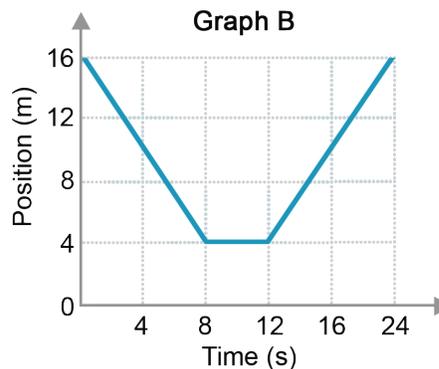
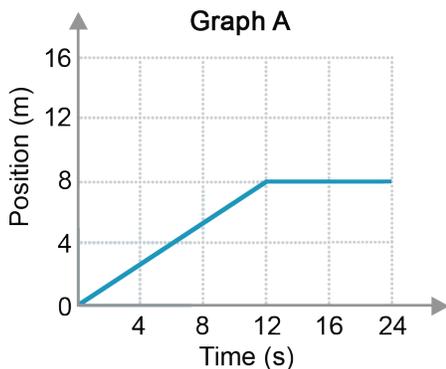
Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

1. If Susie moves leftward 5 meters, what is true about her displacement?
 - a. Her displacement is zero
 - b. Her displacement is positive
 - c. Her displacement is negative
 - d. None of the above
2. The Curiosity Rover landed on Mars on August 6th, 2012. Amazingly, it landed roughly 1.5 miles away from its touchdown target. Which of the following statements is correct?
 - a. The displacement of the Curiosity rover from the touchdown target is 1.5 miles
 - b. The distance of the Curiosity rover from the touchdown target is 1.5 miles
 - c. Both A B are correct
 - d. None of the above
3. Lisa takes her dog to the local dog park every morning. She walks with her dog 5 blocks north, 5 blocks west, and 5 blocks south in order to get to the park.
 - a. Draw a picture of her path and label each distance.
 - b. What is her total distance traveled?
 - c. What is her total displacement?
 - d. If each block is 55 meters, what distance did Lisa travel in meters?

Refer to Graph A and Graph B to answer questions #4-5.



4. What is the total distance traveled by the object in Graph A?
- 0 m
 - 4 m
 - 8 m
 - 12 m
5. What is the magnitude of the displacement of the object depicted by Graph B?
- 0m
 - 4m
 - 8m
 - 12m
6. You are flying 2586 miles from San Francisco to New York.
- An hour into the flight, you are 600 miles from San Francisco. What is your speed in m/s?
 - The pilot looks at the speedometer on the plane and it reads 615 mph. This is a measure of the
 - Average Speed
 - Instantaneous Velocity
 - Average Velocity
 - Instantaneous Velocity
- 965.6 km/hr northeast describes the plane's
- Average Speed
 - Instantaneous Velocity
 - Average Velocity
 - Instantaneous Velocity
7. Which of the following are vectors?
- Distance and speed
 - Speed and displacement
 - Displacement and velocity
 - Velocity and speed
8. What direction is an object moving if the slope of its position-time graph is positive?
- Rightward
 - Leftward
 - At rest
 - Cannot be determined
9. What direction is an object moving if the slope of its position-time graph is negative?
- Rightward

- b. Leftward
 - c. At rest
 - d. Cannot be determined
10. What direction is an object moving if the slope of its position-time graph is zero?
- a. Rightward
 - b. Leftward
 - c. At rest
 - d. Cannot be determined

The data table below describes the motion of a cheetah. Use the information in the data table to answer question #11.

TABLE 2.5:

t (hr)	x (km)
1	93
2	186
3	279
4	372

11. Using the information in the chart above, what is the average speed of the cheetah in m/s?
- a. 26 m/s
 - b. 58 m/s
 - c. 93 m/s
 - d. 126 m/s

The data table below describes the motion of a jogger running east. Use the information in the data table to answer questions #12-13.

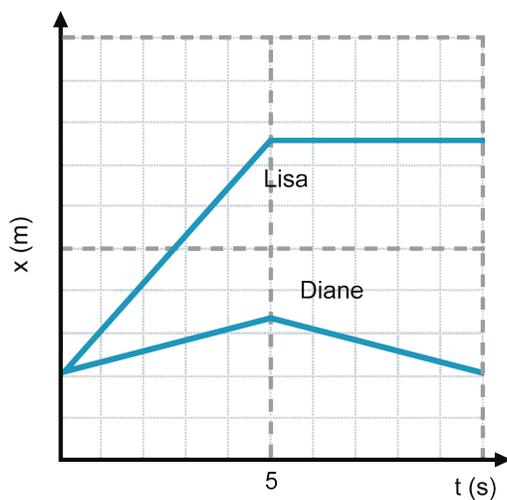
TABLE 2.6:

t (s)	x (m)	v (m/s)
0	0	0
3	7	2.3
10	21	2.1
15	30	2
19	39	2.1
23	44	1.9
25	48	1.9

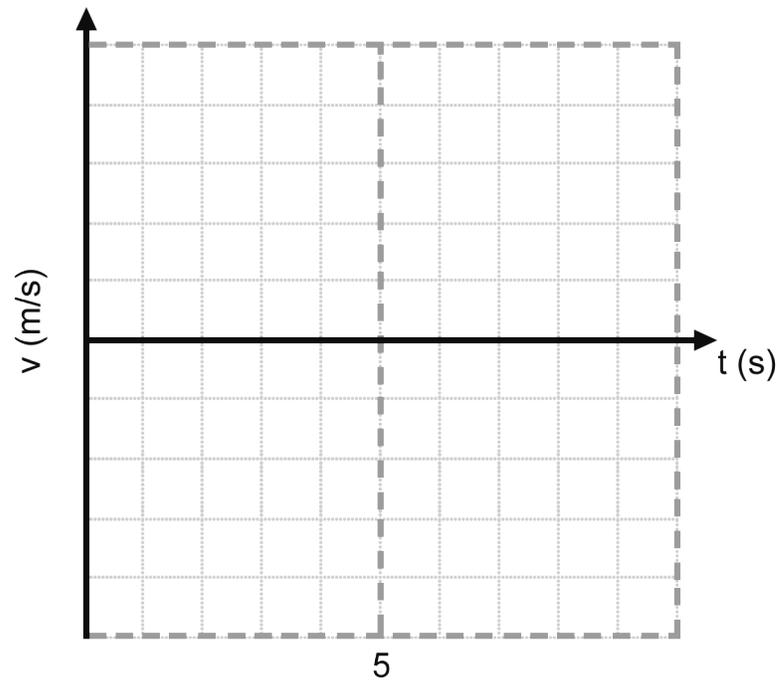
12. What is the average velocity of the jogger?
- a. 1.75 m/s west
 - b. 1.9 m/s east
 - c. 1.75 m/s west
 - d. 2.1 m/s east
13. What is the instantaneous velocity of the jogger at 19s?
- a. 1.75 m/s west
 - b. 1.9 m/s east
 - c. 1.75 m/s west

- d. 2.1 m/s east
14. If a plane has a positive velocity and a positive acceleration, then it is:
- slowing down
 - speeding up
 - moving at constant velocity
 - has zero velocity
15. A driver traveling north slows down from 35 m/s to 0 m/s in about 6 seconds. What is the magnitude of the driver's acceleration?
16. The area under an acceleration-time graph can be used to derive
- displacement
 - position
 - acceleration
 - velocity

The position-time graph below depicts the motion of two runners, Diane and Lisa. Use the graph to answer questions #17-19.



17. Which runner is going faster during the first 5 seconds? How do you know?
18. Use the information provided in the position-time graph to plot Lisa's velocity on the velocity-time graph below.



19. Use the information provided in the position-time graph to describe Diane's velocity in words.
20. The slope of a velocity-time graph represents a moving object's
- displacement
 - position
 - acceleration
 - velocity
-

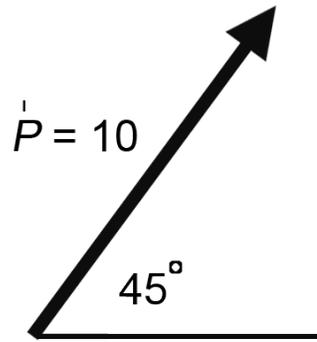
3.5 Two-Dimensional Motion Chapter Test

Chapter Test

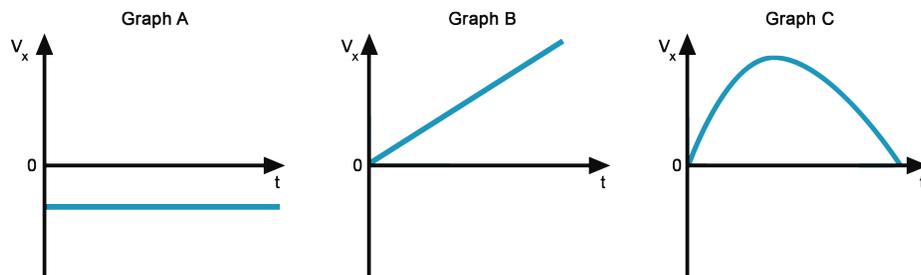
Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- Marble A is rolled off a table from a height of 1 meter at the same exact time Marble B is dropped 1 meter above the ground. Which of the following statements is correct?
 - Marble A will hit the ground before Marble B
 - Marble B will hit the ground before Marble A
 - Both marbles will hit the ground at the same time
 - Not enough information is given to answer the question
- A soccer ball on the ground is kicked with an initial horizontal velocity of +1 m/s rightward and an initial vertical velocity of +3 m/s upward. Which of the following statements accurately describes its motion at $t = 0.5$ s?
 - $x = 0.5$ m, $y = 0.25$ m, $V_x = +1$ m/s, $V_y = -2$ m/s
 - $x = 0.5$ m, $y = 0.25$ m, $V_x = +1$ m/s, $V_y = +2$ m/s
 - $x = 0.5$ m, $y = 0.25$ m, $V_x = -2$ m/s, $V_y = -2$ m/s
 - $x = 0.5$ m, $y = 0.25$ m, $V_x = +2$ m/s, $V_y = +2$ m/s
- Which statement accurately describes the components of a vector whose coordinates are (50.5, 25.6)?
 - The horizontal component is 25.6 and the vertical component is 50.5
 - The horizontal component is 50.5 and the vertical component is 25.6
 - There is only a vertical component of 50.5
 - There is only a horizontal component of 50.5
- Vector \vec{D} has components (-5, -2) and Vector \vec{E} has components (3, -7). Find the sum of \vec{D} and \vec{E} ; call the result Vector \vec{F} .
- Use trigonometry to solve for the magnitude of the x-component of the two-dimensional Vector \vec{P} shown below.



6. You are passenger on a plane traveling at a constant velocity of 500 mph. You throw a water bottle into the air. What is the best frame of reference to use to analyze the water bottle's motion?
- The plane
 - The Earth
 - The water bottle
 - None of the above
7. Car A is traveling 50 mph north on one side of a highway and Car B is traveling 20 mph south on the other side of the highway. What is the velocity of Car A relative to Car B?
- 20 mph
 - +50 mph
 - +70 mph
 - 70 mph
8. A yacht traveling 2 m/s west encounters a current traveling 1.5 m/s north. What is the resultant velocity of the yacht?
9. Which of the following V_x - t graphs correctly depicts a projectile's horizontal velocity over time?



- Graph A
 - Graph B
 - Graph C
 - None of the above
10. A high jumper leaves the ground with an initial velocity of 10 m/s rightward at an angle of 15° . What is the high jumper's initial horizontal velocity?

11. In the homecoming game, the field goal kicker attempts to make a 47 yard (43 m) field goal. He kicks with an initial velocity of 15 m/s at an angle of 60° and the ball is in the air for 6 s. Does he make the field goal?

4.4 Newton's Three Laws Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

Use the following prompt for questions #1-4:

A book rests on a table.

- Which of the following describes a contact force acting on the book?
 - The force of Earth's gravity acting downward on the book
 - The normal force of the table acting upward on the book
 - The force of air resistance acting on the book
 - The force of friction acting on the book
- Which of the following describes a force acting from a distance on the book?
 - The force of Earth's gravity acting downward on the book
 - The normal force of the table acting upward on the book
 - The electrical force acting on the book
 - The magnetic force acting on the book
- What is the net force acting on the book?
 - The net force is zero
 - The net force >1 N
 - The net force <1 N
 - Not enough information is provided to answer the question
- Which of the following statements correctly describes the motion of the book according to Newton's First Law?
 - The book will begin to speed up if the net force is zero
 - The book will start to slow down if the net force is zero
 - The book will remain at rest if there is a net force
 - The book will remain at rest if the net force is zero

Use the following prompt for questions #5-6:

A 7 lb bowling ball accelerates at a rate of 7 m/s².

- If the net force on the bowling ball is tripled, what will be its new acceleration?
 - 2.3 m/s²
 - 7 m/s²
 - 14 m/s²

- d. 21 m/s^2
6. If the mass of the bowling ball is doubled, what will be its new acceleration?
- 2.3 m/s^2
 - 3.5 m/s^2
 - 7 m/s^2
 - 14 m/s^2

Use the following prompt for questions #7-9:

A +10 N rightward net force is applied to a 5kg object moving leftward.

7. What is the resulting acceleration?
8. Does the object speed up or slow down? Explain the reason for your answer.
9. If the velocity of the object at $t = 0 \text{ s}$ was -20 m/s leftward, what would the velocity be at $t = 1 \text{ s}$?
10. What net force is required to accelerate a 100 kg object from 3 m/s to 6 m/s in 1.5 s ?
- 80 N
 - 180 N
 - 200 N
 - 450 N
11. What is the net force on a 400 kg car that is stopping at a red light if it goes from 12 m/s to 0 m/s in 2 s ?
- 6000 N
 - 4800 N
 - 3600 N
 - 2400 N
12. A sled is pulled with a net force of 60 N , causing it to increase its velocity 3 m/s in 7 s . What is the mass of the sled?
13. The acceleration due to gravity on the moon is 1.6 m/s^2 . If an astronaut weighs 96 N on the moon, what is the astronaut's mass on Earth?

Use the following prompt for questions #14-15:

A book is resting on a table.

For each of the following forces acting on the book, identify the properties of the reaction force pair according to Newton's third law of motion.

14. Action: A downward gravitational force from the Earth acting on the book.

15. Action: An upward normal force from the table acting on the book.

Use the following prompt for questions #16-17:

A normal force of +10 N from a table acts on a book.

16. What is the countering force to the force described above?
 - a. -10 N normal force from the book on the table
 - b. +10 N normal force from the book on the table
 - c. -10 N gravitational force from the Earth on the book
 - d. +10 N gravitational force from the Earth on the book
17. What is the reaction pair force according to Newton's 3rd law of motion?
 - a. -10 N normal force from the book on the table
 - b. +10 N normal force from the book on the table
 - c. -10 N gravitational force from the Earth on the book
 - d. +10 N gravitational force from the Earth on the book

For question #18-20, solve for the net force in each of the following situations:

18. A 0.1 kg book is resting on a table.
 - a. The net force is 0 N
 - b. The net force is +1 N
 - c. The net force is +10 N
 - d. The net force is +100 N
19. A 0.1kg book is sliding rightward on a table with a constant acceleration of 2m/s^2 .
 - a. The net force is 0 N
 - b. The net force is +0.2 N
 - c. The net force is +2 N
 - d. The net force is +20 N
20. What is the reaction force to the downward gravitational force on the book from the Earth?
 - a. The upward gravitational force from the book on the Earth
 - b. The downward gravitational force on the book from the Earth
 - c. The upward normal force on the book from the table
 - d. The downward normal force on the table from the book

5.5 Forces in Two Dimensions Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

Use the following prompt for questions #1-5.

Diane picks up a 10 kg box with an upward acceleration of $+2 \text{ m/s}^2$.

1. Draw a free body diagram to illustrate all the forces acting on the box.
2. What is the magnitude and direction of the force due to Earth's gravity acting on the box?
 - a. -10 N downward
 - b. +20 N upward
 - c. -100 N downward
 - d. +120 N upward
3. What is the magnitude and direction of the normal force acting on the box?
 - a. -10 N downward
 - b. +20 N upward
 - c. -100 N downward
 - d. +120 N upward
4. In your own words, explain how the forces acting on the box are responsible for its motion according to Newton's laws.

Use the following prompt for questions #6-7:

A man (105 kg) pulls on a stuck drawer (0.5 kg). The force of static friction on the drawer is 3.5 N and the force of kinetic friction on the drawer is 2.6 N.

6. What is the coefficient of static friction on the drawer?
7. What is the coefficient of kinetic friction on the drawer?

Use the following prompt for questions #8-10:

A 14lb (6.35kg) bowling ball is sliding down a 5 meter frictionless ramp with an incline of 25 degrees at a constant speed.

8. What is the weight of the bowling ball?
 - a. 14 lbs
 - b. 6.35 kg
 - c. -26.8 N
 - d. -63.5 N
9. What is the normal force on the bowling ball?
 - a. -26.8 N
 - b. +26.8 N
 - c. -63.5 N
 - d. +63.5N
10. What is the acceleration of the bowling ball?
 - a. 0 m/s^2
 - b. 6.35 m/s^2
 - c. 26.8 m/s^2
 - d. 63.5 m/s^2

Use the following prompt for questions #11-13:

An Olympic skier of mass 80 kg skies down a slope of 25 degrees with an acceleration of 4.1 m/s^2 .

11. What is the weight of the skier?
 - a. 80 kg
 - b. -80 N
 - c. 800 kg
 - d. -800N
12. What is the normal force on the skier?
 - a. +72.5 N
 - b. +725 N
 - c. +80 N
 - d. +800 N
13. What is the force of friction on the skis?
 - a. +5 N
 - b. +10 N
 - c. +15 N
 - d. +25 N

Use the following prompt for questions #14-16:

A car is driving around a race track.

14. The centripetal force on the car is due to

- a. The force of gravity
 - b. The force of friction
 - c. The normal force
 - d. The tension force of a rope
15. The direction of the centripetal force on the car is
- a. Downward
 - b. Upward
 - c. Clockwise
 - d. Toward the center of the circular track
16. The direction of the car's acceleration is
- a. Downward
 - b. Upward
 - c. Clockwise
 - d. Toward the center of the circle
17. Clark Griswold travels in a 1000kg car with his family and can't get off the round-a-bout, traveling at a constant speed of 11 m/s in a circle with a radius of 35m. Calculate the magnitude and direction of the centripetal acceleration.

Use the following prompt for questions #18-20.

Spiderman (mass=77.3 kg) hangs at rest from two strings of a web. String A has a tension force of 400N and an angle of 45 degrees. String B has a tension force of 565.6N at an angle of 60 degrees.

18. Draw a free body diagram illustrating all the forces acting on Spiderman.
19. Use your understanding of Newton's 2nd Law to prove that the net force in the horizontal (x) dimension is zero.
20. Use your understanding of Newton's 2nd Law to prove that the net force in the vertical (y) dimension is zero.
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6.5 Work and Energy Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

1. In physics, work is
 - a. Decreased by using a simple machine
 - b. Measured in Newtons
 - c. The product of force and distance
 - d. Both A B
2. A Joule is a unit of measurement for which of the following
 - a. Energy
 - b. Work
 - c. Force
 - d. Both A B

Use the following prompt to answer questions #3-4:

You are working at a local grocery store stocking shelves. You have ten 15kg boxes to lift onto a shelf 3m above the ground.

3. How much work will you need to perform?
4. You use a 6 m inclined plane to help you lift the boxes to the shelf. Now how much work will you need to perform?

Use the following prompt for questions #5-6:

A 2500 kg boulder rests at the top of a mountain, 200 m above the ground.

5. How much Potential Energy does the boulder have at the top of the mountain?

6. How much work did it take to roll the boulder to the top of the mountain?

Use the following prompt for questions #7-8:

Two dogs, Spot and Fluffy, are in their backyard. Spot has a mass of 30 kg and is resting on a 1 m high bench. Fluffy is 24 kg and is chasing after a ball at 5 m/s rolling on the ground.

7. Which dog has more kinetic energy?
- Spot
 - Fluffy
 - Both have the same amount of kinetic energy
 - Neither of the dogs have kinetic energy
8. Which dog has more potential energy?
- Spot
 - Fluffy
 - Both have the same amount of potential energy
 - Neither of the dogs have potential energy
9. A mover applies a 300N force to push a box at a constant speed 4 meters across a carpeted floor. What is the work done by friction on the box?
- 300 N
 - +300 N
 - +1200 J
 - 1200 J

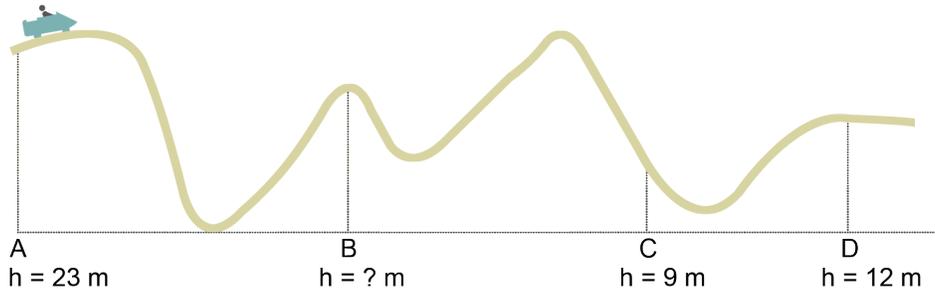
Use the following prompt for questions #10-11:

A car with a mass of 1670 kg travels on the highway at a velocity of 30 m/s.

10. Calculate the car's kinetic energy.
11. Calculate the car's potential energy.

Use the following prompt for questions #12-16:

The roller coaster cart depicted below begins from rest at Point A with a total mechanical energy of 41,400 J and ends at Point D. Assume no energy is lost due to dissipative forces such as friction.



12. What is the mass of the cart?
 - a. 23 kg
 - b. 41.4 kg
 - c. 180 kg
 - d. not enough information to determine
13. What is the total mechanical energy at Point B?
 - a. 23,000 J
 - b. 41,400 J
 - c. 180,000 J
 - d. not enough information to determine
14. If the velocity at Point B is $+10 \text{ m/s}$, what is the height of the roller coaster at Point B?
 - a. 18 m
 - b. 180 m
 - c. 1800 m
 - d. not enough information to determine
15. What is the total mechanical energy at Point C?
 - a. 23,000 J
 - b. 41,400 J
 - c. 180,000 J
 - d. not enough information to determine
16. What is the velocity of the roller coaster at Point C?
 - a. $+3.3 \text{ m/s}$
 - b. $+7.5 \text{ m/s}$
 - c. $+16.7 \text{ m/s}$
 - d. not enough information to determine
17. How much work is needed to keep a 60-Watt light bulb lit each second?
 - a. 6 J
 - b. 60 J
 - c. 600 J
 - d. 6000 J
18. How much energy is needed to keep a 60-Watt light bulb lit each second?
 - a. 6 J
 - b. 60 J
 - c. 600 J
 - d. 6000 J

Use the following prompt for questions #19-20

Susie ($m=60$ kg) and Jan ($m=60$ kg) climb three flights of stairs (18 m) to attend their physics class. Susie arrives in 60 seconds and Jan arrives in 30 seconds.

19. Which person does the most work, Susie or Jan? Explain.

20. Which person uses the most power, Susie or Jan? Explain.

7.5 Momentum Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- If the mass of an object is doubled, then its momentum will
 - Double
 - Triple
 - Be halved
 - Stay the same
- If the velocity of an object is halved, then its momentum will
 - Double
 - Triple
 - Be halved
 - Stay the same
- For a 25 kg object to have the same momentum as a 5kg object, the 25kg object must have
 - a greater velocity than the 5kg object
 - a smaller velocity than the 5kg object
 - the same velocity as the 5kg object
 - Not enough information to determine
- What is the momentum of a 0.5 kg football thrown -5 m/s to the left?
 - 0.5 kg•m/s
 - 2.5 kg•m/s
 - 15 kg•m/s
 - 30 kg•m/s
- What is the velocity of a 2000 kg truck with a momentum of 48,000 kg•m/s ?
 - 0.2 m/s
 - 3 m/s
 - 24 m/s
 - 43 m/s
- What is the mass of a baseball with a velocity of 30 m/s and a momentum of 6 kg•m/s ?
 - 0.2 m/s
 - 3 m/s
 - 8 m/s
 - 16 m/s

Use the following prompt for question #7-10:

A 0.5 kg bowl falls with an initial velocity of -1.5 m/s and lands on the hard wood floor. The same type of bowl falls with the same initial velocity and lands on the carpet.

7. Which bowl experiences a greater change in **momentum**?
 - a. The bowl that lands on the hard wood floor
 - b. The bowl that lands on the carpet
 - c. They both experience the same change in momentum
 - d. Not enough information is provided
8. Which bowl experiences a greater **impulse**?
 - a. The bowl that lands on the hard wood floor
 - b. The bowl that lands on the carpet
 - c. They both experience the same impulse
 - d. Not enough information is provided
9. Which bowl experiences a greater contact **force** with the floor?
 - a. The bowl that lands on the hard wood floor
 - b. The bowl that lands on the carpet
 - c. They both experience the same magnitude of contact force with the floor
 - d. Not enough information is provided
10. Which collision occurs over the longest **time** interval?
 - a. The bowl that collided with the hard wood floor
 - b. The bowl that collided with the carpet
 - c. They both experience the same collision time
 - d. Not enough information is provided

Use the following prompt for questions #11-12:

A toy dart gun shoots a dart.

11. What is the initial total momentum of the system?
 - a. $0 \text{ kg}\cdot\text{m/s}$
 - b. $+2 \text{ kg}\cdot\text{m/s}$
 - c. $+3 \text{ kg}\cdot\text{m/s}$
 - d. not enough information to determine
12. What is the final total momentum of the system?
 - a. $0 \text{ kg}\cdot\text{m/s}$
 - b. $+2 \text{ kg}\cdot\text{m/s}$
 - c. $+3 \text{ kg}\cdot\text{m/s}$
 - d. not enough information to determine
13. If the initial total momentum of a tennis ball and tennis racket is $+10 \text{ kg}\cdot\text{m/s}$, then the final total momentum of the system after the racket hits the ball must be
 - a. $-5 \text{ kg}\cdot\text{m/s}$
 - b. $+5 \text{ kg}\cdot\text{m/s}$
 - c. $-10 \text{ kg}\cdot\text{m/s}$
 - d. $+10 \text{ kg}\cdot\text{m/s}$
14. The total initial momentum of a bat and ball is $+80 \text{ kg}\cdot\text{m/s}$ before they collide. If the ball's final momentum after the collision is $+72 \text{ kg}\cdot\text{m/s}$, determine the bat's final momentum.

15. If two objects collide and stick together, the collision can be categorized as
- Elastic
 - Inelastic
 - Perfectly elastic
 - None of the above
16. The kinetic energy of a system is conserved in which type of collision?
- Elastic
 - Inelastic
 - Perfectly inelastic
 - None of the above

Use the following prompt for questions # 17-20:

A clay ball (mass=0.25kg) has a rightward momentum of +1.75 kg•m/s. A second clay ball (mass =0.25 kg) has a leftward momentum of -1.75 kg•m/s. The two collide, stick together, and come to a complete stop after the collision.

17. What was the total energy of the system before the collision?
- 0 J
 - 6.13 J
 - 12.25 J
 - Not enough information to determine
18. What was the total energy of the system after the collision?
- 0 J
 - 6.13 J
 - 12.25 J
 - Not enough information to determine
19. What was the total momentum before the collision?
- 0 kg•m/s
 - 6.13 kg•m/s
 - 12.25 kg•m/s
 - Not enough information to determine
20. What was the total momentum after the collision?
- 0 kg•m/s
 - 6.13 kg•m/s
 - 12.25 kg•m/s
 - Not enough information to determine
14. momentum = total final momentum
+80 kg•m/s = +80 kg•m/s
+80 kg•m/s = +72 kg•m/s + p_{bat}
 p_{bat} = +8 kg•m/s

8.5 Statics Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- The rotational inertia of a rotating object depends on
 - Mass
 - Mass distribution
 - Rate of rotation
 - Both A B
- What happens to the **angular velocity** of a rotating object when the center of mass is moved closer to its axis of rotation?
 - It decrease
 - It increases
 - It remains the same
 - None of the above
- A gyroscope has a
 - high rotational inertia
 - low rotational inertia
 - no rotational inertia
 - none of the above
- What is the angular momentum of a 3 kg ball rolling down a hill with an angular velocity of 4 rad/s and a rotational inertia of $15 \text{ kg}\cdot\text{m}^2$?
 - $3 \text{ kg}\cdot\text{m}^2/\text{s}$
 - $12 \text{ kg}\cdot\text{m}^2/\text{s}$
 - $45 \text{ kg}\cdot\text{m}^2/\text{s}$
 - $60 \text{ kg}\cdot\text{m}^2/\text{s}$
- A diver rotates twice each second and reduces her rotational inertia by a factor of three, what is her resulting angular velocity.
 - 2 rev/s
 - 3 rev/s
 - 6 rev/s
 - 18 rev/s
- Which of the following are basic requirements for torque
 - Force
 - Lever arm
 - Both A B
 - None of the above
- What length lever arm will produce a torque of $6000 \text{ N}\cdot\text{m}$ by applying a perpendicular force of 300N to it?

- a. 2 m
 - b. 20 m
 - c. 200 m
 - d. 2000 m
8. Which of the wrenches below produces the greatest torque if 100N of perpendicular force is applied?
- a. a wrench with a 0.05 m lever arm
 - b. a wrench with a 0.5 m lever arm
 - c. a wrench with a 1 m lever arm
 - d. all the wrenches above have produce the same torque
9. An object is rotating at a constant angular velocity of 25 rev/s. What is the net torque on the object?
- a. 0 N•m
 - b. 10 N•m
 - c. 100 N•m
 - d. not enough information to determine
10. Calculate the torque produced by a 120 N force applied perpendicular to a 0.5 m lever arm.
11. If an object has **zero net force** and **zero net torque**, it has achieved which of the following?
- a. Translational equilibrium
 - b. Rotational equilibrium
 - c. Static equilibrium
 - d. All of the above
12. **Translational equilibrium** requires
- a. A net force
 - b. A net torque
 - c. A net force of zero
 - d. A net torque of zero
13. **Rotational equilibrium** requires
- a. A net force
 - b. A net torque
 - c. A net force of zero
 - d. A net torque of zero
14. A system in **static equilibrium** is
- a. at rest
 - b. stable
 - c. both B C
 - d. none of the above
15. Sonia and Jeff are playing at the local park. Sonia has a mass of 40 kg and sits 1.2 m from the center axis of a seesaw. Jeff has a mass of 55 kg and comes over to the seesaw. Where should Jeff sit in order for the seesaw to be in rotational equilibrium?

9.4 Newton's Universal Law of Gravity Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

1. According to Kepler's First Law of Motion, which of the following correctly describes the shape of the orbital path of a planet around the sun?
 - a. A circle with the set of all points that are equal distant from a single point
 - b. A circle with the sun at one of the foci
 - c. An ellipse with the sun at one of the foci
 - d. An ellipse with the set of all points that are equal distant from a single point
2. Which of the following statements is consistent with Kepler's Second Law of Motion?
 - a. A planet will move at a slower speed when positioned closer to the sun
 - b. A planet will move at a faster speed when positioned closer to the sun
 - c. A planet will move at a constant speed during its orbit around the sun
 - d. None of the above
3. Kepler's third law relates the radius of an orbit to
 - a. the time it takes to complete one orbit
 - b. the period of an orbit
 - c. Both A B
 - d. None of the above
4. One Astronomical Unit is equal to
 - a. the average distance from the Earth to the sun
 - b. the average distance from the Earth to Mars
 - c. one light year
 - d. none of the above
5. According to Kepler's Third Law of Motion, the period of a planet around the sun is related to
 - a. The planet's distance from the sun
 - b. The planet's mass
 - c. Both A B
 - d. None of the above
6. Which of the following equations accurately depicts Kepler's Third Law of Motion?
 - a. $F_{Net} = ma$
 - b. $PE = mgh$
 - c. $T^2 = kr^3$
 - d. $y = mx + b$
7. According to Kepler's Third Law of Motion, if the period of the Earth around the sun is one year, then
 - a. Kepler's constant "k" must be equal to one

- b. The distance of the Earth to the sun must be one astronomical unit
 - c. Both A B
 - d. None of the above
8. Use Kepler's Third Law of Motion to solve for the period of Mercury around the sun, in years, if the distance from Mercury to the sun is 0.39 AU.
9. According to Newton's Universal Law of Gravity, the force acting on an apple as it falls from a tree
- a. is the same force acting on the moon
 - b. is the force due to gravity
 - c. is equal to the mass of the apple multiplied by the gravitational constant on Earth (g)
 - d. all of the above
10. Which of the following describes the moon's orbit around the Earth according to the Universal Law of Gravity?
- a. The moon is falling around the Earth
 - b. The moon's tangential velocity is large enough to keep it moving around the Earth
 - c. The moon is traveling at a constant speed around the Earth
 - d. All of the above
11. If the Earth were twice as massive, then the force of gravity between you and the Earth would
- a. Double
 - b. Quadruple
 - c. Decrease by $1/2$
 - d. Decrease by $1/4$
12. If you were twice as far from the center of the Earth as you are now, then the force of gravity between you and the Earth would
- a. Double
 - b. Quadruple
 - c. Decrease by $1/2$
 - d. Decrease by $1/4$
13. Which of the following statements correctly describes the force of gravity between the Earth and a desk?
- a. The Earth pulls down on the desk with a force due to gravity
 - b. The desk pulls up on the Earth with a force due to gravity
 - c. The magnitude of the force due to gravity on the Earth and desk are equal
 - d. All of the above
14. What is the distance from the center of the Earth of a satellite orbiting at a distance a third of the Earth's radius (R_e)?
- a. $0.3 R_e$
 - b. R_e
 - c. $1.3 R_e$
 - d. $3 R_e$
15. What is the acceleration of a satellite orbiting at a distance a third of the Earth's radius (R_e)?
- a. 1 m/s^2
 - b. 2 m/s^2
 - c. 4 m/s^2
 - d. 6 m/s^2

10.5 Periodic Motion Chapter Test

Chapter Test

Name _____ Class _____ Date _____

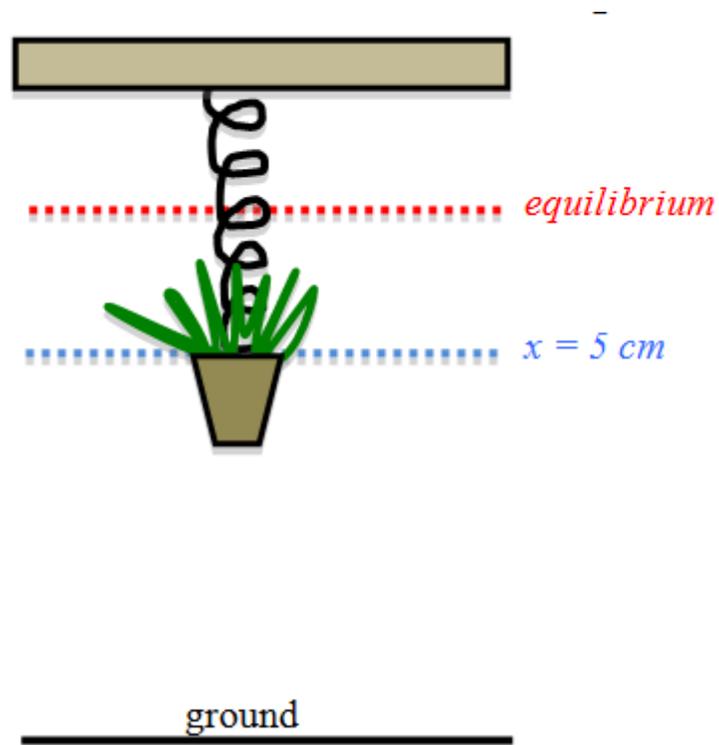
Answer each of the questions below to show your achievement of the lesson objectives.

- Which of the following exhibit periodic motion?
 - heart beat
 - rocking chair
 - a vibrating tuning fork
 - all of the above
- The Earth's orbit around the sun can be described as .
 - Periodic motion
 - Simple harmonic motion
 - Both A B
 - None of the above
- The restorative force on an object exhibiting simple harmonic motion is always
 - In the opposite direction of the object's displacement
 - Directly proportional to the object's displacement
 - Inversely proportional to the object's displacement
 - Both A B
- The restorative force causes an object in simple harmonic motion to
 - Move towards the point of equilibrium
 - Move away from the point of equilibrium
 - Remain at rest
 - None of the above
- What is the shape of a position-time (x-t) graph for an object in simple harmonic motion?
 - Parabola
 - Sinusoidal curve
 - Line
 - None of the above
- Which of the following objects does not exhibit simple harmonic motion?
 - A mass on a spring
 - A simple pendulum
 - The Earth rotating around the sun
 - Both A B
- Which of the following variables affect the period (T) of a mass-spring system?
 - the mass
 - the spring constant

- c. the distance the spring is stretch
- d. A and B only

Use the following prompt for questions #8-12:

A 7 kg plant is hung from a spring hook and causes the spring to stretch 5 cm as illustrated in the diagram below.



8. What is magnitude of the restoring force on this plant-spring system?
 - a. 0.05 N
 - b. 7 N
 - c. 70 N
 - d. 1400 N
9. What is the direction of the restoring force on this plant-spring system?
 - a. Upward
 - b. Downward
 - c. Leftward
 - d. Rightward
10. What is the spring constant (k) of the spring?
 - a. 0.05 N/m
 - b. 7 N/m
 - c. 70 N/m
 - d. 1400 N/m
11. What is the period (T) of the plant-spring system?
 - a. 0.07 s
 - b. 0.2 s
 - c. 0.4 s

- d. 2.5 s
12. What is the frequency (f) of the plant spring system?
- 0.07 s
 - 0.2 s
 - 0.4 s
 - 2.5 s
13. Which of the following variables affect the period (T) of a simple pendulum?
- the mass of the pendulum bob
 - the length of the string
 - the displacement of the pendulum bob
 - none of the above
14. The shape of the position-time (x - t) graph for a simple pendulum will be
- Parabola
 - Sinusoidal curve
 - Line
 - None of the above
15. Which of the following simple pendulums has the greatest period?
- A 5 kg mass attached to a 0.5 m long string
 - A 5 kg mass attached to a 1 m long string
 - A 10 kg mass attached to a 1.5 m long string
 - A 10 kg mass attached to a 2 m long string
16. Which of the following simple pendulums has the highest frequency?
- A 5 kg mass attached to a 0.5 m long string
 - A 5 kg mass attached to a 1 m long string
 - A 10 kg mass attached to a 1.5 m long string
 - A 10 kg mass attached to a 2 m long string
17. Which of the following is transferred by a wave?
- Particles
 - Mass
 - Energy
 - A medium
18. A light wave is a
- Longitudinal wave
 - Transverse wave
 - Stationary wave
 - None of the above
19. A sound wave is a
- Longitudinal wave
 - Transverse wave
 - Stationary wave
 - None of the above
20. Echoes are produced as a result of sound wave
- Reflection
 - Refraction
 - Diffraction
 - None of the above

11.5 Vibrations and Sound Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

1. A sound wave is a
 - a. mechanical wave
 - b. longitudinal wave
 - c. transfer of energy
 - d. All of the above
2. Sound waves are classified as
 - a. longitudinal waves because they cause particles to vibrate perpendicular to the direction the wave travels
 - b. transverse waves because they cause particles to vibrate parallel to the direction the wave travels
 - c. mechanical waves because they require a medium in which to travel through
 - d. electromagnetic waves because they can travel through empty space
3. Two waves with the same wavelength, period and amplitude of 15 cm constructively interfere. Calculate the resultant amplitude of their superposition.
4. Which of the following statements correctly describes sound wave interference?
 - a. all sound waves are in phase
 - b. all sound waves are out of phase
 - c. one sound wave can cancel out another sound wave
 - d. sound wave interference will always result in a louder noise

Use the image of Wave A below, which depicts a wave on a guitar string, to answer questions #5-9:

5. What is the wavelength of the Wave A?
 - a. 1 m
 - b. 2 m
 - c. 3 m
 - d. 4 m
6. If the frequency is 2000 Hz, what is the wave speed?
 - a. 1000 m/s
 - b. 2000 m/s
 - c. 3000 m/s
 - d. 4000 m/s
7. If the frequency increases to 12,000 Hz, what is the resulting wave speed?
 - a. 4,000 m/s

- b. 8,000 m/s
 - c. 16,000 m/s
 - d. 24,000 m/s
8. If the frequency decreases to 1000 Hz, what is the resulting wavelength?
- a. 1 m
 - b. 2 m
 - c. 3 m
 - d. 4 m
9. Which of the following statements correctly describes the affect on the wave speed, wavelength, and frequency of this wave as it travels from the guitar string, through the air, and into the guitarist's ear.
- a. The wave speed will remain the same, and the frequency will increase as the wavelength decreases.
 - b. The wave speed will remain the same, and the frequency will decrease as the wavelength increases.
 - c. The frequency will remain the same, and the wave speed will increase and the wavelength increases.
 - d. The frequency will remain the same, and the wave speed will decrease as the wavelength decreases.
10. Which of the following conditions below are necessary for resonance?
- Natural frequency
Forced vibration frequency matching the natural frequency
Increase in Amplitude
- a. I only
 - b. I II only
 - c. I, II, III
 - d. None of the above
11. Which of the following examples utilizes the principle of resonance?
- a. An opera singer breaking a wine glass with only their voice
 - b. One tuning fork being sent into motion by an identical vibrating tuning fork
 - c. A parent pushing a child on a swing and increasing their amplitude
 - d. All of the above

Use the following prompt for questions #12:

A guitar string that is 0.7 m long has fundamental frequency of 392 Hz.

12. Create a sketch of the standing wave on this guitar string in the second harmonic.
13. Calculate the speed of the wave on this guitar string in the second harmonic.
14. When this guitar string vibrates in the second harmonic, it creates a sound wave in air, traveling at 343 m/s. What is the frequency of this sound wave?
- a. 240.1 Hz
 - b. 274.4 Hz
 - c. 392 Hz
 - d. 490 Hz

Use the image of a standing wave produced in a pipe closed at one end to answer questions #15-16:

15. How many antinodes are present in the standing wave illustrated above?

- a. Zero
 - b. One
 - c. Two
 - d. Three
16. What is the harmonic of the standing wave illustrated above?
- a. First
 - b. Third
 - c. Fifth
 - d. Seventh
17. When a sound source approaches an observer, the waves become compressed and result in
- a. shorter wavelengths
 - b. lower frequencies
 - c. slower wave speed
 - d. all of the above
18. When a sound source moves away from an observer, the waves spread out and result in
- a. shorter wavelengths
 - b. lower frequencies
 - c. slower wave speed
 - d. all of the above

Use the following prompt for questions #19-20:

An ambulance is driving at a velocity of 10 m/s with its siren blaring at 800 Hz.

19. Calculate the frequency you hear as it drives towards you.
- 20.
- 21.
22. Calculate the frequency you hear as it drives away from you.

12.6 Fluid Mechanics Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

1. What is the density of a piece of silver with a mass of 31.5 grams and a volume of 3 cm^3 ?
 - a. 10.5 kg/m^3
 - b. 105 kg/m^3
 - c. $1,050 \text{ kg/m}^3$
 - d. $10,500 \text{ kg/m}^3$
2. An object that is less dense than water will
 - a. float
 - b. have a specific gravity less than one
 - c. sink
 - d. Both A B
3. Pressure is the same as
 - a. Force
 - b. Force divided by area
 - c. Weight
 - d. The sum of the density of a liquid and the depth
4. The pressure of a liquid increases with
 - a. Density
 - b. Depth
 - c. Volume
 - d. Both A B
5. Which of the following liquids at rest exerts the greatest pressure?
 - a. A small bowl of freshwater 10 cm deep
 - b. A large tub of freshwater 15 cm deep
 - c. A small glass of freshwater 25 cm deep
 - d. A large puddle of freshwater 5 cm deep
6. The Earth's atmosphere
 - a. Exerts a pressure
 - b. Has a weight
 - c. Increases density as it approaches sea level
 - d. All of the above
7. A barometer can be used to measure
 - a. Atmospheric pressure
 - b. Gauge pressure

- c. Total pressure
 - d. Absolute pressure
8. Which of the following statements accurately describes how atmospheric pressure allows a person to drink through a straw?
- a. There is a sucking force greater than atmospheric pressure that pulls up on the liquid in a straw
 - b. The atmospheric pressure pushes down on the liquid around the straw
 - c. A straw has a vacuum force that pulls up on the liquid
 - d. None of the above
9. As the number of air molecules above you decreases, the atmospheric pressure
- a. Increase
 - b. Decreases
 - c. Stays the same
 - d. Not enough information to determine
10. To pump up a tire, you must rely on
- a. Atmospheric pressure
 - b. Gauge pressure
 - c. Both A B
 - d. None of the above
11. What is the total pressure of a tire with a gauge pressure of $151,685 \text{ N/m}^2$
- a. $1.01 \times 10^5 \text{ N/m}^2$
 - b. $2.53 \times 10^5 \text{ N/m}^2$
 - c. $5.10 \times 10^5 \text{ N/m}^2$
 - d. $7.32 \times 10^5 \text{ N/m}^2$
12. Hydraulic machines rely on the principle that
- a. atmospheric pressure is always $101,325 \text{ Pa}$
 - b. pressure in a fluid increases equally in all areas
 - c. a submerged object experiences an upward buoyant force
 - d. the pressure of a liquid increases with density
13. A car crusher pushes down with a force of 5000 N on a 3 m^2 input piston, producing a force of $50,000 \text{ N}$ to crush an old car. What is the area of the output piston?

Use the following prompt for questions #14-16:

An 0.7 m^3 iron sphere with a density of 7870 kg/m^3 is about to be dropped into a large pool of water with a density of 1000 kg/m^3 .

14. Calculate the buoyant force on the sphere when it is fully submerged in the water.
15. According to Archimedes' Law, the weight of water the sphere displaces when it is fully submerged is
- a. $5,509 \text{ N}$
 - b. 7000 N
 - c. 7870 N
 - d. $55,090 \text{ N}$

16. Will the iron sphere sink or float when it is dropped into the pool? Provide evidence for your answer.
17. According to Bernoulli's principle, an increase in the speed of a fluid results in
- An increase in pressure
 - A decrease in pressure
 - Increase in density
 - Decrease in density
18. A tornado causes the roof of a house to pop off because
- The velocity of the air above the roof is greater than the velocity of the air below the roof
 - The velocity of the air above the roof is less than the velocity of the air below the roof
 - The pressure of the air above the roof is greater than the pressure of the air below the roof
 - None of the above

13.6 Heat Chapter Test

Chapter 13 Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- When liquid is heated it always
 - contracts
 - expands
 - evaporates
 - sublimates
- The atoms in your desk
 - are motionless
 - are vibrating back and forth in place
 - are free to move around each other
 - move freely in any direction
- Temperature is
 - only used to determine the amount of heat in a liquid
 - inversely proportional to the average kinetic energy of the atoms in an object
 - the energy transferred between two objects
 - the measurement that describes how hot or cold an object is
- Convert the 271.9 Kelvin to the centigrade (Celsius) scale.
- Which of the following would most likely be at a temperature of 271.9K?
 - Water Boiling
 - Body Temperature
 - Room Temperature
 - Snow falling
- Which of the following statements correctly describes the relationship between temperature and kinetic energy?
 - Temperature is the measure of the total kinetic energy of all the atoms in an object
 - Temperature is the measure of the average kinetic energy of the atoms in an object
 - As the temperature of an object increases, the kinetic energy of the atoms in an object decreases.
 - Temperature is independent of the kinetic energy of the atoms in an object

Use the following prompt to answer questions #7-9:

A large bucket of water and a small cup of water are both at 20°C.

- The temperature of the large bucket of water is
 - higher than the temperature of the small cup of water

- b. lower than the temperature of the small cup of water
 - c. the same as the temperature of the small cup of water
 - d. not enough information to determine
8. The average kinetic energy of the atoms in the large bucket of water is
- 9.
 - a. higher than the average kinetic energy of the small cup of water
 - b. lower than the average kinetic energy of the small cup of water
 - c. the same as the average kinetic energy of the small cup of water
 - d. not enough information to determine
10. The internal energy of the large bucket of water is
- a. higher than the internal energy of the small cup of water
 - b. lower than the internal energy of the small cup of water
 - c. the same as the internal energy of the small cup of water
 - d. not enough information to determine
11. When an object heats up it gains,
- 11.
 - a. Mass
 - b. Atoms
 - c. Force
 - d. Energy
12. An object can contain
- a. Heat
 - b. Internal energy
 - c. Work
 - d. All of the above

Use the following prompt to answer questions #12-13:

You hold a mug filled with hot chocolate.

12. Describe the heat transfer between the mug and your hands.
13. Which of the following objects contains the most heat?
- a. The mug
 - b. The hot chocolate
 - c. Your hands
 - d. Heat cannot be contained
14. What is the SI unit for heat?
- 15.
 - a. Calorie
 - b. Joule
 - c. Degrees Celsius
 - d. Degrees Fahrenheit
16. A group of skiers sit near a fireplace in a ski lodge to get warm through the process of

16.
 - a. Conduction
 - b. Convection
 - c. Radiation
 - d. None of the above
17. The second floor of a house is warmer than the basement due to
 - a. Conduction
 - b. Convection
 - c. Radiation
 - d. None of the above
18. A hot seat belt burns your hand as you put it on as a result of
 - a. Conduction
 - b. Convection
 - c. Radiation
 - d. of the above
19. The greater the specific heat value,
 - a. the more heat energy is needed to produce a temperature increase.
 - b. the less heat energy is needed to produce a temperature increase.
 - c. the faster an object will experience a rise in temperature.
 - d. the warmer the object.

14.4 Thermodynamics Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- Which of the following statements correctly describes the Ideal Gas Law?
 - No gas exactly follows the Ideal Gas Law
 - Temperature in the Ideal Gas Law must be expressed in Kelvin
 - One mole of an ideal gas at standard temperature and pressure occupies 22.4 liters
 - All of the above
- The Ideal Gas Law is applicable at
 - High temperature; low pressure
 - High temperature; high pressure
 - Low temperature, low pressure
 - Low temperature, high pressure
- According to the Ideal Gas Law, what happens to the volume of a gas as pressure increases and the temperature is held constant?
 - It Increases
 - It Decreases
 - It remains the same
 - Not enough information to determine
- What would be the temperature of 1.2 moles of an ideal gas if it had a pressure of 1.25 atm in a 20 L tank?
 - 19°C
 - 0°C
 - 273 K
 - 293 K
- The first law of thermodynamics states that the total internal energy of a system is dependent on
 - Heat and work
 - A Heat reservoir
 - Pressure inside a cylinder
 - None of the above
- A thermodynamic process that takes place at constant temperature is called a
 - Isobaric process
 - Isochoric process
 - Isothermal process
 - Adiabatic process
- A system in which both mass and energy may enter or leave is a(n)
 - Isolated system

- b. Closed system
 - c. Open system
 - d. None of the above
8. The transfer of energy due to a temperature difference is referred to as
- a. Heat
 - b. Work
 - c. Both A B
 - d. None of the above
9. The internal energy of a system will increase when
- a. Heat flows out of the system
 - b. Work is done on the system
 - c. The system does work on the environment
 - d. None of the above
10. Which of the following equations correctly represents the change in internal energy when heat flows into a system?
- a. $\Delta U = +Q$
 - b. $\Delta U = -Q$
 - c. $\Delta U = -Q - W$
 - d. $\Delta U = 0$
11. Which of the following equations correctly represents the change in internal energy when work is done by a system?
- a. $\Delta U = +W$
 - b. $\Delta U = -W$
 - c. $\Delta U = -Q - W$
 - d. $\Delta U = 0$
12. A heat reservoir can be used to maintain the system at constant
- a. Temperature
 - b. Pressure
 - c. Volume
 - d. All of the above
13. Calculate the change in the internal energy of a system that does 650 J of work as a heat reservoir transfers 250 J of energy into the system.
14. Second law of thermodynamics is based on
- a. Heat flow from cold to hot
 - b. Heat flow from high temperatures to low temperatures
 - c. Heat flow from low temperatures to high temperatures
 - d. The fact that all natural processes are reversible
15. Heat engines
- a. Supply heat to an engine from a hot reservoir (substance at a higher temperature)
 - b. Transfer some heat into work
 - c. Transfer some heat to a cold reservoir (some substance at lower temperature)
 - d. All of the above
16. What is the efficiency of a heat engine whose ignition transfers 3.25×10^3 J into the system and exhaust transfers 2.32×10^3 J out of the system?

- a. 10%
 - b. 12%
 - c. 29%
 - d. 43%
17. The Carnot engine shows that the efficiency of a heat engine is related to
- a. The volume of a fuel tank in an engine
 - b. The amount of coal a steam engine can burn
 - c. The high and low temperatures under which the engine operates
 - d. All of the above
18. In all natural processes, the total entropy of a system will always
- a. Increase
 - b. Decrease
 - c. Stay the same
 - d. Not enough information to determine

15.4 Electrostatics Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- Which of the following produces an imbalance of charge?
 - Rubbing two objects together
 - Friction
 - The ground
 - Both A B
- Which of the following statements correctly describes an electron?
 - A particle that carries positive charge
 - Repels negatively charged particles
 - Repels positively charged particles
 - Resides in the nucleus of an atom
- A negatively charged object
 - Contains no electrons
 - Has lost electrons
 - Has gained electrons
 - Has lost protons
- A typical atom is
 - Neutral
 - Positively charged
 - Negatively charged
 - not enough information to determine
- Electrostatic Force is
 - Attractive
 - Repulsive
 - Both A B
 - None of the above
- Which of the following materials would serve as a good insulator?
 - Rubber
 - Glass
 - Metal
 - Both A B
- According to Coulomb's Law, the electrostatic force is directly proportional to the
 - Product of two charges
 - The square of the distance between two charges

- c. Both A B
 - d. None of the above
8. Calculate the magnitude of the electrostatic force between a $4.0\mu\text{C}$ charged particle and a $2.0\mu\text{C}$ charged particle separated by 0.5 meters.
9. The force field that surrounds a charged particle is a(n)
- a. Gravitational field (g)
 - b. Electric field (E)
 - c. Magnetic field (B)
 - d. None of the above
10. If the electric field lines point toward a charge, the charge must be
- a. Negative
 - b. Positive
 - c. Neutral
 - d. Not enough information to determine
11. A charge is placed in an electric field at a point where the magnitude of the electric field is $7.63 \times 10^7 \text{N/C}$. Calculate the magnitude of the electrostatic force acting on the charge.
12. Draw the electric field lines surrounding the charged particles below.



16.6 Electric Potential Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- Which of the following statements correctly describes how a massive object gains gravitational potential energy.
 - A massive object must have a velocity.
 - A massive object must be placed at a height above the Earth.
 - Work must be done on the massive object.
 - Both B C.
- As a charged object moves with the electric field, its electric potential energy will
 - Increase
 - Decrease
 - Convert to kinetic energy
 - Both B C
- The electric potential energy of a charged particle will increase if
 - The amount of charge increases
 - The amount of voltage increase
 - The electric potential increases
 - All of the above
- The unit for electric potential is the
 - Volt (V)
 - Joule (J)
 - Coulomb (C)
 - Newtons/Coulomb (N/C)
- A mass at a height above the Earth has gravitational potential energy just as
 - A charge has electric potential energy
 - A voltage has electric potential energy
 - A charge on a voltage has electric potential energy
 - None of the above
- A 1.5 V battery has
 - 0.75 joules per every 1 coulomb of charge
 - 1.5 joules per every 1 coulomb of charge
 - 3 joules per every 1 coulomb of charge
 - not enough information to determine
- What is the voltage of 2 nC with an electric potential energy of 5 nJ?
 - 1 V

- b. 1.5 V
 - c. 2 V
 - d. 2.5 V
8. The electric potential energy of a charged particle depends on
- a. The gravitational force
 - b. The spring constant (k)
 - c. Its location in an electric field
 - d. The mass of the particle
9. In order to increase the electric potential energy of a charged object in an electric field
- a. work must be done on the charge to move it with the electric field
 - b. work must be done on the charge to move it against the electric field
 - c. work must be done by the charge on the electric field
 - d. no work must be done
10. A material with capacitance has the ability to
- a. do work
 - b. store charge
 - c. store energy
 - d. All of the above
11. An instrument used in many electronic devices to store electric potential energy is
- a. A conductor
 - b. An insulator
 - c. A capacitor
 - d. A dielectric
12. The capacitance of a parallel plate capacitor is directly proportional to the
- a. Area of the conducting plates
 - b. Distance between the conducting plates
 - c. The voltage source
 - d. Both A C
13. A 4 farad capacitor with 2 coulombs of charge has an electric potential difference of
- a. 0.5 V
 - b. 1 V
 - c. 2 V
 - d. 4 V
14. Insulating materials with high polarizability are referred to as
- a. Dielectrics
 - b. Insulators
 - c. Conductors
 - d. Capacitors
15. A parallel plate capacitor is able to store 7pC of charge. How much charge would it be able to store with a paper dielectric ($k=3.3$) inserted between its two plates?
- a. 7 pC
 - b. 17 pC
 - c. 23.1 pC
 - d. 56.7 pC
16. The potential energy stored within the capacitor is the same as

- a. the electric potential
 - b. the electrostatic force
 - c. the work done by a battery
 - d. the work done by the electric field
17. What is the electric potential difference between the two plates of a 1 nanofarad capacitor storing 1 nanojoule of charge?
- a. 1 V
 - b. 1.2 V
 - c. 1.4 V
 - d. 10 V

17.6 Circuits Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- Current is the rate at which charges
 - Move a certain distance along a wire
 - Pass a point on a wire
 - Are used up by a resistor
 - Transform electric potential energy
- Current is the flow of
 - Protons
 - Electrons
 - Neutrons
 - All of the above
- What causes current to flow?
 - An energy source creating an electric potential difference
 - A loop of conducting material that allows charges to flow freely
 - Both A B
 - None of the above
- When 0.4C of charge passes a point along a wire in 2.5 minutes, the current is
 - 0.15 A
 - 1 A
 - 60 A
 - 240 A
- Conventional current describes the flow of
 - Charge in a battery
 - Electrons along a wire
 - Positive charge
 - Negative charge
- Electric resistance is measured in
 - Amperes
 - Volts
 - Ohms
 - Coulombs/Second
- Electrical resistors
 - Promote the flow of charge in a circuit
 - Hinder the flow of charge in a circuit

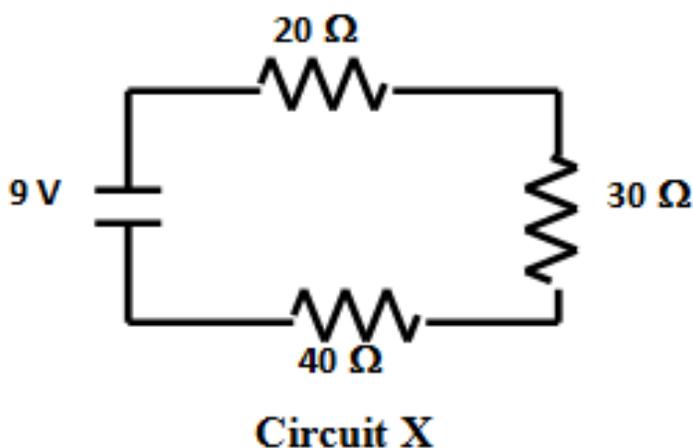
- c. Stop the flow of charge in a circuit
 - d. Do not affect the flow of charge in a circuit
8. If the voltage in a circuit decreases, the current will
- a. Increase
 - b. Decrease
 - c. Stay the same
 - d. Not enough information to determine
9. What is the resistance of a light bulb that carries 0.12A when connected to a 1.5V battery?
- a. 0.18 ohms
 - b. 1 ohms
 - c. 10 ohms
 - d. 12.5 ohms
10. As the resistivity of a material increases, its conductivity
- a. Decrease
 - b. Increases
 - c. Stays the same
 - d. Not enough information to determine.
11. The resistivity of a wire increases as its _____ increases.
- a. Diameter
 - b. Length
 - c. Cross-sectional area
 - d. All of the above
12. A 24-gauge wire is _____ than an 18-gauge wire.
- a. Wider
 - b. Thicker
 - c. More resistive
 - d. More conductive
13. A 12-gauge wire allows a
- a. larger current than a 14-gauge wire
 - b. larger current than a 10-gauge wire
 - c. smaller current than a 18-gauge wire
 - d. smaller current than a 24-gauge wire
14. What is the length of a 10-gauge (5.26mm^2) aluminum wire ($\rho_{\text{aluminum}} = 2.7 \times 10^{-8}$) with a resistance of $4.0 \times 10^{-5}\Omega$?
- a. 2×10^{-10} m
 - b. 8 m
 - c. 1457 m
 - d. 7692 m

Use the chart below to answer question # 15:

15. What is the tolerance of a resistor with a band color sequence of Black, Brown, Brown, Gold?
- a. 0
 - b. 1
 - c. 10Ω
 - d. 5%

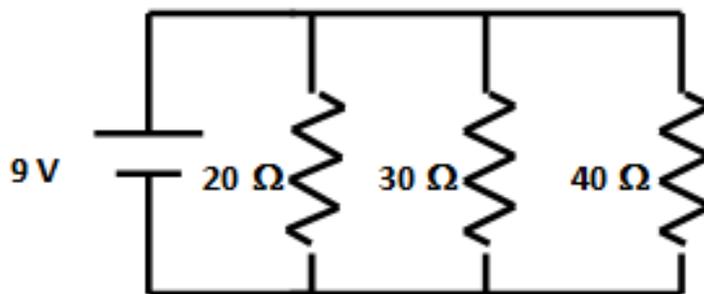
16. Three bulbs are connected in series. What happens if one bulb burns out?
- Only one bulb will go out
 - Only two bulbs will go out
 - All three bulbs will burn out
 - Not enough information to determine
17. The equivalent resistance of this type of circuit is always less than the resistance of any one resistor in the circuit.
- Series
 - Parallel
 - Both A B
 - None of the above
18. Two resistors in parallel will always experience the same
- Current
 - Voltage drop
 - Resistance
 - Capacitance

Refer to the diagram of circuit X below to answer questions #19-21:



19. Calculate the equivalent resistance of circuit X.
20. Calculate the current through the 20Ω resistor in circuit X.
21. Calculate the voltage drop across the 30Ω resistor in circuit X.

Refer to the diagram of circuit Y below to answer questions #22-24:



Circuit Y

22. Calculate the equivalent resistance of circuit Y.
 23. Calculate the current through the 20Ω resistor in circuit Y.
 24. Calculate the voltage drop across the 30Ω resistor in circuit Y.
 25. What would a voltmeter read if it were placed in parallel with the 40Ω resistor in circuit Y?
-

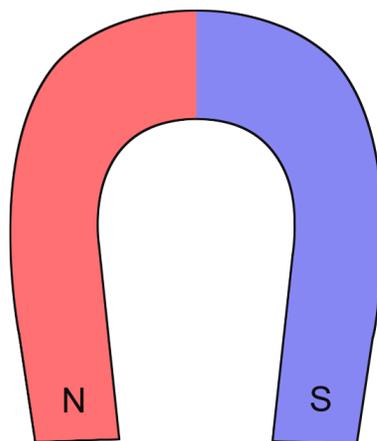
18.5 Magnetism Chapter Test

Chapter Test

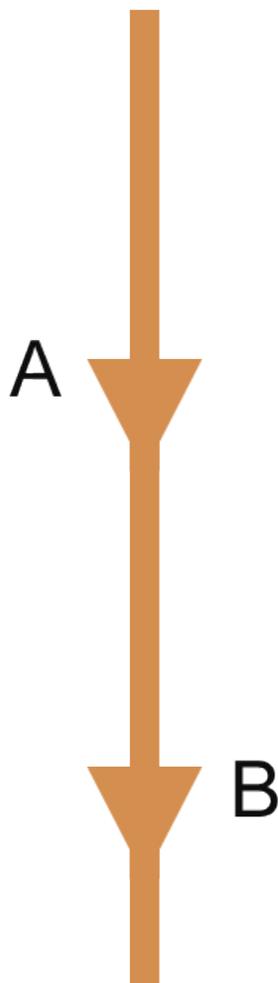
Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

1. Draw the magnetic field lines around the permanent horseshoe magnet made of iron in the space below:

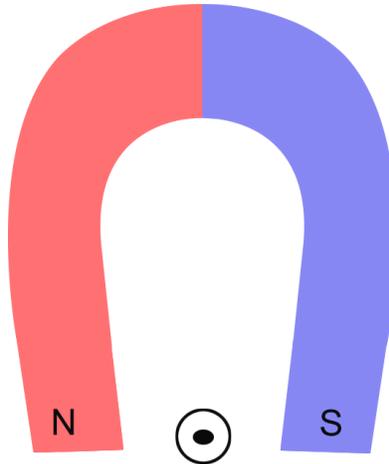


Use the image of the current-carrying wire to answer questions #2-3 below:



2. The direction of the magnetic field at **point A** is
 - a. Leftward
 - b. Rightward
 - c. Into the page
 - d. Out of the page
3. The direction of the magnetic field at **point B** is
 - a. Leftward
 - b. Rightward
 - c. Into the page
 - d. Out of the page
4. Which statement correctly explains why a current-carrying wire experiences a force when placed in a magnetic field?
 - a. The electrons in the current-carrying wire are repelled by the electrons in the magnet
 - b. The electrons in the current-carrying wire are attracted to the protons in the magnet
 - c. The magnetic field exerts a force on the moving charges in the current-carrying wire
 - d. The magnetic field exerts a force on the stationary charges in the current-carrying wire

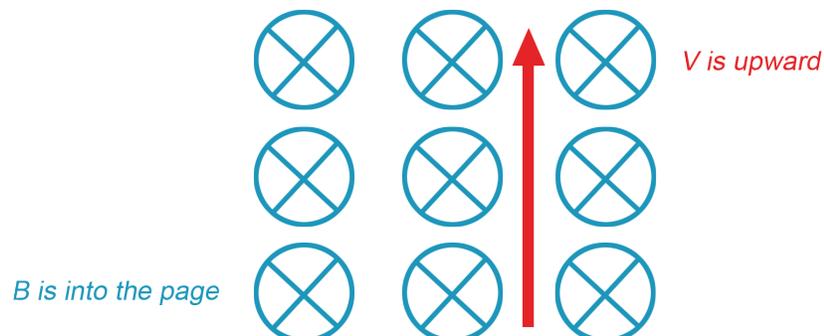
The image below depicts a horseshoe magnet with a wire between its north and south poles running along the z-axis. The wire has a current coming out of the page (along the +z-axis). Use this image to answer question #5 below.



5. What is the direction of the force on the wire due to the magnetic field?
- Rightward (toward the south pole)
 - Leftward (toward the north pole)
 - Upward
 - Downward
6. A magnetic field of 1.3 T points in the +x-direction. A 2 m piece of a wire with a current of 4 A is lying along the +z-axis in the magnetic field. What is the magnitude and direction of the force exerted by the magnetic field on the wire?
7. Which of the charges below experiences a force in a magnetic field?
- A neutron moving at an angle toward a magnetic field
 - A proton moving parallel to a magnetic field
 - An electron moving perpendicular to a magnetic field
 - An electron at rest in a magnetic field

Use the prompt below to answer question #8. The magnetic field (B) is illustrated in blue and the velocity vector of the moving electric charge (V) is illustrated in red.

An electron moves upward into a magnetic field that is traveling into the page (along the -z-axis).



8. According to the second Right-Hand Rule, what is the direction of the force (F) on the moving electron depicted in the magnetic field above? Explain the reason for your choice.

 9. An proton hits the Earth's magnetic field ($50 \mu\text{T}$) at a 25° angle with a speed of 1.2×10^7 m/s. Calculate the magnitude of the force from the magnetic field on the proton.

 10. An electric motor relies on the understanding that
 - a. A magnetic field exerts a force on electric charges at rest.
 - b. A magnetic field exerts a force on a current-carrying wire.
 - c. A current-carrying wire generates an electric field.
 - d. All of the above.
-

19.5 Electromagnetism Chapter Test

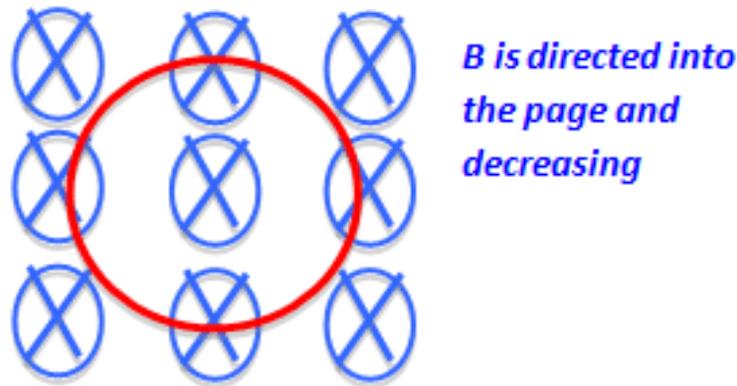
Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- Magnetic flux is the product of the magnitude of the average magnetic field and
 - the perpendicular area that it goes through
 - the parallel area that it goes through
 - the number of loops in the coil of wire
 - the induced voltage
- A magnetic field of 0.5 T passes through a coil of wire with a cross-sectional area of 0.02m² at a 10° angle to the area vector. What is the total magnetic flux through the coil?
 - 0 Wb
 - 0.001 Wb
 - 0.01 Wb
 - 0.1 Wb
- As a coil of wire rotates in a magnetic field
 - The magnetic flux changes
 - The magnetic flux remains constant
 - A voltage is induced
 - Both A C
- When a magnet moves through a coil of wire that has half as many loops as another,
 - half as much voltage is induced
 - the same amount of voltage is induced
 - twice as much voltage is induced
 - not enough information to determine

Use the diagram below of a stationary coil of wire (illustrated in red) in a decreasing magnetic field (illustrated in blue) directed into the page (along the $-z$ -axis) to answer questions #5-6:



5. According to Lenz's law, if the flux into the page is decreasing, then the induced current will
 - a. Create a magnetic flux into the page
 - b. Create a magnetic flux out of the page
 - c. There will be no induced current because there is no change in magnetic flux
 - d. Not enough information to determine
6. According to Lenz's law, if the flux into the page is decreasing, then the induced current will be
 - a. Clockwise
 - b. Counter Clockwise
 - c. There will be no induced current because there is no change in magnetic flux
 - d. Not enough information to determine
7. Which of the following are electric generators?
 - a. A windmill
 - b. A coal power plant
 - c. A hydroelectric dam
 - d. All of the above

Use the following prompt to answer questions #8-9:

A transformer has 200 turns in its primary coil and 600 turns in its secondary coil.

8. What type of transformer is this?
 - a. A step-up transformer
 - b. A step-down transformer
 - c. A direct transformer
 - d. An alternating transformer
9. If 60 V is put across the primary coil, the resulting voltage output of the secondary coil will
 - a. Be cut in half
 - b. Double
 - c. Triple
 - d. Quadruple
10. A light wave
 - a. Is created by a stationary or moving electric charge
 - b. Consists of all the waves on the electromagnetic spectrum
 - c. Requires a medium to travel through
 - d. All of the above

20.5 Geometric Optics Chapter Test

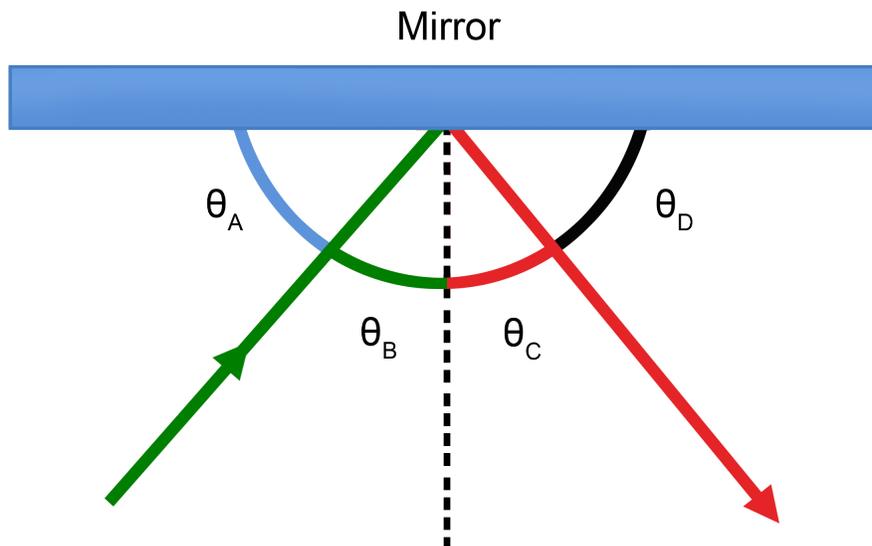
Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives

1. The ray model is an acceptable way to describe light because
 - a. The periodic motion of the electrons producing the light is so slow
 - b. The wavelengths of visible light are so small
 - c. Light is actually a row of electrons, similar to a current-carrying wire
 - d. All of the above

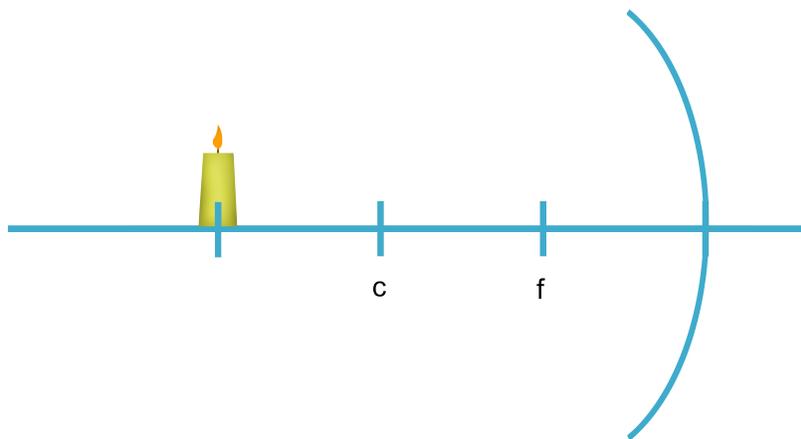
Use the image below of a ray of light reflecting off a mirror to answer questions #2-3:



2. If the angle of incidence in the image above is 47 degrees, then which of the following is correct?
 - a. $\theta_A = 47^\circ$
 - b. $\theta_B = 47^\circ$
 - c. Both A B
 - d. None of the above
3. According to the law of reflection, which of the following is correct?
 - a. $\theta_A = \theta_B$
 - b. $\theta_B = \theta_C$
 - c. $\theta_C = \theta_D$
 - d. $\theta_A = \theta_D$

4. Which of the following statements correctly describes an image formed in a flat mirror?
- The image is real
 - The image will appear closer to the mirror than the actual object
 - The image will be the same size as the object
 - All of the above

Refer to the diagram of a candle **beyond the focal point of a concave mirror** below to answer question #5:



5. Describe the image of the candle by circling the correct answer choices below:
Image orientation:

UPRIGHT / INVERTED

Type of image:

REAL / VIRTUAL

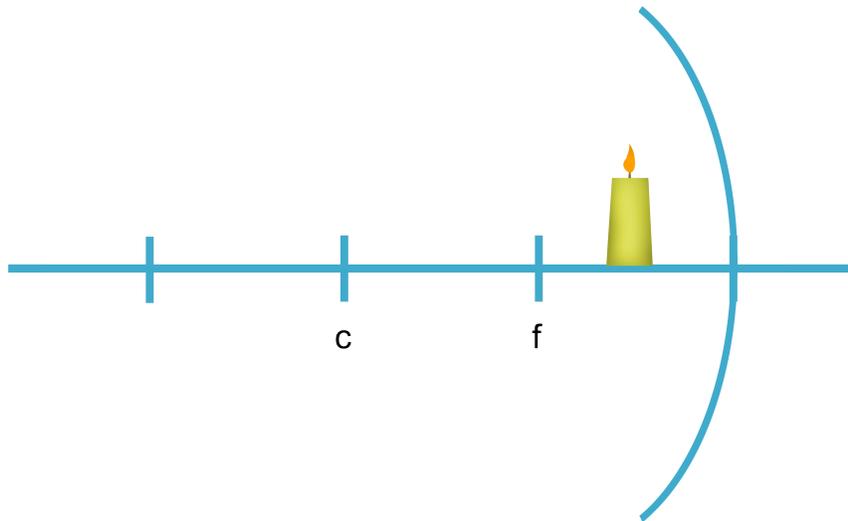
Relative size of the image:

BIGGER / SMALLER

Image location:

IN FRONT OF MIRROR / BEHIND MIRROR

Refer to the diagram of a candle **closer to the concave mirror than its focal point** below to answer question #6:



6. Describe the image of the candle by circling the correct answer choices below:

Image orientation:

UPRIGHT / INVERTED

Type of image:

REAL / VIRTUAL

Relative size of the image:

BIGGER / SMALLER

Image location:

IN FRONT OF MIRROR / BEHIND MIRROR

Use the following prompt for questions #7-10: A pencil of height 8 cm is positioned 5 cm from a concave mirror with a focal length 10 cm.

7. What is the image position (d_i) of the pencil?

- 0.1 cm
- 0.1 cm
- 10 cm
- 10 cm

8. The image of the pencil will be

- Real
- Virtual
- Inverted
- In front of the mirror

9. What is the magnification of the pencil's image?

- a. 0.02
- b. -0.02
- c. 2
- d. -2

10. The height of the pencil image is

- a. 4 cm
- b. 8 cm
- c. 16 cm
- d. not enough information to determine

Use the following prompt for questions #11-12:

A person stands in front of a **concave mirror** and sees an image with a magnification of -0.25.

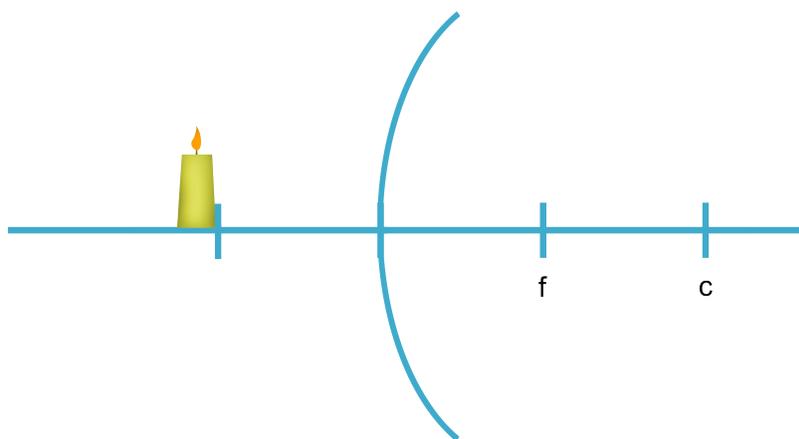
11. Based on the information above, the image of the person must be

- a. Upright
- b. Inverted
- c. Virtual
- d. Behind the mirror

12. Based on the information above, if the person is 1.65 meters tall (5 ft, 5 inches), what is the height of their image in the mirror?

- a. 0.413 m
- b. 6.6 m
- c. 1.65 meters
- d. not enough information to determine

Refer to the diagram of a candle in front of a convex mirror to answer question #13:



13. Describe the image of the candle by circling the correct answer choices below:

Image orientation:

UPRIGHT / INVERTED

Type of image:

REAL / VIRTUAL

Relative size of the image:

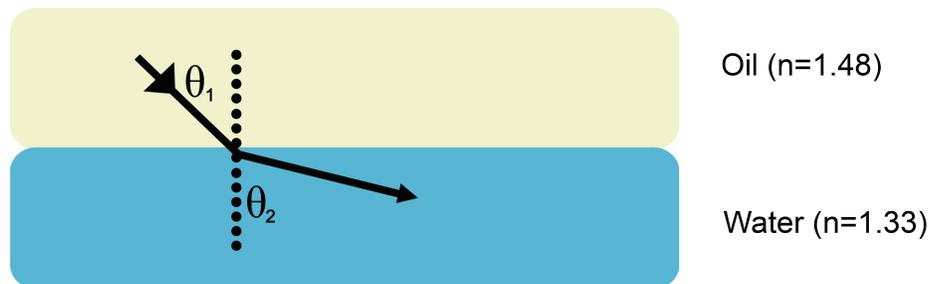
BIGGER / SMALLER

Image location:

IN FRONT OF MIRROR / BEHIND MIRROR

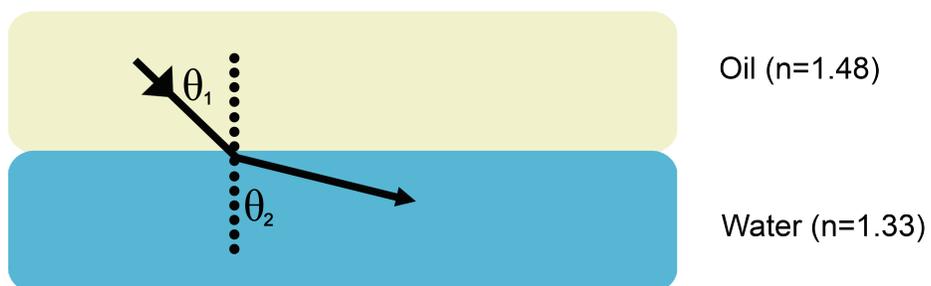
14. The ratio of the speed of light in a vacuum to the speed of light in a given material is
- Referred to as the index of refraction
 - Always less than one
 - Used to calculate the angle of reflection
 - All of the above
15. If the speed of light in a diamond is about 1.24×10^8 m/s, the index of refraction for a diamond must be
- 1
 - 1.52
 - 1.33
 - 2.41

Use the image below to answer questions #16-17:



16. Which of the following statements correctly describes the change in the speed of light in the image above?
- Light will slow down as it travels from oil to water
 - Light will speed up as it travels from oil to water
 - The speed of light will remain constant (3.0×10^8 m/s) as it travels from air to water
 - There is not enough information to determine how the speed of light will change
17. Which of the following correctly describes the bending of light in the image above, with reference to Snell's law?
- The angle of incidence (θ_1) will be greater than the angle of refraction (θ_2)
 - The angle of incidence (θ_1) will be less than the angle of refraction (θ_2)
 - The angle of incidence (θ_1) will be equal to the angle of refraction (θ_2)
 - There is not enough information to determine how the light will bend

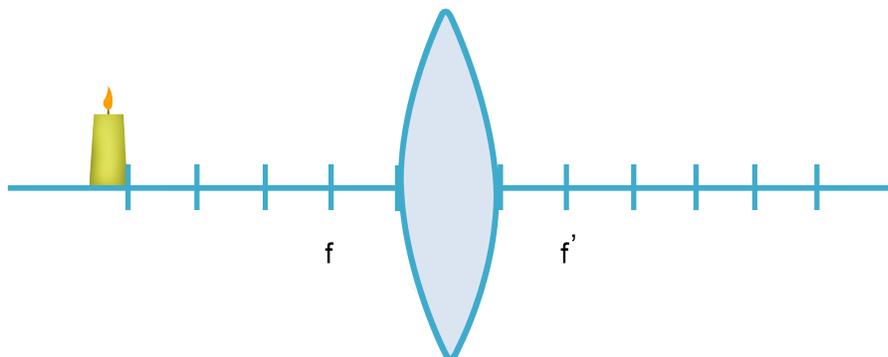
Use the image below to answer questions #18-19:



18. If θ_1 is 17° , calculate the measurements of the θ_2 using Snell's law in the space below.

19. Do your mathematical answers match the your answers to question #17 above?

20. Draw a ray diagram to illustrate the image of the candle in the lens below:



21.5 Physical Optics Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives

- Physical optics depends on describing light as a
 - Ray
 - Wave
 - Particle
 - All of the above
- When a light wave travels from one medium to another, the _____ remains the same.
 - Frequency
 - Wavelength
 - Speed
 - All of the above
- The spreading of white light into all the colors of the rainbow is described as
 - Diffraction
 - Dispersion
 - Total internal reflection
 - Refraction
- Red Light has the highest
 - Frequency of all the colors of the visible spectrum
 - Velocity through a glass prism
 - Index of refraction in a glass prism
 - Both A C
- The Double-Slit Experiment proved that light
 - Is a wave
 - Diffraction through small openings
 - Interferes with other waves that are in phase
 - All of the above
- The optical properties of a thin film result from
 - Reflection
 - Refraction
 - Interference
 - Both A C
- Light waves experience a phase shift when traveling from
 - air to oil
 - soap to air

- c. oil to air
 - d. none of the above
8. Sunlight is
- a. A longitudinal wave
 - b. Polarized
 - c. Non-polarized
 - d. Produced by electrons vibrating in the same direction
9. 3D glasses polarization light by
- a. Transmission
 - b. Reflection
 - c. Refraction
 - d. Diffraction
10. Polaroid sunglasses block light polarized by
- a. Transmission
 - b. Reflection
 - c. Refraction
 - d. Diffraction

22.2 The Special Theory of Relativity Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

1. Einstein contradicted classical Galilean relativity when he proposed that the speed of light in a vacuum
 - a. Depends on the relative motion of the observer
 - b. Is the same for all observers in any inertial frame of reference
 - c. Can be determined by adding the velocity vectors of light and the motion of the observer
 - d. Slows down as an observer moves away from the light source
2. An astronaut aboard the International Space Station (travelling at 7.66 km/s) conducts an experiment to measure the speed of a beam of light passing the space station. According to the special theory of relativity, the astronaut's measurement should equal
 - a. 2.0×10^7 m/s
 - b. 1.8×10^8 m/s
 - c. 3.0×10^8 m/s
 - d. not enough information to determine
3. According to special relativity, if the speed of light is constant, then the ratio of distance to time must
 - a. Increase
 - b. Decrease
 - c. Also remain constant
 - d. Not enough information to determine
4. According to Einstein, the simultaneity of two events is
 - a. Absolute
 - b. Relative
 - c. Constant
 - d. None of the above
5. In the distant future, an astronaut embarks on a long journey into space in which she travels on spaceship at very high speeds, close to the speed of light. Which of the following statements correctly describes a possible affect of time dilation upon her return to Earth.
 - a. She could return to Earth older than her parents
 - b. She could return to Earth before she was born
 - c. She could return to Earth younger than her twin sister
 - d. She could return to Earth the same age as her twin sister
6. One of the most important derivations Einstein made from the special theory of relativity was that
 - a. Heat is a form of energy
 - b. Mass is a form of energy
 - c. Energy is conserved
 - d. Momentum is conserved

7. General relativity is a theory regarding
 - a. Space
 - b. Time
 - c. Force
 - d. Gravity
8. According to Einstein's general theory of relativity, an experiment conducted on a spaceship accelerating at -9.8 m/s^2 would produce the same results as the same experiment conducted stationary on
 - a. Mars
 - b. The moon
 - c. The Earth
 - d. Anywhere in the universe (all of the above)

Essay Questions

Apply your understanding of special and general relativity to answer the following questions using a combination of words, pictures, and equations.

9. Discuss the major differences between Galilean relativity and special relativity.
10. Compare and contrast Newton and Einstein's description of gravity.

23.2 Quantum Physics Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

1. A quantum relates to
 - a. The wave model of light
 - b. The minimum amount of electromagnetic energy that can be lost or gained
 - c. A blackbody's ability to emit all wavelengths of light
 - d. All of the above
2. Planck's mathematical equation describes the
 - a. The frequency of light in the visible spectrum
 - b. The energy of each photon in a beam of light
 - c. The wave behavior of light
 - d. The energy levels in an atom
3. According to Planck, a small energy change results in the
 - a. Emission of low-frequency light
 - b. Absorption of high-frequency light
 - c. Absorption of low-frequency light
 - d. Both A C
4. What is the energy of a photon of violet light with a frequency of 5.0×10^{14} Hz?
 - a. 3.91×10^{-40} J
 - b. 3.31×10^{-19} J
 - c. 1.12×10^{-27} J
 - d. 6.626×10^{-34} J
5. Einstein's particle model proposes that light is
 - a. An electromagnetic wave
 - b. Composed of quanta of electromagnetic energy
 - c. Unrelated to the photoelectric effect
 - d. All of the above
6. A photon is a(n)
 - a. Quantum of light
 - b. Discrete bundle of electromagnetic energy
 - c. Blackbody radiation
 - d. Both A B
7. The amount of energy in a photon is proportional to the
 - a. Frequency of the electromagnetic wave
 - b. Wavelength of the electromagnetic wave

- c. Velocity of light
 - d. All of the above
8. Which of the following has the greatest photon energy?
- a. Radio wave
 - b. Gamma ray
 - c. Microwave
 - d. X-ray
9. Einstein's explanation of the photoelectric effect helped to
- a. Disprove that light behaves like a wave
 - b. Disprove that light behaves like a particle
 - c. Prove that light behaves like both a particle and wave
 - d. Prove that light cannot be quantized
10. Blackbody radiation provided evidence for the
- a. Particle theory of light
 - b. Wave theory of light
 - c. Matter has wave properties
 - d. Speed of light in a vacuum is constant
11. Rainbows provide evidence for the
- a. Particle theory of light
 - b. Wave theory of light
 - c. Matter has wave properties
 - d. Speed of light in a vacuum is constant
12. According to De Broglie, as the momentum of a particle increases
- a. The wavelength decreases
 - b. The frequency increases
 - c. The energy stays the same
 - d. Not enough information to determine

24.2 Atomic Physics Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- Which of the following correctly describes the results of Rutherford's gold foil experiment?
 - All of the alpha particles passed through the gold foil
 - All of the alpha particles bounced off at random angles
 - Most of the alpha particles passed through the gold foil, but some were deflected
 - None of the above
- The nuclear model of the atom consists of
 - An extremely small nucleus that exists at the center of the atom
 - All the positive charge and almost all of the mass of the atom located in the nucleus
 - Most of the atom being empty space
 - All of the above
- Thompson's plum pudding model was
 - Supported by the gold foil experiment
 - Disproved by the gold foil experiment
 - Replaced with Rutherford's nuclear model
 - Both B C
- Bohr's model of the atom helped to explain the
 - Neutral charge of an atom
 - Negative charge of an electron
 - Reason why excited hydrogen gas emits only certain frequencies of light
 - All of the above
- In the Bohr model of the atom, the electrons
 - Were organized into stepwise energy levels
 - Existed in an electron cloud
 - Only radiated energy when moving from one energy level to another
 - All of the above
- According to Bohr's model, electrons in a ground state
 - Must absorb energy to move to lower energy levels
 - Have the lowest possible energies
 - Remain stationary
 - All of the above
- Bohr quantized the atomic model by proposing that
 - Electrons only followed certain orbits
 - Electrons absorbed or emitted certain amounts of energy

- c. Atoms can only exist in certain energy states
 - d. All of the above
8. The energy lost when an electron moves from a higher level to a lower level is given off as a (n)
- a. Electron
 - b. Photon
 - c. Emission Spectrum
 - d. Line Spectrum
9. The uncertainty principle applies to
- a. Newton's laws of motion
 - b. Quantum measurements
 - c. Simple Machines
 - d. All of the above
10. As the certainty of an electron's position increases, the certainty of its
- a. Momentum decreases
 - b. Momentum increases
 - c. Velocity increases
 - d. None of the above

25.2 Nuclear Physics Chapter Test

Chapter Test

Name _____ Class _____ Date _____

Answer each of the questions below to show your achievement of the lesson objectives.

- The nucleus of an atom is composed of
 - Protons bound to electrons by a strong nuclear force
 - Nucleons bound together by a strong nuclear force
 - Neutrons bound together by a weak nuclear force
 - Electrons bound together by a weak nuclear force
- As the number of protons in an atom's nucleus increases
 - The more neutrons are required to stabilize the nucleus
 - The number of electrons must increase to maintain the atom's overall neutral charge
 - The overall stability of the atom decreases
 - All of the above
- Identify the type of radioactive decay in the following reaction:
$${}_{88}^{219}\text{Ra} \rightarrow {}_{89}^{219}\text{Ac} + {}_{-1}^0\text{e}^{-} + \nu$$
 - Alpha
 - Beta
 - Gamma
 - None of the above
- Which type of radioactive decay results in the highest energy emission?
 - Alpha
 - Beta
 - Gamma
 - None of the above
- Alpha decay results in the emission of a
 - Photon
 - Neutrino
 - Negatively charged electron
 - Positively charged helium ion
- Iodine-131 has a half-life of 8 days. If you start with a sample of 150 grams, how much of the original isotope will remain after 30 days?
 - 8 grams
 - 11 grams
 - 144 grams
 - 150 grams
- Nuclear energy is released when

- a. Heavy nuclei split apart
 - b. Lighter nuclei join together
 - c. Due to the equivalence of mass and energy
 - d. All of the above
8. Which of the following statements is true regarding the reaction below?
- $${}^1_0n + {}^{235}_{92}\text{U} \rightarrow {}^{142}_{56}\text{Ba} + 3({}^1_0n)$$
- a. This is an example of nuclear fusion.
 - b. This is an example of nuclear fission.
 - c. This process can be used to create nuclear chain reactions.
 - d. Both B C
9. A nuclear power plant relies on energy released by
- a. Nuclear fission
 - b. Nuclear fusion
 - c. Both A B
 - d. None of the above
10. The sun gets its energy from
- a. Nuclear fission
 - b. Nuclear fusion
 - c. Both A B
 - d. None of the above