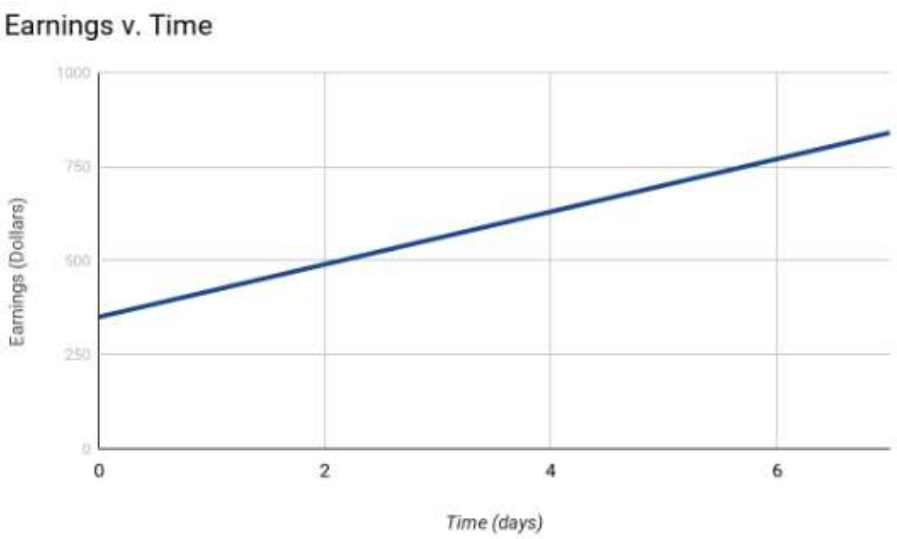
2018-19 Semester 2 Multiple Choice Final Exam - Version A Name_____

This is YOUR final exam. You may write in this packet as you solve the questions. Feel free to draw diagrams where it will help you understand the problem. This packet will not be scored. Write your answers clearly on the answer sheet. ***Any unclear letters on the answer sheet will be marked wrong.***

Section Name: Analyzing Linear Data

The following graph displays total earnings as a function of time.

Time (days)	Earnings (Dollars)
0	350
1	420
2	490
3	560
4	630
5	700
6	770
7	840



1) Which of the following statements is true according to the graph?

A. For each day worked, you earn $100.
B. For each day worked, you earn $110.
C. For each dollar you earn, you must work 0.5 days.
D. For each day worked, you earn $70.

2) Which of the following is the correct equation for the line?

A. y = 350x + 70
B. y = 70x + 350
C. y = -350x + 70
D. y = -70x + 350

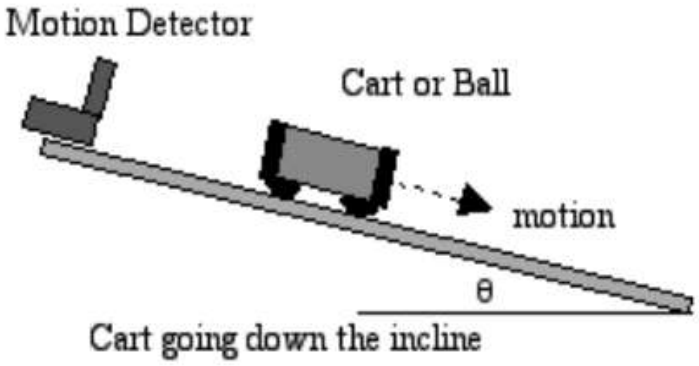
3) What would you expect total earnings to be after working for 10 days?

A. $1050
B. $1500
C. $1040
D. $1140

Section Name: Forces and Interactions

4) A 0.5 kg cart is allowed to roll down a ramp, as shown in below. Students in the class recorded the cart's velocity at different time intervals. The constant Net Force on the cart is 0.7 N. The students have to write a CER about whether or not the data from the system supporting Newton's 2nd Law. Do the results of their experiment support this law?

Time (seconds)	Velocity (meters/sec)
0	0
0.2	0.28
0.4	0.56
0.6	0.84
0.8	1.12



$$\text{Acceleration} = \frac{change\ in\ velocity}{time\ taken}$$

$$\text{Acceleration} = \frac{final\ velocity - initial\ velocity}{time\ taken}$$

$$a = \frac{Vf - Vi}{t}$$

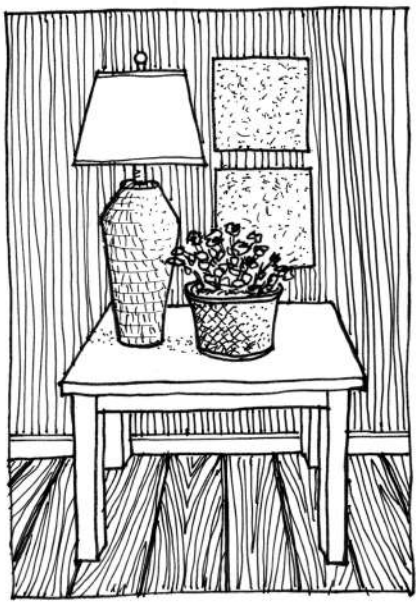
Newton's 2nd Law: F = ma

A. No, Newton's 2nd law states that the acceleration should be zero if the force is constant.
B. No, the force is not sufficient under Newton's 2nd law to cause the acceleration in the data table.
C. Yes, as the force increases, the acceleration increases in the amount required by Newton's 2nd law.
D. Yes, the acceleration calculated from the table matches the acceleration calculated using Newton's 2nd law.

5) Mark and Ben are standing on opposite sides of a wooden box. Ben applies 20 newtons (N) of force to the front of the box. Which force could Mark apply to move the box towards Ben?

A. 20 N of force to the front of the box.
B. 25 N of force to the front of the box.
C. 20 N of force to the back of the box.
D. 25 N of force to the back of the box.

6) The picture below shows a lamp at rest on a table.



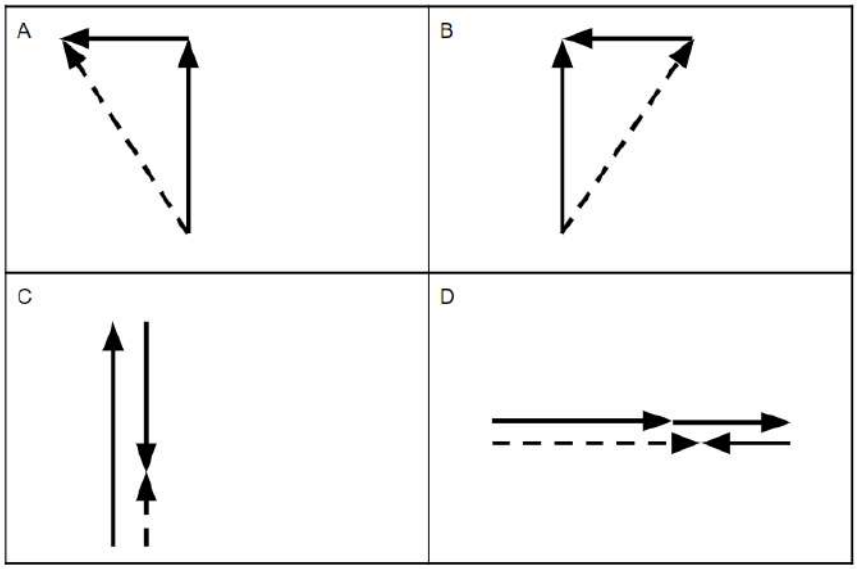
Which of these statements correctly describes the forces acting on the lamp?

A. Gravity pulls the table down and pushes the lamp up.
B. Gravity pushes down on the lamp with a force greater than the upward force from the table.
C. The downward force of gravity affects the lamp more than the table.
D. The downward force of gravity on the lamp is balanced by the upward force of the table on the lamp.

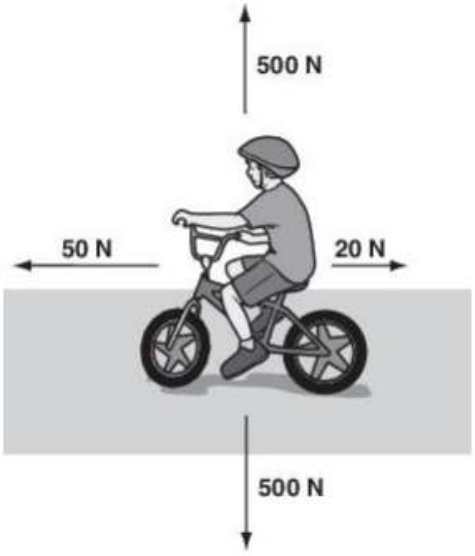
7) A car traveling on a flat, straight road increases its speed. Which of these descriptions of the forces acting on the car is correct?

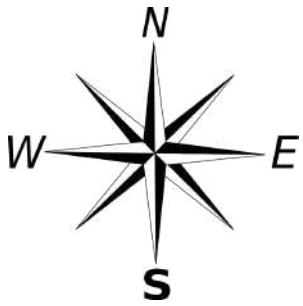
A. The combined force of gravity, friction, and air resistance is zero.
B. The forward force supplied by the engine is greater than the force of gravity.
C. The force of gravity is greater than the combined forces of friction and air resistance.
D. The forward force supplied by the engine is greater than the combined forces of friction and air resistance.

8) A motorboat is driven across a river with 30 N of force at a right angle to a current that is flowing with a force of 10 N. Choose the diagram that ***best*** represents the component Force vectors and resultant vector for this scenario.



9) David rides his bike to his friend's house. The diagram below shows the forces acting on David and his bike in newtons (N). A compass has also been included to help you answer the question correctly. Which of the following statements is true about David and his bike?





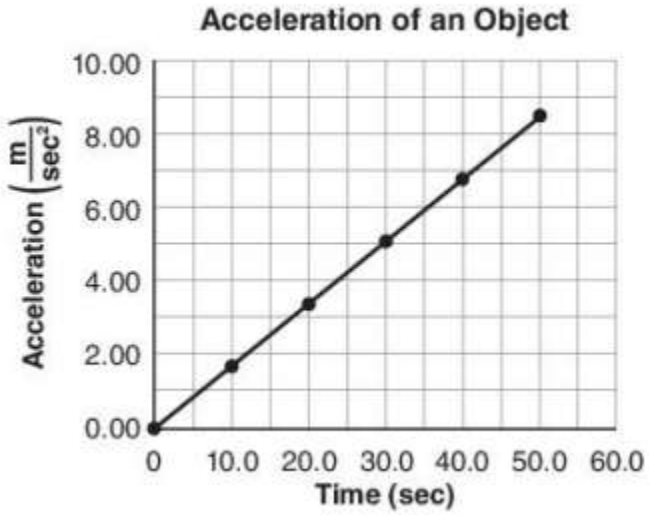
A. David is moving towards the East, and is slowing down.
B. David is moving towards the East, and is speeding up.
C. David is moving towards the West, and is slowing down.
D. David is moving towards the West, and is speeding up.

10) An object is pushed across a horizontal floor with an acceleration of 8 m/s2. The net force acting on the object is 40 N. What is the mass of the object?

A. 0.2 kg
B. 5 kg

C. 32 kg
D. 320 kg

11) The graph below shows the acceleration of an object with a mass of 0.050 kg. Newton's 2nd law of motion that relates force, mass and acceleration (F=ma) can be applied to the data shown. What does the application of this law show about the force acting on the object?

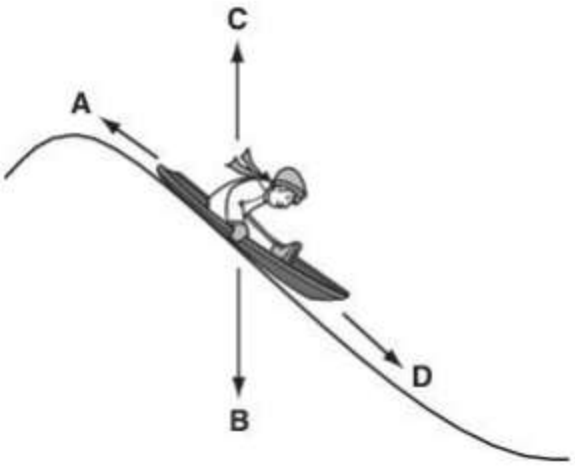


A. No force is acting on the object.
B. A force is acting in an uphill direction.
C. Constant force is acting on the object.
D. A force that is increasing is acting on the object.

12) A car traveling on a flat, straight road increases its speed. Which of these descriptions of the forces acting on the car is correct?

A. The combined force of gravity, friction, and air resistance is zero.
B. The forward force supplied by the engine is greater than the force of gravity.
C. The force of gravity is greater than the combined forces of friction and air resistance.
D. The forward force supplied by the engine is greater than the combined forces of friction and air resistance.

13) In the diagram below, a girl sits on a sled and slides down a hill of snow. Which arrow represents the force of friction opposing the motion of the sled down the hill.



A. Arrow A
B. Arrow B
C. Arrow C
D. Arrow D

14) If the forces acting on an object are balanced, which of the following must be true?

A. The object must be at rest.
B. The object must be moving at a constant speed.
C. The object must have an acceleration of zero.
D. None of these are true.

15) Determine the changes in acceleration when a 12 N force is first applied to a 3 kg object and then applied to a 6 kg object.

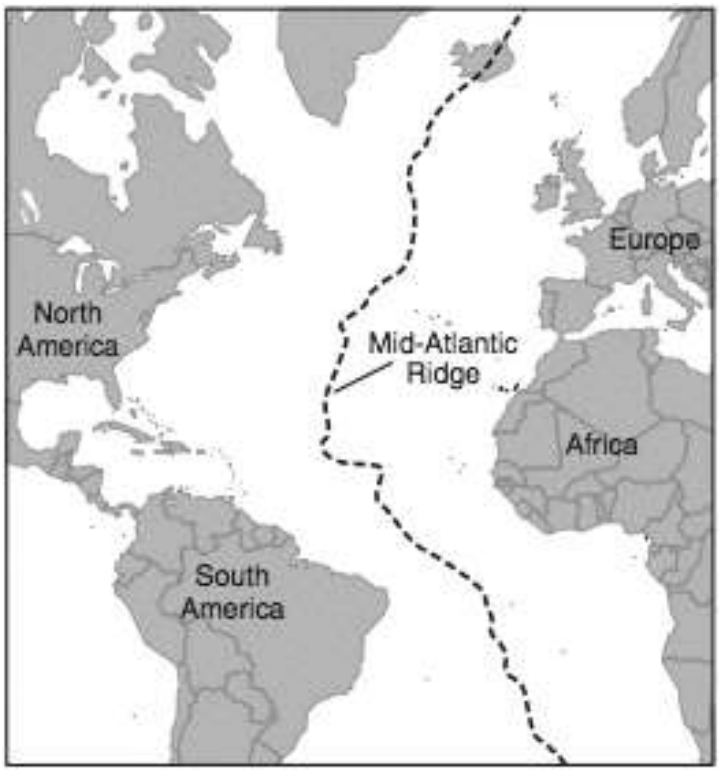
A. The acceleration will not change.
B. The acceleration will double.
C. The acceleration will be decreased by half.
D. There is not enough force applied to cause either object to accelerate.

Section Name: Earth's Changing Surface

12) What role did electrostatic forces play in the formation of the Earth?

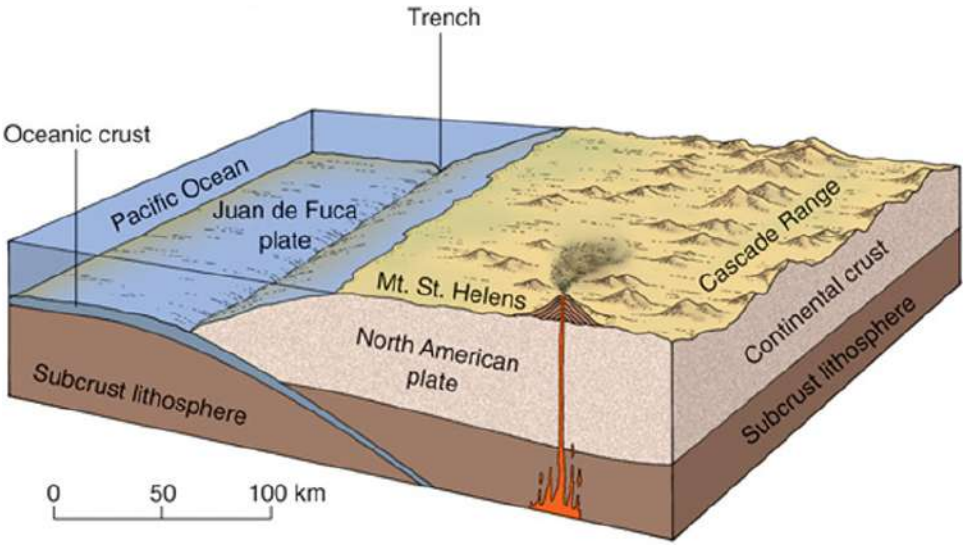
A. They caused a supernova which started the planetary formation process in motion.
B. They are responsible for reshaping an irregular asteroid into a spherical protoplanet.
C. They caused dust particles to cling together after a supernova set a nebula in motion.
D. They pulled comets from the edge of the solar system to Earth, which his how we got our water.

13) The map below shows the location of the Mid-Atlantic Ridge. Which statement ***best*** describes what is occurring at this location?



A. Two oceanic plates are converging, forming a transform fault.
B. Two oceanic plates are subducting, forming a deep ocean rift valley.
C. New oceanic crust is being formed along the mid-ocean ridge as two oceanic plates diverge.
D. New oceanic crust is being formed along the mid-ocean ridge as two oceanic plates converge.

14) The model below represents the tectonic plate activity in an area of the Pacific Northwest. Which of the following statements ***best*** describes what this model shows about the region?



A. The model shows that mountains form when one plate collides with another.
B. The model that water from the beneath Earth's surface can rise when it is heated.
C. The model shows that convection currents carry bits of rock that can be released as ash.

D. The model shows that the Juan de Fuca plate has been melting into magma that can rise to Earth's surface.

16) Which of the following statements ***best*** explains the relationship between conveyor belts and tectonic boundaries?

A. Conveyor belts move in a circular pattern just like convection currents do in the mantle, and both the conveyor belt and the moving mantle move material from one location to another.
B. Conveyor belts are loops, and tectonic plates are also loops.
C. Conveyor belts move boxes from one spot to another in a repeating circular pattern, and tectonic plates also make the circulating mantle move from one spot to another.
D. Tectonic plates push down on the mantle, and boxes also push down on the conveyor belts.

Section Name: Energy

17) The transformation of the chemical energy of fuel allows the engine in automobiles to run. What BEST describes the efficiency of this energy transformation?

A. This transformation is not 100% efficient because some of the useful chemical energy is lost as heat.
B. This transformation is 100% efficient because all of the chemical energy is converted into useful heat energy.
C. This transformation is 100% efficient because all of the chemical energy is converted into useful mechanical energy.
D. This transformation is not 100% efficient because some of the useful chemical energy is lost as mechanical energy.

18) A steam engine consumes 7,300 J of heat energy, converting some of it to mechanical energy and some to unusable forms of heat energy. Which are the MOST LIKELY amounts of mechanical energy and unusable heat energy produced?

A. 2900 J of mechanical and 4400 J of heat energy.
B. 3000 J of mechanical and 1000 J of heat energy.
C. 7300 J of mechanical and 1000 J of heat energy.
D. 7300 J of mechanical and 7300 J of heat energy.

19) A high jumper starts running from rest, gains speed, jumps up and over the bar, and falls to the sawdust pit on the other side. If the high jumper is considered a closed system, which sequence shows the energy changes from the time he starts running until he lands in the sawdust?

A. Chemical to kinetic to potential to kinetic.
B. Potential to thermal to kinetic to potential.
C. Kinetic to chemical to kinetic to mechanical.

D. Chemical to thermal to mechanical to kinetic.

20) Courtney observes that her laptop computer becomes slightly hot when it is left on for a long time. Which option ***best*** explains the reason for this?

A. Some energy is lost as heat when the chemical energy of the batteries is converted into electrical energy.
B. Some energy is lost as sound when the chemical energy of the batteries is converted into electrical energy.
C. Some energy is lost as light energy when the chemical energy of the batteries is converted into electrical energy.
D. Some energy is lost as mechanical energy when the chemical energy of the batteries is converted into electrical energy.

21) In a factory, an electric engine produces 110,000 kilojoules of energy. Only 80,000 kj of this energy are used to do work. What happens to the remaining energy?

A. The remaining energy is lost to the atmosphere as heat.
B. The remaining energy is stored as potential energy for later use.
C. The remaining energy is changed back into electricity to run the engine.
D. The remaining energy is lost as mechanical energy during the working of the engine.

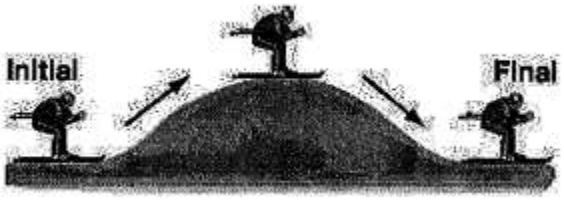
22) A ball is dropped from a height where it had a potential energy of 1,200 J. At one point during the fall, the potential energy of the ball is 800 J. If air resistance is not considered, what is the amount of kinetic energy that the ball has at this point according to the Law of Conservation of Energy?

A. 2,000 J
B. 1,200 J
C. 800 J
D. 400 J

23) A ball is falling from a height under the force of gravity. Which energy transformation is taking place during the fall before the ball reaches the ground?

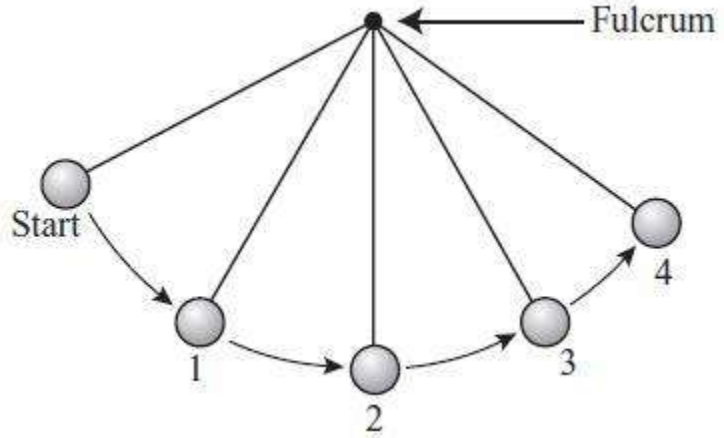
A. Kinetic energy is changing into heat and sound energy.
B. Potential energy is changing into heat and sound energy.
C. Potential energy is increasing, and kinetic energy is decreasing.
D. Kinetic energy is increasing, and potential energy is decreasing.

24) The diagram below shows the motion of a skier going up and down a hill. How does the motion of the skier illustrate the transformation between kinetic and potential energy?



A. The skier gains both potential and kinetic energy while going up the hill.
B. The skier loses potential energy and gains kinetic energy while going up the hill.
C. The skier has equal amounts of potential and kinetic energy at the top of the hill.
D. The skier loses potential energy and gains kinetic energy while going down the hill.

25) Isabel studies a pendulum in a lab activity, as shown below. Which energy change occurs when the pendulum moves from position 1 to position 2?

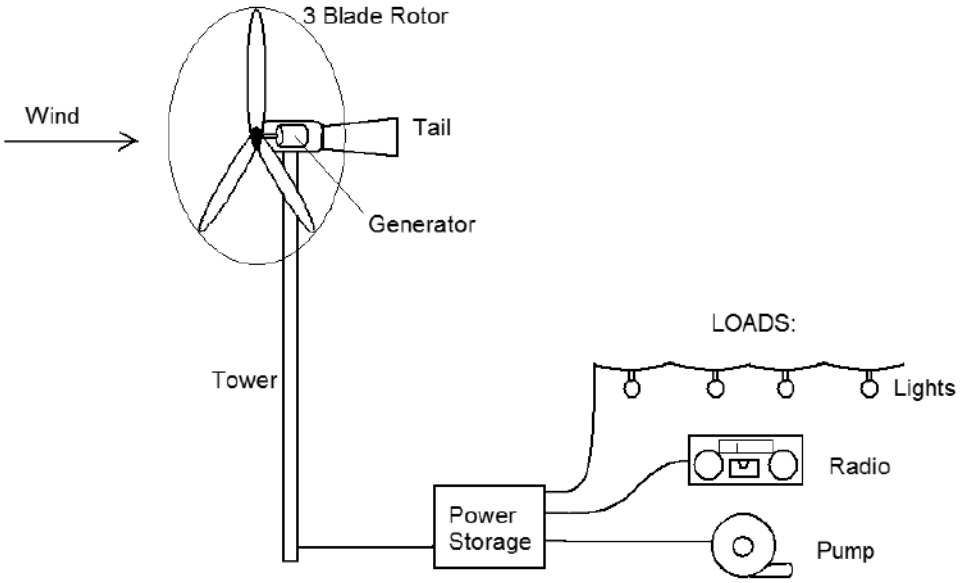


A. Kinetic and potential energy both increase.
B. Kinetic and potential energy both decrease.
C. Kinetic energy converts into potential energy.
D. Potential energy converts into kinetic energy.

26) On a cold morning, Kenneth rubs his hands together to generate heat. During this activity, mechanical energy is converted into heat energy. Which of these statements BEST describes this energy transformation?

A. The total mechanical energy is converted into useful heat energy.
B. Most mechanical energy is converted into heat energy, but some mechanical energy is lost as sound energy to the environment.
C. Some mechanical energy is lost as chemical energy to the environment.
D. The total mechanical energy is converted into useful heat and chemical energy.

27) Wind turbines are connected to a device that looks like a large propeller, called a rotor. When the wind blows, the rotor spins and turns the turbine. Which energy transformation is taking place when the wind spins the turbine?



A. Solar energy to electrical energy
B. Chemical energy to electrical energy
C. Thermal energy to mechanical energy
D. Electrical energy to mechanical energy

Section Name: Waves

28) Caleb counts the number of waves that pass a given point in a certain amount of time on the beach. What property of waves does Caleb measure?

A. Period
B. Frequency
C. Amplitude
D. Wavelength

29) Which of the following statements best describes the relationship between frequency and wavelength?

A. As frequency increases, wavelength decreases.
B. As frequency increases, wavelength increases.

C. As frequency decreases, wavelength decreases.

D. As frequency decreases, wavelength does not change.

30) A student is calculating wave speed for a lab. The class came up with the following equation to solve for wave speed. The students used the other two equations to solve for period, given frequency.

$$V = f \times \lambda$$

WAVE SPEED = FREQUENCY X WAVELENGTH

(m/s) (Hz) (m)

$$\text{Frequency} = \frac{1}{\text{Periodic time}} \quad \text{or} \quad f = \frac{1}{T} \text{ Hz}$$

$$\text{Periodic time} = \frac{1}{\text{Frequency}} \quad \text{or} \quad T = \frac{1}{f} \text{ sec}$$

The student's data is shown in the table below. Which mistake, if any, did the student make in his calculations?

Wavelength (m)	Frequency (Hz)	Period (s)	Wave Speed (m/s)
5	16	.063	0.315
10	8	.13	1.3
15	5.3	0.19	2.85
20	4	0.25	5

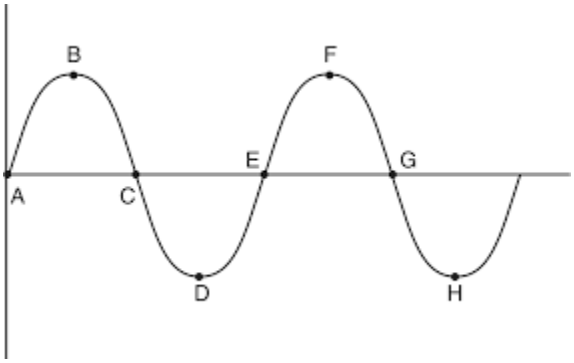
A. The student didn't make any mistakes.

B. The student multiplied wavelength times frequency, but was supposed to divide wavelength by frequency.

C. The student multiplied wavelength times period, but was supposed to divide period by wavelength.

D. The student multiplied wavelength times period, but was supposed to multiply wavelength times frequency.

31) A wave like the one shown in the diagram below is called a transverse wave. Such a wave is typical of light waves and other types of electromagnetic waves. Every transverse wave has certain properties, including wavelength. One measure of wavelength is the distance from B to F. What is another measure of wavelength?



A. Distance from A to C
B. Distance from C to H
C. Distance from E to H
D. Distance from D to H

32) What is the frequency of a guitar string with a period of 0.05 seconds?

A. 200 Hertz
B. 5 Hertz
C. 20 Hertz
D. 0.05 Hertz

33) A common physics lab involves the study of the oscillations of a pendulum. If a pendulum makes 33 complete back-and-forth cycles of vibration in 11 seconds, then its period is _____.

A. 33 s
B. 0.03 s
C. 0.33 s
D. 3 s

34) A period of 5.0 seconds corresponds to a frequency of _____ Hertz.

A. 0.20
B. 0.50
C. 0.02
D. 0.25

35) A wave is introduced into a thin wire held tight at each end. It has an amplitude of 3.8 cm, a frequency of 51.2 Hz and a distance from a crest to the neighboring trough of 12.8 cm. Determine the period of such a wave.

A. 13.5 s
B. 0.0195 s
C. 0.25 s
D. 0.078 s