

Culturally Relevant Pedagogy in STEM Education – Summer 2018

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Assignment 3 – Lesson Plan for Grade - 6

Date used - 5/10 to 5/12 (3 – 55 Minutes Periods)

Background information

I work at a Charter school in Hollywood, Florida. It's in an urban setting. I teach all 8th grade science students. Our school serves more than 1500 students from K through 10 and is opening as a K-12 from this academic year. Although the school is only 3 years old, it's enrollment is very high and student body is very diverse. One of the most fascinating things about our school is that it has large number of students who are of Russian origin. Many of those students are ESOL level 1, and it's been a fascinating experience being their teacher. Not only I learned about their culture, I also learned how to be an effective teacher to a student who cannot speak English at all. I was astounded to know how well most of them performed in the State exams. Apart from Russian students, a big percentage of students are also Latino/Hispanics. Our school has a very diverse student body. While many students come from low income families, there is also a big percentage of students who come from families with strong financial stability. One of the best things about my school is that there are many students with learning disabilities. A regular class will have students with diverse cultural backgrounds. This also brings greater challenge to the science teacher to help those students cross the border, as discussed in one of readings. There are also some students who have European and Asian origin. Population of white students is the largest and is followed by African American and Hispanic. A title 1 school, majority of students are below grade level, but the school is improving every year through emphasis in STEAM education and culturally relevant pedagogy. I had 107 students in my 8th class last year. That was a diverse population. As mentioned above, I had students with origin from different parts of the world, mainly South American and Russia. Students were 24/25 years old, and there were many students who came had single parents and struggling family.

Highlighted multicultural components

Most importantly, students have been identified and strong connection has been established as the first step of culturally responsive teaching. Many methods are used in this lesson plan at different points that makes instruction culturally responsive. The lesson doesn't put emphasis on the ethnic backgrounds of students to facilitate culturally relevant instruction. It uses students' learning styles and tools. For example, I use oral methods at several points because I have students in my classroom who have Southeast Asian or Latino. As I am an Asian myself and understand those cultures, it's through oral traditions learning happens before they come to school or are outside school. Memory strategies have been used at various points in the lesson plan to make it easy for the students whose cultures favor understanding and transfer of knowledge through memorization. For example, conservation of energy song is played in the Engage section to make it easier for students to remember the concept. Social activities such as discussions, think-pair-share, group activity, and games have been used throughout the lesson to make it culturally responsive. For example, this lesson plan includes Kahoot games as formative assessment at several points to check for understanding. I strongly believe that students of any cultural origin would be very responsive to fun games, music, and social activities.

Technology component

Extensive use of online programs such as virtual labs, animation, videos, and excel are used both by the teacher and students throughout the period of lesson. For example, students will take a tennis ball and find its potential energy at 5 different heights and use Excel to make a graph to show how potential energy differs with different height. Students will do the same thing for Kinetic energy and show a graph how KE changes with change in the speed of an object. Excel will be used to do the data analysis. Interactive smart board is an integral part of lesson. Videos will be played using a smart-board and games such as Kahoot and assessment programs such as Usatestprep will be available online. Jupiter Ed, gradebook will be used as a platform of online discussions and homework submission.

NGSSS – Next Generation Sunshine State Standards

SC.6.P.11.1 - Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where potential energy is transformed into kinetic energy and vice versa.

NGSS Standards

MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS3-1),(MSPS3-5)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3),(MS-PS3-4)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1)

WHST.6-8.1 Write arguments focused on discipline content. (MS-PS3-5)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related,

focused questions that allow for multiple avenues of exploration. (MS-PS3-3), (MS-PS3-4)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS3-2)

Mathematics –

MP.2 Reason abstractly and quantitatively. (MS-PS3-1), (MS-PS3-4), (MS-PS3-5)

6.RP.A.1 Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1), (MS-PS3-5)

Learning Objectives

(Lesson Rationale – Goals and Essential Question)

Students will be able to –

- Apply concepts of potential and kinetic energy to explain the Law of Conservation of Energy and Transformation of Energy.
- Develop scientific model to represent the transformation of Potential and Kinetic Energy.
- Differentiate and give examples of potential energy and kinetic energy.
- Differentiate potential energy and kinetic energy;
- Compare potential energy and kinetic energy;
- Recognize that there is a difference between potential energy and kinetic energy
- Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.

- Conduct basic mathematical calculations to find Kinetic and Potential Energies by using the given formulas.
- Understand that energy can change from one form into another
- Understand that energy can be described by equations.

Essential Question

(This higher order question will be directly derived from the benchmark, introduced at the beginning of the lesson, discussed throughout the lesson, and answered by students at the end of the lesson to show understanding of the concepts taught.)

Identify situations where potential energy is transformed into kinetic energy and vice versa. List examples in which conservation of energy takes place in our everyday lives?

Guiding Questions

- How are kinetic and potential energy different?
- How are kinetic and potential energy related?
- When and how does kinetic energy become transformed into potential energy?
- When and how does potential energy become transformed into kinetic energy?
- How are the downward and upward motion of the ball in the experiment related to kinetic and potential energy?
- In the experiment with the ball, at what point is there maximum potential energy for each bounce of the ball?

(Guiding Questions taken from cpalms.org)

Higher Order Questions

(Several questions will be answered to provoke higher order thinking and include Moderate to High Complexity Levels.)

1. What are the factors that affect potential energy and kinetic energy?
2. What happens to PE and KE if the value of any of the following is altered?
Mass, Velocity, Gravity, Height
3. What is the difference between Mechanical Energy, KE, and PE?
4. Use the example of hydroelectricity production to explain law of conservation of energy.

Vocabulary

energy, kinetic energy, potential energy, gravitational potential energy, elastic potential energy, joule, mass, energy transformation, mechanical energy, Law of Conservation of Energy, heat, law (scientific law)

Accommodations – will be provided accordingly as mandated by the District.

Preferential Seating

Small group (11-20) for standardized tests

Extended Time

Provide redirection

Verbal Encouragement

Provide advance notice of assignments

Will use planner to write down the assignments

Repeat, Clarify, and summarize the directions

Double the allotted time

Supplemental Aids

Flexible Presentation – Oral Presentation of test prompts

Flexible Presentation – Repeat/Paraphrase directions (student)

Flexible Presentation – Verbal Encouragement

Flexible Scheduling /Timing – Additional time for task (Total Time = Twice the allotted time)

Flexible Scheduling/Timing – Lessons broken into smaller segments

Flexible Setting – Preferential seating

Accommodations – Total time = twice the allotted amount of time

Repeat, Clarify or summarize test directions

Provide verbal encouragement

Brief testing sessions with frequent breaks, as allowed in test manual

EXIT TICKET – will be a 5 questions short quiz at the end of each class period

Justification – Integration of Subjects

Science	Different concepts from diverse fields of science are used in lesson to achieve mastery of the given standards. For example, gravitational potential energy (Earth/Space) and Kinetic energy of cells, atoms and molecules (chemistry/life science) is used to explain concepts of these two major types of energy and their transformation and conservation.
Mathematics	Simple mathematical calculations have been integrated in this sixth-grade lesson to support the deeper understanding of the scientific concepts. Student learn to solve a simple linear equation to find the value of an unknown variable. Students master how to solve a given equation of kinetic energy and potential energy when are formulas are given.
Technology	Extensive use of online programs such as virtual labs, animation, videos, and excel are used both by the teacher and students throughout the period of lesson. For example, Students will take a tennis ball and find its potential energy at 5 different heights and use Excel to make a graph to show how potential energy differs with different height. Students will do the same thing for Kinetic energy and show a graph how KE changes with change in the speed of an object. Excel will be used to do the data analysis. Interactive smart board is an integral part of lesson.
Engineering	Students will use the concepts of mechanical energy in designing doors, pencil sharpeners, musical instruments, and other everyday objects. Students will use the example of roller coaster to explain how engineers use the concepts of kinetic and potential energies to design this system.

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<p>Engage</p> <p>The purpose for the ENGAGE stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.</p>	<p><u>Reinforcement bell ringer/Lesson opener:</u> What are the different forms of energy?</p> <p><u>Activity</u></p> <p>After the students are done with the bell ringer, I will give students the opportunity to share their response. Then I will discuss the bell ringer and open the lesson for the day with an illustration ‘Apple on a string’.</p> <p>Materials Required – An apple and a string</p> <p>A piece of string will be tied onto the stem of an apple and I will hold the string to show the students how the apples swings back and forth and explain the transformation of PE to KE and vice versa.</p> <p><u>Testing prior knowledge</u></p> <p>Students will be asked following questions while I illustrate this simple example of apple in a string –</p> <ol style="list-style-type: none"> 1. What did you just observe? 2. What inference can you make about the change of position of the apple? 3. What are various types of energies associated with the illustration? <p>Then students will watch the following video about Newton’s cradle and also listen to a song in youtube about law of conservation of energy.</p> <p>https://www.youtube.com/watch?v=k60jGJfV8oU</p> <p>https://www.youtube.com/watch?v=8dgyPRA86K0</p> <p>By watching this video, student will be able to make more sense about PE/KE and transformation of energy.</p> <p>Then the ENGAGE session will wrap up with another video lesson –</p> <p>https://www.youtube.com/watch?v=IqV5L66EP2E</p>



(Pic from google)

Kahoot! Time

STUDENT GROUP ACTIVITY –

Students, in groups of 3, will construct a larger than life Newton's Cradle using sports balls in lab.

Materials Required –

Thin rope

Bungy Cord

Balls

Formative Assessment – Check for Understanding

(Test made using usatestprep.com)

1) What is/are the energy transformation(s) that take place when using a wind turbine like these to generate usable energy?

A) mechanical - electrical

B) kinetic - mechanical - electrical

C) friction - mechanical - electrical

Eliminate

D) mechanical - friction - electrical

2) Wind turbines can generate a great deal of usable energy and have become popular because there is no cost to use wind and they do not emit greenhouse gases. A typical wind turbine is only 30% efficient though. Explain what has happened to the other 70% of the energy.

A) It is lost due to friction.

B) It is converted to thermal energy.

C) It is stored as potential energy in the turbine.

D) It is released as mechanical energy into the air.

3) A certain clock requires a weight lifted up once a day. The weight provides the energy that allows the clock to keep running. Identify the transformation of that powers a grandfather clock.

A) It transforms kinetic energy into potential energy.

B) It transforms potential energy into kinetic energy.

C) It transforms potential energy into electrical energy.

D) It transforms electrical energy into potential energy.

4) At what point was the potential energy greatest in the Newton's cradle you designed?

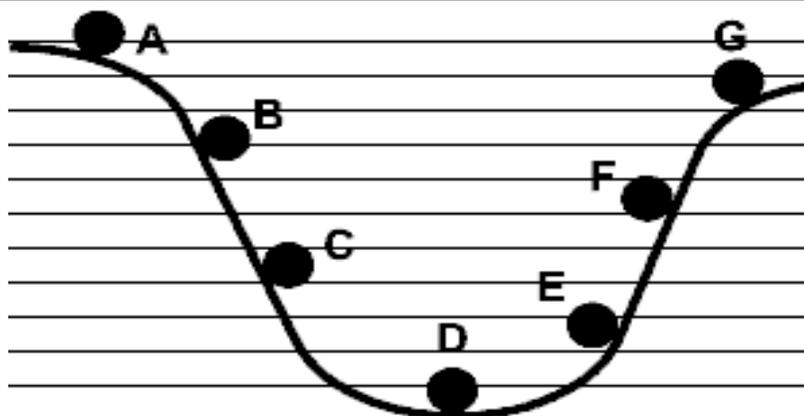
5E Lesson Plan

5) How does your activity support transformation of energy?

5E Lesson Plan	
<p>Explore</p> <p>The purpose for the EXPLORE stage is to get students involved in the topic; providing them with a chance to build their own understanding.</p>	<p>THINK PAIR SHARE</p> <p>Students will then take about 5 minutes to reflect on what they learned so far and how that aligns with our understanding of the learning objectives. Each student will then list at least 5 examples of potential and kinetic energy they observe every day. As they list those examples, students will also consider instances in which there is change in the form of energy. Students will then pair up and share their examples.</p> <p>Then students will identify several pictorial examples as Potential Energy and Kinetic Energy. Student will raise their hands and provide response. I may also choose students to check for understanding of the topic.</p> <p>Then students will work in groups of 3 to do the following exercise</p> <p><u>FORMATIVE ASSESSMENT</u></p> <p>Classify the following as a type of potential energy or kinetic energy (use the letters K or P)</p> <ol style="list-style-type: none"> 1. A bicyclist pedaling up a hill _____ 2. An archer with his bow drawn _____ 3. A volleyball player spiking a ball _____ 4. A baseball thrown to second base _____ 5. The chemical bonds in sugar _____ 6. The wind blowing through your hair _____ 7. Walking down the street _____ 8. Sitting in the top of a tree _____ 9. A bowling ball rolling down the alley _____ 10. A bowling ball sitting on the rack _____
<p>Explain</p> <p>The purpose for the EXPLAIN</p>	<p>Students will remain in a group of 3. First, they will do a self-reflection on what has been taught so far and write it down to share with the group members. Then I will project the following image on the smartboard for them to think, plan, investigate, and organize collected information.</p>

5E Lesson Plan

stage is to provide students with an opportunity to communicate what they have learned so far and figure out what it means.



(Pic from google)

Students will work together to discuss different amounts of energy at different points after they are done working individually.

Then I will launch the following virtual lab on potential and kinetic energy and work together with the students.

http://www.glencoe.com/sites/common_assets/science/virtual_labs/PS05/PS05.html

What are the relationships between kinetic energy and potential energy?

Energy is the ability to cause change. Energy exists in many forms. Some of these forms include radiant, electrical, chemical, thermal and nuclear energy.

Kinetic energy is energy in the form of motion, such as in a bouncing ball.

Potential energy is stored energy. The amount of potential energy an object has depends on its position or condition. In the Virtual Lab you will learn about the relationship between potential energy and kinetic energy by swinging a pendulum and observing bar and wave graphs as they illustrate its energy. For the purposes of this activity, assume that there is no friction or air resistance.

Objectives:

Distinguish between kinetic and potential energy.

Recognize that energy can change from one form to other forms with no loss of

total energy.

Procedure:

1. Click the Video button. Watch the video about potential and kinetic energy.

Observe the point at

which the clock pendulums and the swings are at their highest and lowest kinetic and potential

energy. Record your observations in your Journal.

2. Click the weight at the end of the pendulum arm and drag it to the desired height.

3. Click the Swing button.

4. Observe what happens to the bar and wave graphs as the pendulum swings, and record the data

in your Journal. The arrow on the pendulum always points in the direction of its motion.

5. Click the Pause button to stop the pendulum at different points in its swing.

Observe the potential

and kinetic energy on the graphs at each stopping point. Click the Table button and record this

information in the Table.

6. To return the pendulum to the center position, click the Reset button.

7. When you have collected data for a number of stopping points, make some observations about

the relationship between potential and kinetic energy and record them in your Journal. Be sure to

include your observations about the sum of potential and kinetic energy at each

5E Lesson Plan	
	stopping point.
<p>Elaborate/Extend</p> <p>The purpose for the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications.</p>	<p>Now that students can compare/contrast PE and KE and also explain and identify examples, they will work on Law of Conservation of energy. Students will use their knowledge of KE/PE to explain that energy can neither be created nor be destroyed but can only be changed from one form to another.</p> <p>Students will use their knowledge to list several real-life examples that clarify law of conservation of energy and share with their group.</p> <p>Then students will use the formula $PE=mgh$ and $KE=1/2 mv^2$ to calculate potential and kinetic energy.</p> <p>Gradual Release of Responsibility (GRR) for Calculations (MATHEMATICS)</p> <p>I DO -</p> <ol style="list-style-type: none"> 1. Your pet puppy Scruffy can run up to 2 meters/sec (m/s) on his fastest days. Scruffy has a mass of 8 kg. What is his maximum kinetic energy on his fastest days? 2. A skydiver jumps from a plane that is 1,500 meters above the ground. The diver has a mass of 125 kg. What is the skydiver's potential energy at this height? <p>WE DO -</p> <ol style="list-style-type: none"> 1. Missy Diwater, the former platform diver for the Ringling Brother's Circus had a kinetic energy of 15,000 J just prior to hitting the bucket of water. If Missy's mass is 50 kg, then what is her speed? 2. A cart is loaded with a brick and pulled at constant speed along an inclined plane to the height of a seat-top. If the mass of the loaded cart is 3.0 kg and the

height of the seat top is 0.45 meters, then what is the potential energy of the loaded cart at the height of the seat-top?

YOU DO (COLLABORATIVELY) -

1. A 75-kg refrigerator is located on the 70th floor of a skyscraper (300 meters above the ground) What is the potential energy of the refrigerator?

2. The potential energy of a 40-kg cannon ball is 14000 J. How high was the cannon ball to have this much potential energy?

(FORMATIVE)

YOU DO (INDEPEDENTLY) -

1.

A 10 kg toddler on a tricycle is sitting at the top of a 5 meter high hill.

a. What is the toddler's potential energy?

b. As the toddler travels down the hill on his tricycle, he reaches an average velocity of 10

m/s. What is the kinetic energy?

Problems from - <https://bentonms.pwcs.edu/common/pages/DisplayFile.aspx?itemId=5697082>)

<https://www.wlsv.k12.or.us/cms/lib/OR01001812/Centricity/Domain/756/Kinetic>

[%20and%20Potential%20Energy%20Worksheet.pdf](#)

Kahoot Time!

USE OF TECHNOLOGY

Students will take a tennis ball and find its potential energy at 5 different heights and use Excel to make a graph to show how potential energy differs with different height.

Students will do the same thing for Kinetic energy and show a graph how KE changes with change in the speed of an object.

Materials Required -

Tennis ball

Ruler

Stopwatch

Evaluate

The purpose for the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place.

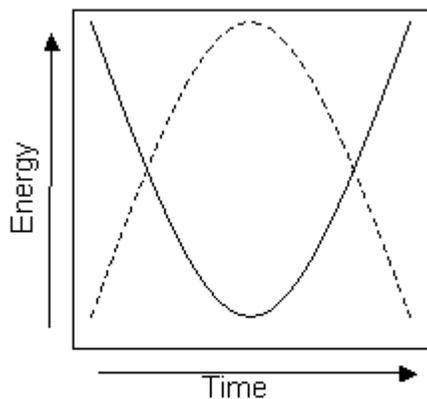
Students will also take the following summative assessment -

- 1) An example of friction being converted into heat energy is
 - A) the sun.
 - B) a generator.
 - C) a Snickers bar.
 - D) ***rubbing your hands together.***

- 2) The law of conservation of energy states that
 - A) energy may be created, destroyed or transformed.
 - B) energy may be created, but only in certain types of nuclear reactions.
 - C) ***energy may neither be created nor destroyed; it may only be transformed.***
 - D) the energy created by one process must be equal to that destroyed by another process.

- 3) The process by which people walk
 - A) requires only a little energy.
 - B) is powered by the body's surplus heat energy.
 - C) ***relies on the conversion of chemical energy from food into mechanical energy by muscles.***
 - D) relies on the creation of mechanical energy by muscles, which is transferred into heat energy.

- 4)



Potential energy -----

Kinetic energy _____

According to the graph, which of these remains constant throughout?

- A) ***total amount of energy***
- B) potential
- C) kinetic energy
- D) time

5)

During physical science, Ms. Greene challenged her students to produce an energy transformation. James and Jill wrapped a 4-inch nail with a coil of fifty turns of wire. They connected one end of the coil to one terminal of a knife switch. They connected the other terminal of the knife switch to the battery. Finally, they connected the end of the coil to the other terminal of the battery.

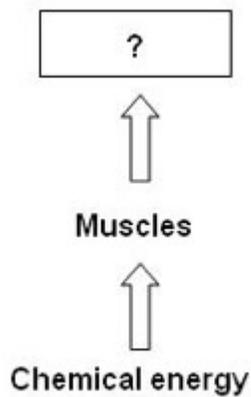
James held the tip of a 1-inch nail near the flat end of the 4-inch nail. Jill closed the knife switch quickly and then opened it. The 1-inch nail was pulled toward the 4-inch nail.

James and Jill used a battery as a source of electricity to construct a(n) _____ that created _____ energy that caused the nail to move.

- A) motor; electrical
- B) generator; magnetic
- C) generator;

electrical
D) **electromagnet;**
magnetic

6)

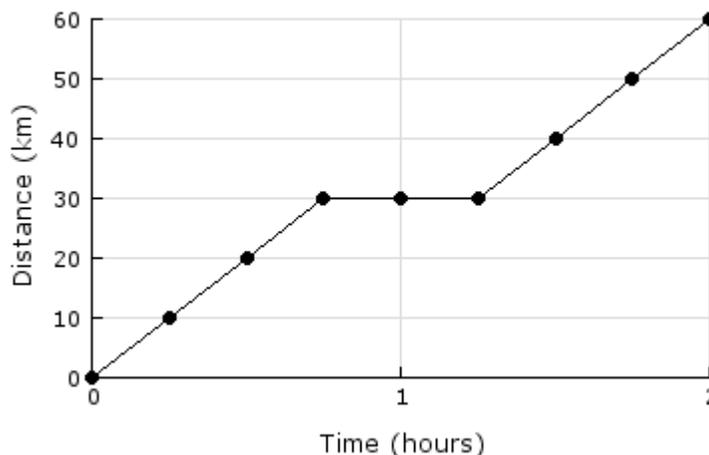


Muscles convert chemical energy into

- A) light energy.
- B) nuclear energy.
- C) **mechanical energy.**
- D) electromagnetic energy.

7)

Travel by Car

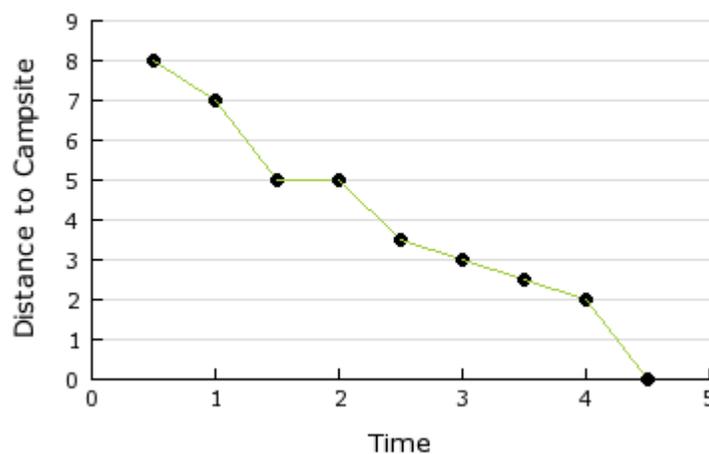


Sara and Sam went for a two-hour drive. According to the graph, between .75 hours and 1.25 hours into their trip, they

- A) slowed down to a speed of 15km/hour.
- B) travelled at a constant rate of 30km/hour.
- C) ***were not moving since there was no change in position.***
- D) turned around to go home but their speed remained constant.

8)

Camper's Hiking Rate



During summer break, Jamie's family went camping in the mountains. There were no roads to their camp, 8 miles away, and it took them about 4.5 hours to reach the campsite on foot. Did Jamie's family stop to rest

during the trip? How can you tell from the data?

- A) No. They continued moving but their speed varied.
- B) Yes. After 1.5 hours, there is no change in position for 30 minutes.**
- C) No. They continued moving, although they also slowed down continuously during the trip.
- D) Not really. They did stop, but that was only when they reached the campsite at distance equals 0.

9) A gasoline engine transforms approximately 34 percent of the fuel's chemical energy into mechanical energy. If energy is conserved, what happens to the other 66 percent?

- A) Most is transformed into thermal energy.**
- B) Most is transformed into electrical energy. It is lost due to friction between moving parts.
- C) It is stored to run the car at a later time.
- D) It is stored to run the car at a later time.

10) Which would be the best example to demonstrate the principle of conservation of energy?

- A) a stone is crushed
- B) light bends around a sharp edge
- C) a pendulum swings back and forth**
- D) a balloon inflates when air is blown into it

11)



To cook food, a microwave oven converts electrical energy into _____ energy.

- A) electromagnetic**
- B) heat
- C) mechanical
- D) nuclear

12) A fan is connected to a battery in a series circuit. What kind of energy transfer occurs if the circuit is closed?

- A) Light energy changes to chemical energy.
- B) Thermal energy changes to mechanical energy.
- C) Chemical energy changes to mechanical energy.**
- D) Mechanical energy changes to chemical energy.

13)



If C moves to position 5 (60 meters), what is its average velocity during these 5 seconds?

- A) 10 m/s
- B) 11 m/s
- C) 12 m/s**
- D) 13 m/s

14) Electrical energy can be transformed into other types of energy. We often experience these changes of energy in our everyday lives. Which example is a transformation from electrical energy to light energy?

A)



B)



C)



D)



15) Electrical energy can be transformed into other types of energy. We often experience this transformation of energy in our everyday lives. Which example represents a conversion from light energy to electrical energy?

A)



B)



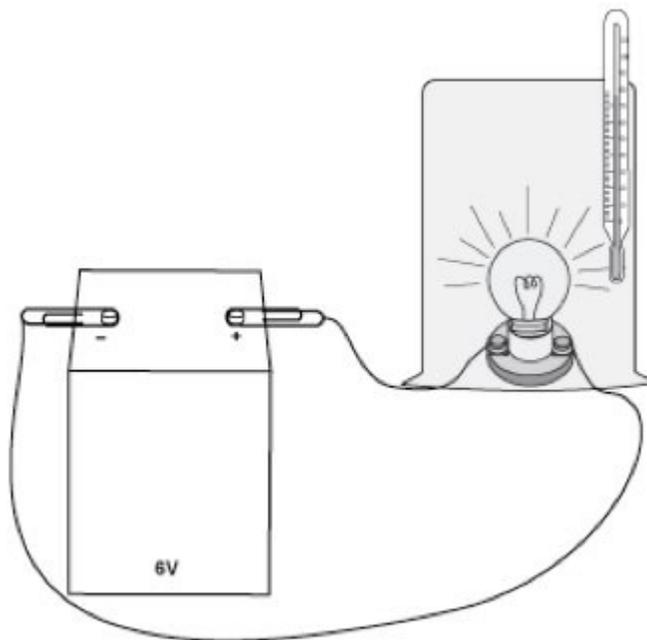
C)



D)



16)



Jenna built a completed electrical circuit. Jenna's circuit illustrates what energy transformation?

- A) Electrical energy decreases over time.
- B) Electrical energy does not affect heat or light.
- C) Electrical energy can be transformed only into light.
- D) **Electrical energy can be transformed into both heat and light.**

17) Which example shows electrical energy being transformed into heat energy?

- A) burning a wax candle
- B) **a small toaster oven toasts a bagel**
- C) rubbing two sticks together
- D) sunlight heating a metal door

18) Which statement is TRUE?

- A) Energy can be created or destroyed.
- B) Electrical energy is created from other forms of energy.
- C) Energy in a battery makes new energy called electrical energy.
- D) **Stored energy in a battery can be transformed into electrical energy.**

19) One of these items transforms electrical energy into sound. It is

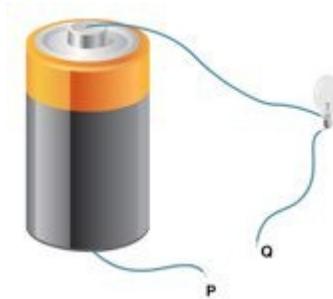
- A) a firecracker.

5E Lesson Plan

- B) a violin.
- C) a radio.**
- D) a drum.

20) Yesenia wants to bake cookies in her electric oven. The oven will transform electrical energy into _____ energy.

- A) heat**
 - B) light
 - C) motion
 - D) sound
- 21)



A battery uses _____ energy to generate _____ energy.

- A) chemical, electrical**
- B) chemical, mechanical
- C) electrical, chemical
- D) electrical, mechanical

22)



The light bulb transfers electrical energy into light. What is one type of energy that is also generated that is NOT a desired effect?

- A) chemical
- B) **heat**
- C) mechanical
- D) sound

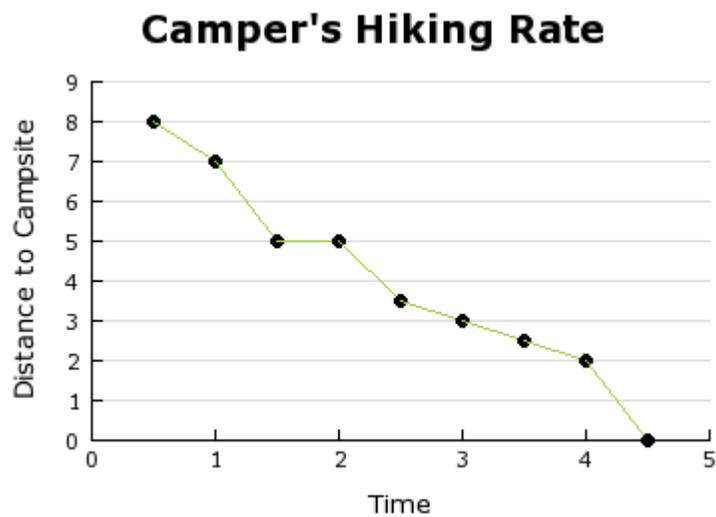
23)



We have to eat in order to carry out all of our bodily processes. What type of energy transformation is taking place when we use that digested food in order to run?

- A) thermal to chemical
- B) **chemical to mechanical**
- C) mechanical to chemical
- D) electrical to chemical

24)

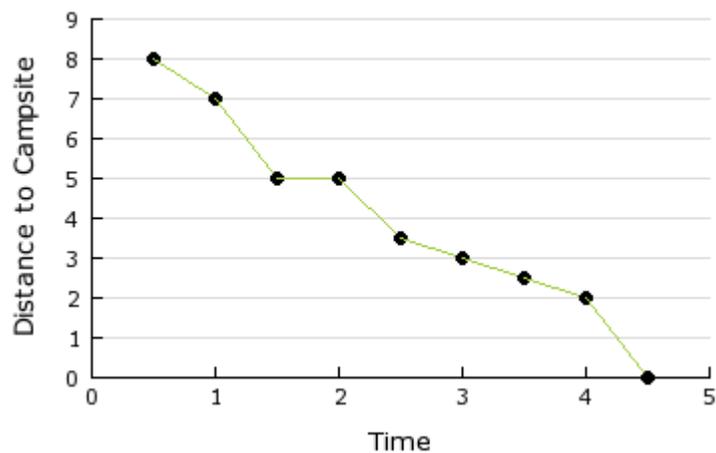


A camper marks their position on a map and makes a graph as shown. Which statement best describes their motion over this period of time?

- A) ***The camper is walking toward their campsite.***
- B) The camper is walking faster as time goes on.
- C) The camper is walking slower as time goes on.
- D) The camper is walking away from their campsite.

25)

Camper's Hiking Rate

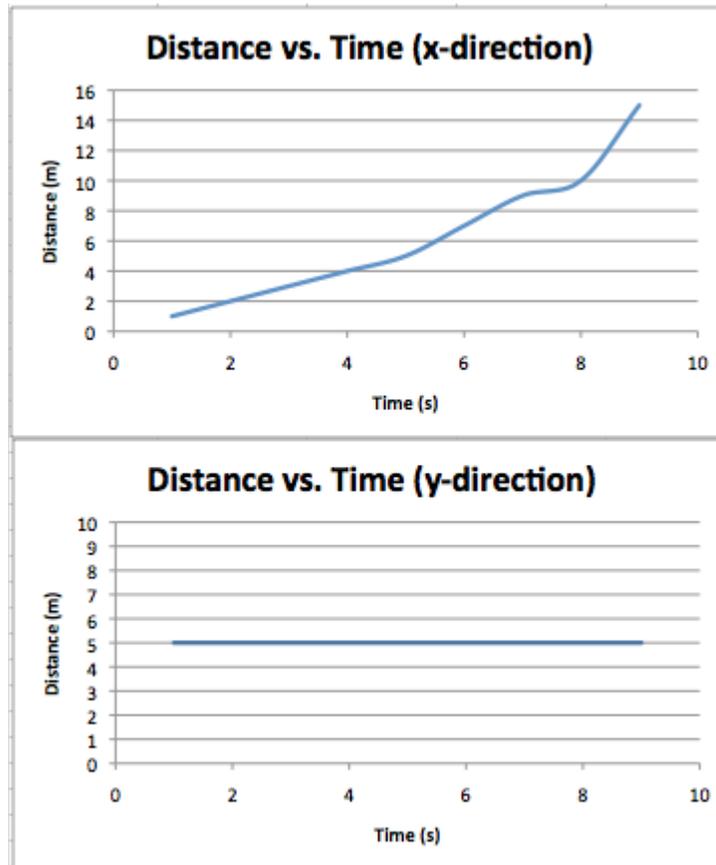


In the position vs time graph, each dot represents the end of a 30 minute interval.

During which interval are the persons represented by the graph not moving?

- A) 0 to 0.5 hrs
- B) 1.5 to 2 hrs**
- C) 2 to 2.5 hrs
- D) 4.5 to 5 hrs

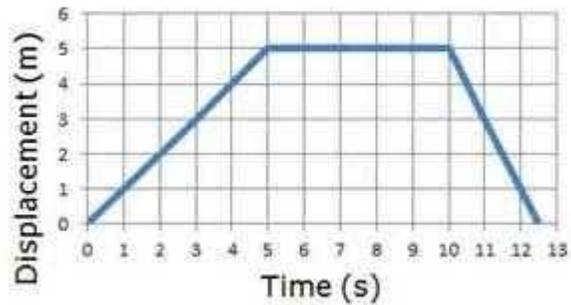
26)



In which of the directions is the object moving according to the graphs?

- A) *the x-direction only*
- B) the y-direction only
- C) both the x and y-directions
- D) neither the x or y-directions

27)



The object represented by the graph is not in motion at

- A) 1 second.
- B) 4 seconds.
- C) 7 seconds.**
- D) 11 seconds.

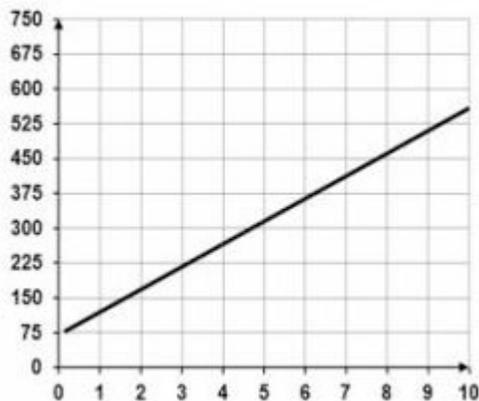
28) A certain clock requires a weight lifted up once a day. The weight provides the energy that allows the clock to keep running. Identify the transformation of that powers a grandfather clock.

- A) It transforms kinetic energy into potential energy.
- B) It transforms potential energy into kinetic energy.**
- C) It transforms potential energy into electrical energy.
- D) It transforms electrical energy into potential energy.

29) Toy remote control cars require batteries as a power source. Identify the energy transformation that powers an electric generator in a toy remote control car.

- A) It transforms electrical energy into kinetic energy.
- B) It transforms kinetic energy into electrical energy and then into chemical potential energy.
- C) It transforms chemical potential energy into kinetic energy and then into electrical energy.
- D) It transforms chemical potential energy into electrical energy and then into kinetic energy.**

30)



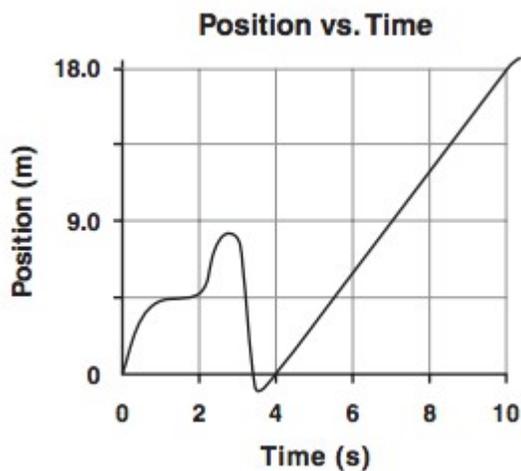
If the graph shown is a position-time graph of an object moving at constant velocity, what is the velocity of the object? Assume that the units of position are meters and the units of time are seconds.

- A) 0.02 m/s
- B) 10 m/s
- C) 50 m/s**
- D) 75 m/s

31) A fan that is battery powered starts with _____ energy produced by the battery which is then transforms into _____ energy of the motor which lastly transforms into _____ energy of the fan moving resulting in work being done.

- A) kinetic, potential, electrical
- B) chemical, electrical, mechanical**
- C) chemical, mechanical, electrical
- D) electrical, potential, mechanical

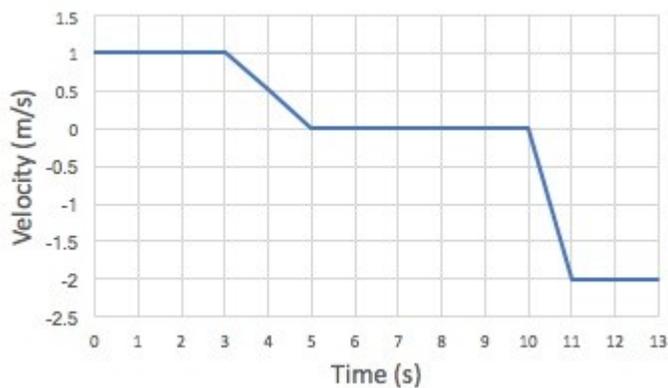
32)



Over the interval from 4 seconds to 10 seconds, the object's speed was calculated to be 3 m/s. What is the object's position after 8 seconds have elapsed.

- A) 10 meters
- B) 11 meters
- C) **12 meters**
- D) 13 meters

33)



A dog was west of his home for a short time and returns home then runs past it in the other direction (east). The graph shows his position as a function of time.

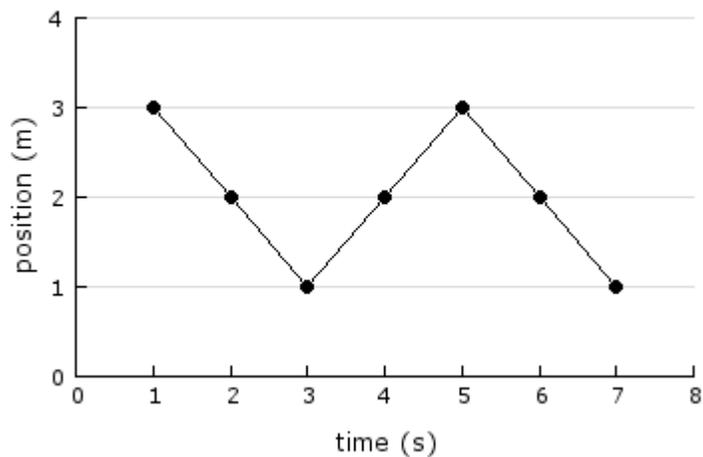
How long did the dog stop at his home before running again?

- A) 1 seconds
- B) 2 seconds
- C) **5**

- seconds**
D) 10 seconds

34)

Motion of Pendulum

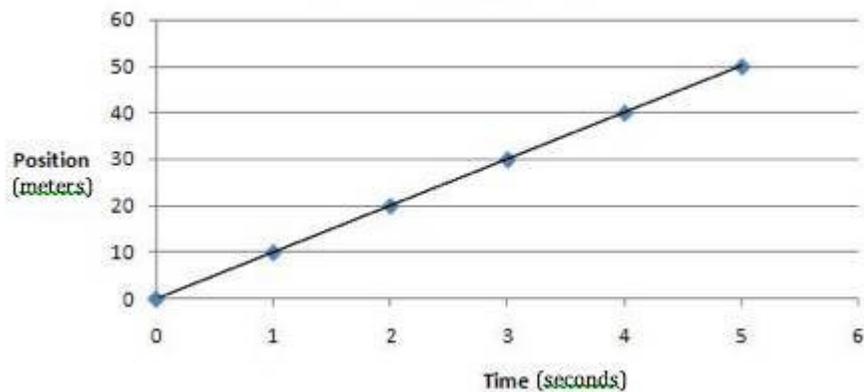


John's grandfather clock has a pendulum that keeps the seconds. The observed pattern of motion for three complete swings of the pendulum is shown. Assuming that the pendulum starts at the right and moves toward the center first, predict the direction the pendulum will move next.

- A) *cente*
*r***
B) left
C) outer
D) right

35)

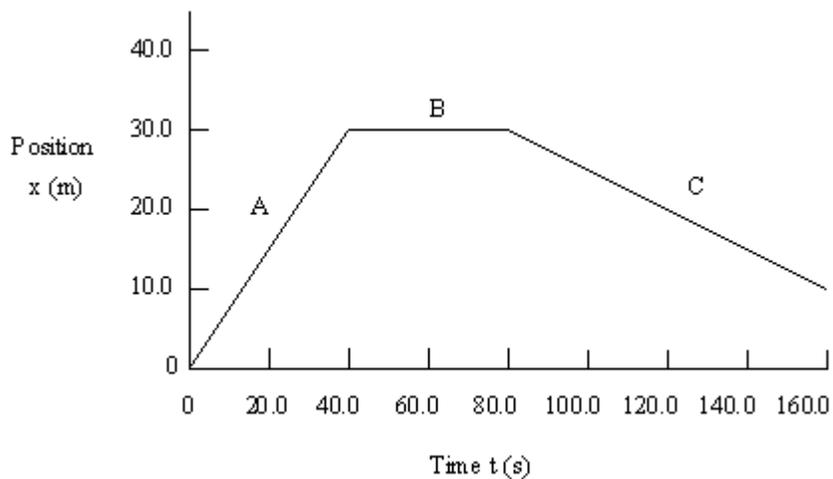
Position vs. Time



A car's position in relation to time is plotted on the graph. What is the car's average velocity?

- A) 5 m/s
- B) 10 m/s**
- C) 30 m/s
- D) 50 m/s

36)

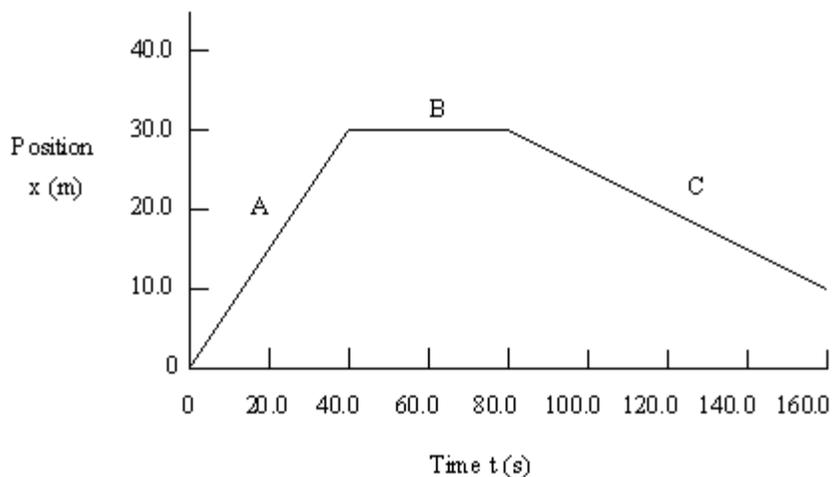


A car's position in relation to time is plotted on the graph. What is the car's average velocity for segment C?

- A) -4 m/s
- B) -0.25 m/s**
- C) 0.25 m/s

D) 4 m/s

37)



A car's position in relation to time is plotted on the graph. What can be said about the car during segment B?

- A) The car travels for 80 seconds during segment B.
- B) *The car has come to a stop and has zero velocity.***
- C) The car is traveling faster during segment B than in segment C.
- D) The car is traveling with a constant velocity due to the flat line of the graph.

(Assessment created using usatestprep)