

Sci 1110 Review questions and problems for Test 1 Fall 2008

Chapter 1 review

Questions for review:

1. What is the oldest known standard of measurement?
2. What parts of the human body have been used as measurement devices?
3. How many acres are in a square mile?
4. How does a temporal hour compared to our modern hour?
5. How did early scientists use the movement of the stars to keep accurate time?
6. What were some of the early units of weight?
7. What was Queen Elizabeth's role in the development of standards of units?
8. Why is the metric system easier to use than the English system of units?
9. What are the modern standards for each of the four basic units?
10. Give an example of a measurement with a) good precision and poor accuracy b) good precision and good accuracy.
11. What was the primary cause of the failure of the Mars Orbiter?
12. What is meant by scientific notation? What is the advantage of this system for expressing large and small numbers?
13. What does an accuracy of 3 significant figures represent?
14. What are the various types of prefixes used for the metric system?
15. Give an example of a measurement with:
a) good precision and poor accuracy b) good precision and good accuracy.
16. What was the primary cause of the failure of the Mars Orbiter?
17. Percent error as done in lab
18. Significant digits in numbers

Problems for Review:

1. $10,000 \text{ cm}^2$ is equal to which one of the following?
 - a. 1 m^2
 - b. 100 m^2 .
 - c. 1000 m^2 .
 - d. 1000 mm^2 .
 - e. $10,000 \text{ mm}^2$.
2. 1 m^3 is equal to which one of the following?
 - a. 100 cm^3
 - b. 1000 cm^3 .
 - c. 10000 cm^3 .
 - d. 10000 mm^3 .
 - e. $1,000,000 \text{ cm}^3$.
3. Which one of the following is not a fundamental unit in the SI system?
 - a. m^2
 - b. m
 - c. kg
 - d. sec
4. Which of the following is not a fundamental quantity?
 - a. weight
 - b. time
 - c. mass
 - d. length
5. As a student, which fundamental quantity do you measure most often every day?
 - a. length
 - b. mass
 - c. time
 - d. electric charge

6. Which of the following is not a standard metric unit?

- a. gram
- b. kilogram
- c. second
- d. meter

7. The standard unit of time, the second, is now defined with reference to

- a. Earth's revolution period.
- b. Earth's rotation period.
- c. the cesium-133 atom.
- d. the mean solar day.

8. The meter was defined originally as

- a. the wavelength of a line in the spectrum of krypton-86.
- b. one ten-millionth of the diameter of Earth.
- c. the length of a platinum-iridium bar.
- d. one ten-millionth of one-half of a meridian.

9. How many significant digits are in the number 0.00034?

- a. 2
- b. 3
- c. 4
- d. 5
- e. 6

10. A person measures a box very carefully with an expensive ruler. However, he does not notice a part of the ruler is broken off at the end. The measurements made would therefore be:

- a. good precision with good accuracy
- b. good precision with poor accuracy
- c. poor precision with good accuracy
- d. poor precision with poor accuracy

11. How far does a car travel in 3 seconds traveling at 75 mph?

- a. 1 m
- b. 5 m
- c. 10 m
- d. 15 m
- e. 100 m

12. 10 m is equal to which one of the following?

- a. 100 cm
- b. 1000 cm.
- c. 10000 cm.
- d. 10000 mm.
- e. 1,000,000 cm.

13. How many significant digits are in the number 1.000000003?

- a. 1
- b. 2
- c. 3
- d. 5
- e. 10

Chapter 2 review

1. How did Aristotle believe dropped objects fell to Earth?
2. What is meant by the impetus theory of motion?
3. How was Galileo able to make accurate measurements of falling bodies?
4. How does braking distance vary with velocity of a vehicle?
5. Which vehicle will stop faster, a 4-Wheel Drive SUV or a front-wheel drive station wagon if both are traveling at 70 mph?
6. Give an example of an object with a velocity of zero and an acceleration of 50 m/s^2 .
7. What is the primary difference for the occupants between a car stopping gently from a speed of 60 mph and a car traveling at 60 mph crashing into a brick wall?
8. How does the horizontal velocity of an object in projectile motion affect the vertical motion of the object?
9. How did the medieval philosophers believe projectiles travel?
10. What is the property of golf balls that allows them to fly farther than other comparable objects?
11. Would a golf ball travel farther on the Moon than a ball with a smooth surface?
12. How is the force of a ball traveling in a semi-circle similar to the force on a bouncing ball?
13. What is the derivation of the term centrifugal force?
14. What type of motion did Aristotle believe was natural for the Moon and planets?
15. What is the expression for centripetal force? Who first derived the expression?

Problems for review

1. If your car accelerates from 0 to 30 m/sec in 10 sec what is your acceleration?
 - a. 0.0
 - b. 0.3 m/s^2
 - c. 3.0 m/s^2
 - d. 30.0 m/s^2
 - e. 300.0 m/s^2
2. What is the effect of wheels on the range of a trebuchet?
 - a. They increased the range
 - b. They decreased the range
 - c. They made the trebuchet less accurate.
 - d. They had no effect on the range
 - e. They increased the height but not the range.
3. Which of the following is in uniform velocity?
 - a. an object in free fall accelerating at 10 m/s^2
 - b. car traveling due south at 50 mph
 - c. a rocket as it blasts off from the launch pad
 - d. an Olympic skier winding through a slalom course
 - e. a car traveling in a circle of radius 100 m at 70 mph
4. Which one of the following is a unit of acceleration?
 - a. m^2/s^2
 - b. km^2/s^2
 - c. km/s
 - d. cm/s^2
 - e. m
5. A car traveling at 25 mph can stop in 75 ft. How far does it take for the same car to stop if it is traveling at 50 mph?
 - a. 150 ft.
 - b. 200 ft.
 - c. 300 ft.
 - d. 500 ft.
 - e. 900 ft.

6. A car going around a circular racetrack of radius 100 m at 20 m/s experiences an acceleration of 4 m/s^2 . What would be the acceleration if the radius of the track was reduced to 50 m?

- a. 1 m/s^2 .
- b. 2 m/s^2 .
- c. 4 m/s^2 .
- d. 8 m/s^2 .
- e. 16 m/s^2 .

7. Two ball are released from the same height at the same time. Ball A is released vertically and ball B is launched horizontally. Which one of the following statements is true concerning the objects motions?

- a. Ball A strikes the ground first.
- b. Ball B travels in a hyperbolic path towards the ground.
- c. The heavier ball will strike the ground first.
- d. Both balls strike the ground at the same time.

8. How far does a car travel in 3 seconds traveling at 75 mph

- f. 1 m
- g. 5 m
- h. 10 m
- i. 15 m
- j. 100 m

Questions 9 - 11: the figure at the right shows a graph of velocity vs. time for an object.

9. What is the initial velocity of the object at $t = 0 \text{ sec}$?

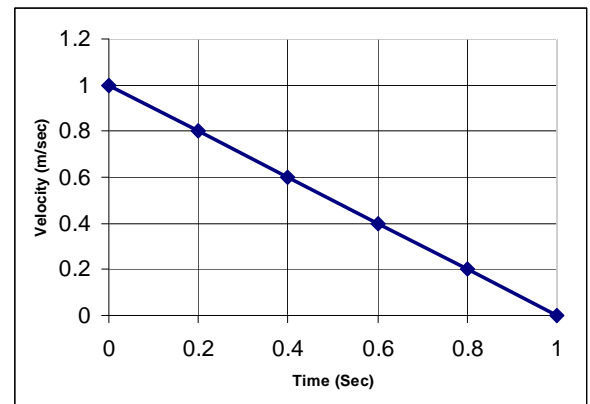
- a. 0 m/sec
- b. 0.4 m/sec
- c. 1.0 m/sec
- d. 4.0 m/sec
- e. 9.8 m/sec

10. What is the acceleration of this object?

- a. -1 m/s^2
- b. 1 m/s^2
- c. 2 m/s^2
- d. 0.5 m/s^2
- e. 0

11. At what time is the object stopped?

- a. $t = 0 \text{ sec}$
- b. $t = 0.2 \text{ sec}$
- c. $t = 0.4 \text{ sec}$
- d. $t = 1.0 \text{ sec}$
- e. $t = -1.0 \text{ sec}$

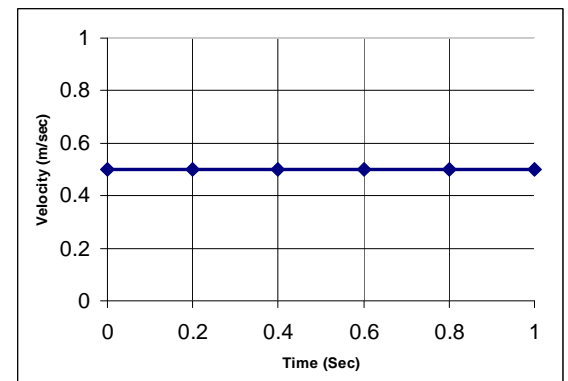


12. What feature do cars have so passengers inside do not have a “severe second collision” inside the car?

- a. Very soft bumpers so the car bounces back after the collision.
- b. Very hard exterior frames so the car does not crumple in a collision.
- c. An exterior frame that crumples under impact in a collision.
- d. A large engine so the driver can accelerate backwards quickly in the event of an impending collision.
- e. A frame with air bags in the trunk

13. What is the maximum “g” force that a person can survive?

- a. 1 g
- b. 10 g



- c. 100 g
- d. 1000 g
- e. 10,000 g

14. The figure at the right shows a graph of velocity vs. time for an object. What is the motion of this object?

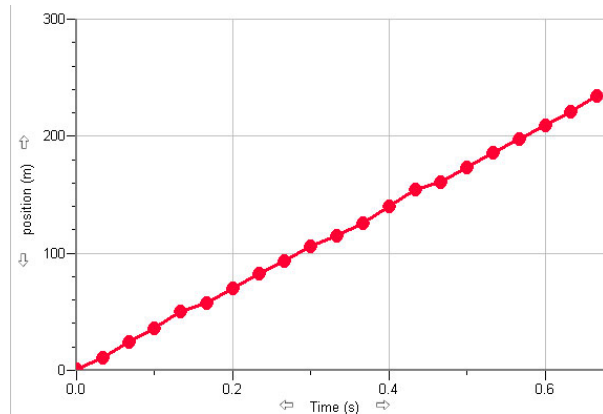
- a. It is accelerating at a constant rate.
- b. it is decelerating at a constant rate.
- c. it is moving in a circle at a constant speed
- d. It is moving at constant speed.
- e. It is not moving.

15. Calculate the rate of acceleration for a runner who reaches a speed from rest to 10 m/sec in fifty sec.

- a. 0.0 m/s^2
- b. 0.2 m/s^2
- c. 0.5 m/s^2
- d. 1.2 m/s^2
- e. 2.0 m/s^2

16. The figure at the right shows a graph of position vs. time for an object. What is the motion of this object?

- a. It is accelerating at a constant rate.
- b. it is moving at a constant velocity.
- c. it is moving in a circle at a constant speed
- d. It is moving vertically
- e. It is not moving.



17 What is the velocity of this object?

- a. 3.33 m/s
- b. 2.00 m/s
- c. 0.66 m/s
- d. 0.5 m/s
- e. 0

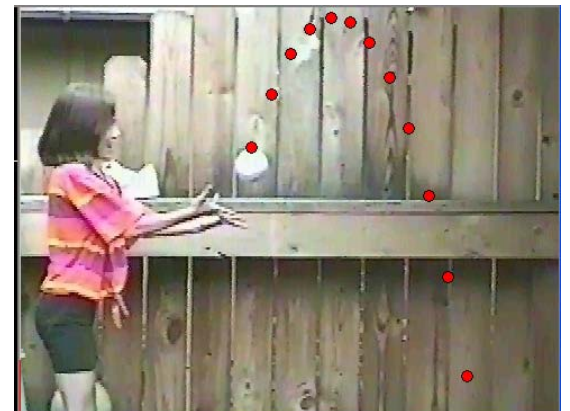
18. What is the acceleration of this object?

- a. -1 m/s^2
- b. 1 m/s^2
- c. 2 m/s^2
- d. 0.5 m/s^2
- e. 0

The figure at the rights shows a girl tossing a ball.

19. What is the acceleration of the ball when it reaches the highest point?

- a. 0
- b. -5 m/s^2
- c. $+5 \text{ m/s}^2$
- d. -10 m/s^2
- e. It is impossible to determine since we do not know how long it took to rise.



20. When is the vertical velocity of the ball zero?

- a. When it is released
- b. At its highest point
- c. When it reaches the same height as the release height
- d. Just before it hits the ground
- e. The vertical velocity is never zero since it is accelerating

Chapter 3 Review

1. What were the original elements developed by the Greeks and how were they different?
2. Describe the theory developed by Anaximenes?
3. Why did early philosophers believe an aether existed in space?
4. What was the connection Newton made between the falling apple and the Moon?
5. What happens to a cannon ball if it launched at a very high speed?
6. What are the three factors in Newton's law of gravitation?
7. What happens when a satellite is shot horizontally at high speed as compared to launching it vertically?
8. How does your mass depend on your location?
9. How does your weight depend on your location?
10. Give an example of Newton's first law of motion.
11. What is the net force on an object that is moving at a constant velocity of 20 m/s?
12. What happens if two equal and opposite horizontal forces are applied to a block resting on a flat table?
13. Does an object traveling at constant speed in a circle have a net force exerted on it? Explain.
14. Describe the examples of Newton's 2nd law in this chapter.
15. What is an impulse? What effect does a longer rifle have on a fired bullet?
16. What was the length of the SuperGun developed by Iraq in the 1980's?
17. Who developed the first quantified theory of friction?
18. What is the difference between kinetic and static friction?
19. What do we mean by the coefficient of friction?
20. What is the effect of water on the coefficient of friction for a car tire?
21. What is the effect of speed on the coefficient of friction for a car tire in heavy rain?
22. How does a 4-wheel drive SUV stop faster than a normal 2-wheel drive sedan?

Problems for Review

1. What would happen if a rocket was launched **horizontally** from the Earth at 8 km per second with air resistance neglected?
 - a. The rocket would go into orbit.
 - b. The rocket would crash back into Earth
 - c. The rocket would crash into the Sun
 - d. The rocket would never return
 - e. The rocket would orbit the Moon
2. What would happen if a rocket was launched **vertically** from the Earth at 8 km per second with air resistance neglected?
 - a. The rocket would go into orbit.
 - b. The rocket would crash back into Earth
 - c. The rocket would crash into the Sun
 - d. The rocket would never return
 - e. The rocket would orbit the Moon
3. The acceleration due to gravity is about 10 m/s^2 at the Earth's surface. What is the acceleration due to gravity for a person on the space station orbiting 200 miles above the Earth's surface?
 - a. 0
 - b. 1 m/s^2
 - c. 3 m/s^2
 - d. 9 m/s^2
 - e. 11 m/s^2
4. Which one of the following does not affect the force of gravity between two objects?
 - a. mass of the first object.
 - b. mass of the second object.
 - c. gravitational constant.
 - d. distance between the two objects.
 - e. the elements that are contained in both objects.

5. How does the weight and mass of an object on the Moon's surface compared to the mass and weight of the object on Earth?
- The mass would be the same on both the Earth and Moon.
 - The weight would be less on the Earth.
 - The mass would be greater on the Earth.
 - The mass would be greater on the Moon.
 - The weight would be the same on both the Earth and Moon.
6. If the Moon were positioned **one-half** as far from the Earth as it is now, the gravitational attraction between the Earth and Moon would be
- four times as great.
 - one-fourth as great.
 - one-third as great
 - the same as it is now since the distance does not affect gravitational attraction.
 - one-ninth as great.
7. The natural tendency of an object to remain at rest or in motion with a constant velocity is
- Newton's 1st Law of Motion.
 - Newton's 2nd Law of Motion
 - Newton's 3rd Law of Motion
 - Newton's Law of Gravitation.
8. Two ball are released from the same height at the same time. Ball A is released vertically and ball B is launched horizontally. Which one of the following statements is true concerning the objects motions?
- Ball A strikes the ground first.
 - Ball B travels in a hyperbolic path towards the ground.
 - The heavier ball will strike the ground first.
 - Both balls strike the ground at the same time.
9. A force of 10 N is exerted on a 1-gm pellet. What is the acceleration of the pellet?
- 0.001 m/s^2
 - 1 m/s^2
 - 100 m/s^2
 - 1000 m/s^2
 - 10000 m/s^2
10. A 100 kg object in space has an unbalanced force equal to the weight of a piece of paper exerted on it for one full day. What is the velocity of the object after the 24 hour period?
- 0 mph
 - 0.2 mph
 - 2.0 mph
 - 3.0 mph
 - 200 mph
 - 20,000 mph
11. What is the equivalent of a force of 100 m/s^2 ?
- 1 g
 - 10 g
 - 100 g
 - 1000 g
 - 10,000 g
12. Which of the following is an example of Newton's third law of motion?
- the movement of a boat when you jump onto shore

- b. a car moving at constant velocity
 - c. a car moving in a circle at constant velocity
 - d. a car accelerating at 10 m/s^2
 - e.
13. What is the unbalanced force acting on a car moving with a constant velocity of 20 m/s ?
- a. -40 N
 - b. -80 N
 - c. $+40 \text{ N}$
 - d. $+80 \text{ N}$
 - e. 0
14. The Deep Space 1 engine uses ion propulsion to exert a force of 0.3 N to send the 300 kg satellite to investigate an asteroid. What is the acceleration of the rocket during the first 100 days of the trip?
- a. 100 m/s^2
 - b. 10 m/s^2
 - c. 1 m/s^2
 - d. 0.1 m/s^2
 - e. 0.001 m/s^2

Chapter 4 review

Questions for Thought:

1. What the definition of work as it is used in physics?
2. What is meant by conservation of energy?
3. What is the expression for Kinetic Energy? What variables does this expression involve?
4. How does potential energy depend on gravity?
5. What is the relation between Total Energy, kinetic energy, and potential energy in a closed system?
6. What is the 1st law of thermodynamics?
7. What is relation between Work and Kinetic Energy?
8. How does the potential and kinetic energy of a simple pendulum change as the pendulum swings in motion?
9. How does the conservation of energy affect the height a dropped superball rebounds?
10. How did kinetic energy play a part in the Columbia Disaster in February 2003?
11. What is the difference between power and energy?
12. What is the difference between electrical power and electrical energy? What is it you pay for each month? What is the relation between kinetic energy and the distance it takes to stop a vehicle?
13. What is the difference between heat and energy?
14. Who invented the steam engine in 1707?
15. What was the major accomplishment of James Watt with regards to the steam engine?
16. What are the primary uses of energy in the United States?
17. What is the unit of power in SI units and English units? How do these values compare to each other?

Problems for Review:

1. The watt number on a light bulb tells the amount of energy the light bulb is using in joules per second. Which of the following light bulbs is using the most **energy**?
 - a. 100-watt bulb that burns for twenty minutes
 - b. 75-watt bulb that burns for thirty minutes
 - c. 60-watt bulb that burns for one hour
 - d. 40-watt bulb that burns for two hours
 - e. 25-watt bulb left on for ten hours
2. The watt number on a light bulb tells the amount of energy the light bulb is using in joules per second. Which of the following light bulbs is using the most **power**?
 - a. 100-watt bulb that burns for twenty minutes
 - b. 75-watt bulb that burns for thirty minutes
 - c. 60-watt bulb that burns for one hour
 - d. 40-watt bulb that burns for two hours
 - e. 25-watt bulb left on for ten hours
3. James Watt designed experiments in horsepower to
 - a. assist miners in removing ore.
 - b. calculate the velocity of a electric car.
 - c. quantify the energy generated by a horse in mines.
 - d. invent the combustion engine.
4. The first law of thermodynamics states
 - a. in a freefall, energy is lost.
 - b. the sum of energy in an isolated system decreases over time.
 - c. a moving object will continue moving in a straight line unless acted on by an unbalanced force.
 - d. while the kind of energy in a closed system can change, the total amount cannot.
 - e. the approximate amount of energy you spend every day is equal to the force exerted over distance.
5. Thermal energy is measured in units of
 - a. joules/second.
 - b. calories.
 - c. watts.

- d. foot-pounds.
- e. all of the above.

6. What did James Prescott Joule discover about heat?

- a. Heat is a form of energy.
- b. Potential energy equals heat.
- c. Calories should be limited to energy required.
- d. Brass tools work better under water.
- e. Horses expend energy at a rate of 550 foot lb/sec.

7. What is the work done when you lift a 10-N weight vertically 10 m above the ground? ($g = 9.8 \text{ m/s}^2$)

- a. 0 Joules
- b. 9.8 Joules
- c. 20 Joules
- d. 100 Joules
- e. 980 Joules

8. Which of the following is equivalent to one horsepower?

- a. 750 W
- b. 0.75 joules
- c. 1200 ft-lbs per hour
- d. 550 in-lbs per hour
- e. none of the above

9. The quantity $mv^2/2$ is known as

- a. potential energy.
- b. power potential energy.
- c. friction energy.
- d. elastic energy.
- e. kinetic energy.

10. The speed of a pendulum is greatest

- a. at the top of its swing.
- b. when its potential energy is greatest.
- c. at the top of its swing on the opposite side.
- d. when its kinetic energy is greatest.

11. Which of the following four bodies has the greatest kinetic energy?

- a. A body of mass 1 kg moving with speed 1 m/s.
- b. A body of mass 2 kg moving with speed 5 m/s.
- c. A body of mass 3 kg moving with speed 50 m/s.
- d. A body of mass 5 kg moving with speed 10 m/s.
- e. A body of mass 5 kg moving with speed 100 m/s

12. The quantity mgh is known as

- a. kinetic energy.
- b. power.
- c. work.
- d. potential energy.
- e. elastic energy.

13. A kilowatt-hour is a unit that measures

- a. energy.
- b. power.
- c. work x time.
- d. work per unit of time.

14. The kilowatt is a unit of

- a. power.
- b. electricity.
- c. energy.
- d. electric charge.

15. Power is

- a. force divided by time.
- b. energy multiplied by time.
- c. velocity multiplied by time.
- d. work divided by time.

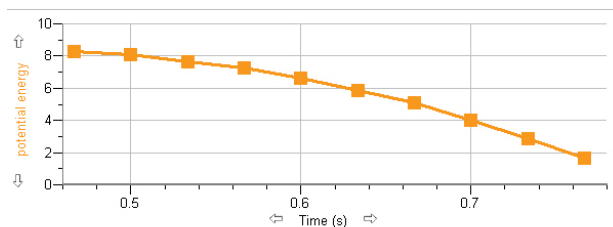
16. A person climbing a flight of stairs in 50 sec produces 50 W of power. What is the power produced if the person climbs the same flight in 25 sec?

- a. 10 W
- b. 50 W
- c. 100 W
- d. 200 W
- e. 500 W

Questions 17 - 19: The graphs at the right represent potential, kinetic, and total energy for a falling object from a height of 10 m at $t = 0.45$ sec.

17. What is the potential energy of the object at the top of the well based on the graph?

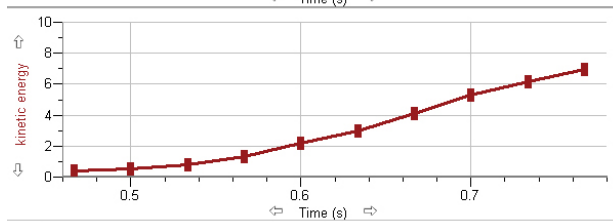
- a. 0 Joules
- b. 2 Joules
- c. 4 Joules
- d. 8 Joules
- e. It is impossible to know



The object is then dropped.

18. What is the kinetic energy when the object halfway down the well (5m)?

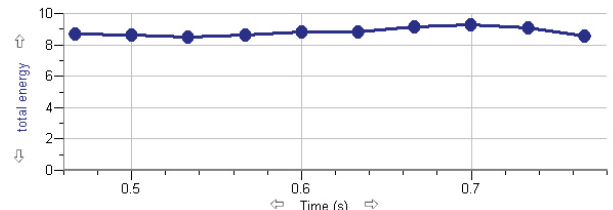
- a. 0 Joules
- b. 2 Joules
- c. 4 Joules
- d. 8 Joules
- e. It depends on the mass



has fallen

19. What will be the total energy of the object at the well just before it hits the bottom at $t = 0.8$

- a. 0 Joules
- b. 2 Joules
- c. 4 Joules
- d. 8 Joules
- e. 10 Joules



the bottom of sec?