Grade 10

CONCEPTS OF PHYSICAL SCIENCE

B-1 • UNITS 1 & 2

Based on the Alaska Science Standards SB 1.1, SB 2.1

FOR THE

Juneau-Douglas High School

Sealaska Heritage Institute

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Integrating Culturally Responsive, Place-Based Content with Language Skills Development for Curriculum Enrichment

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INTRODUCTION

Over the years, much has been written about the successes and failures of students in schools. There is no end to the solutions offered, particularly for those students who are struggling with academics. There have been efforts to bring local cultures into the classroom, thus providing the students with familiar points of departure for learning. However, most often such instruction has been limited to segregated activities such as arts and crafts or Native dancing rather than integrating Native culture into the overall learning process. Two core cultural values, *Haa Aaní,* the reference for and usage of the land, and *Haa Shagóon,* the tying of the present with the past and future, are known by both students and parents, and can be included in a curriculum that simultaneously provides a basis for self-identity and cultural pride, within the educational setting. This will provide a valuable foundation for improved academic achievement.

While the inclusion of Native concepts, values, and traditions into a curriculum provides a valuable foundation for self-identity and cultural pride, it may not, on its own, fully address improved *academic* achievement.

This program is designed to meet the academic realities, faced by high school students every day, using a developmental process that integrates *culture* with *skills* development. The values of *Haa Aaní* and *Haa Shagóon* are reinforced through the various activities in the program.

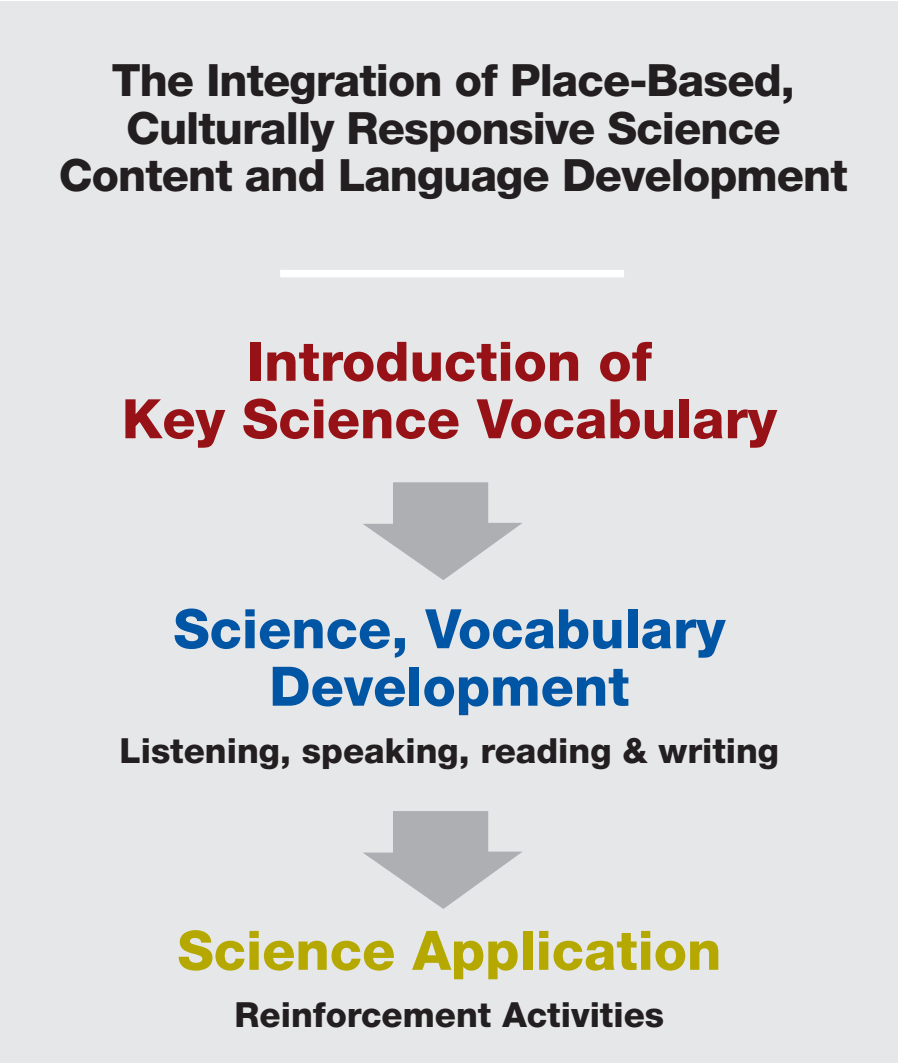
During science lessons, the students are exposed to new information and to key vocabulary that represent that information. While the students may acquire, through various processes, the scientific information, the vocabulary is often left at an exposure level and not internalized by them. Over time, this leads to *language-delay* that impacts negatively on a student's on-going academic achievement.

Due to *language delay*, many Native Alaskan high school students struggle with texts that are beyond their comprehension levels and writing assignments that call for language they do not have.

To this end, in this resource program, each key vocabulary word in science is viewed as a *concept*. The words are introduced concretely, using place-based information and contexts. Whenever possible, the concepts are viewed through the Native heritage cultural perspectives, thus reinforcing the value of *Haa Shagóon* and *Haa Aaní.* Using this approach, the students have the opportunity to acquire new information in manageable chunks; the sum total of which, represent the body of information to be learned in the science program.

When the key vocabulary/concepts have been introduced, the students are then taken through a sequence of listening, speaking, reading, and writing activities, designed to instill the vocabulary into their long term memories.

Finally, at the end of each unit, the students will participate in enrichment activities based on recognized and research-based *best practices*. By this time, the science information and vocabulary will be familiar, adding to the students' feelings of confidence and success. These activities will include *place-based* and *heritage culture* perspectives of the information learned.



The Developmental Language Process

The Developmental Language Process is designed to instill language into long term memory. The origin of the Process is rooted in the struggles faced by language-delayed students, particularly when they first enter school.

The Process takes the students/children through developmental steps that reflect the natural acquisition of language in the home and community. Initially, once key language items have been introduced concretely to the students, the vocabulary are used in the first of the language skills, Basic Listening. This stage in the process represents *input* and is a critical venue for language acquisition and retention. A baby hears many different things in the home, gradually the baby begins to *listen* to what he/she hears. As a result of the *input* provided through Basic Listening, the baby tries to repeat some of the language heard – this is represented by the second phase of the Process, Basic Speaking - the oral *output* stage of language acquisition.

As more language goes into a child's long-term memory, he/she begins to understand simple commands and phrases. This is a higher level of listening represented by the stage, Listening Comprehension. With the increase in vocabulary and sentence development, the child begins to explore the use of language through the next stage in the Process, Creative Speaking. All of these steps in the Process reflect the natural sequence of language development.

The listening and speaking skill areas represent *true* language skills; most cultures, including Alaska Native cultures, never went beyond them to develop written forms. Oral traditions are inherent in the listening and speaking skills.

However, English does have abstract forms of language in reading and writing. Many Native children entering kindergarten come from homes where language is used differently than in classic Western homes. This is not a value judgment of child rearing practices but a definite cross-cultural reality. Therefore, it is critical that the Native child be introduced to the concepts of reading and writing before ever dealing with them as skills areas. It is vital for the children to understand that reading and writing are *talk in print*.

The Developmental Language Process integrates the *real* language skills of listening and speaking with the related skills of reading and writing. At this stage in the Process, the students are introduced to the printed words for the first time. These abstract representations are now familiar, through the listening and speaking activities, and the relationship is formed between the words and language, beginning with Basic Reading.

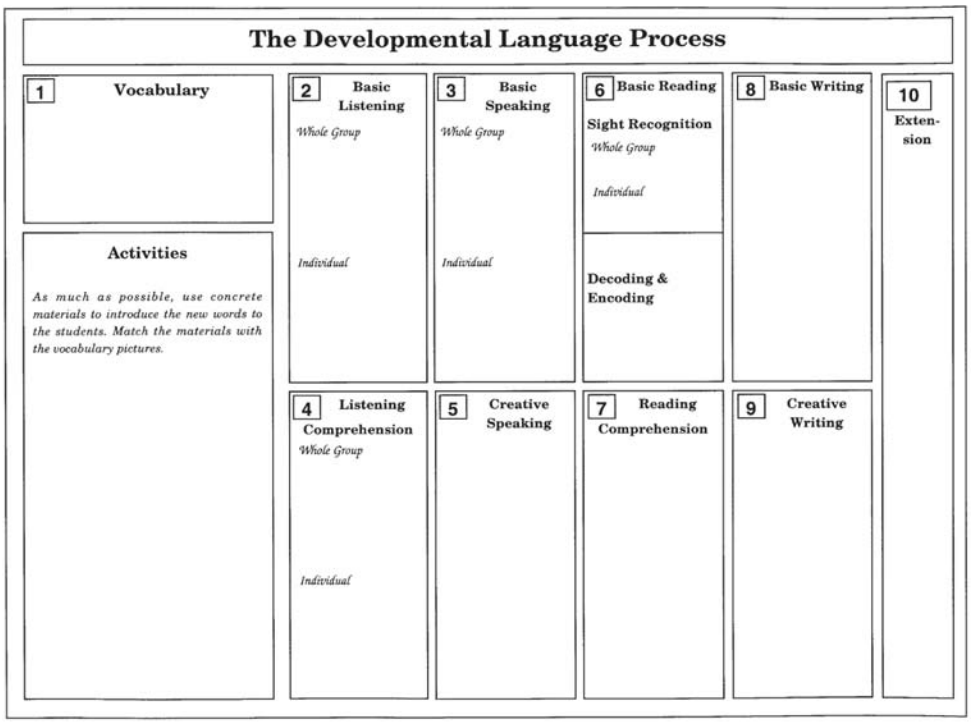
As more language goes into the children's long-term memories, they begin to comprehend more of what they read, in Reading Comprehension.

Many Alaskan school attics are filled with reading programs that didn't work – in reality, any of the programs would have worked had they been implemented through a language development process. For many Native children, the printed word creates angst, particularly if they are struggling with the reading process. Often, children are asked to read language they have never heard.

Next in the Process is Basic Writing, where the students are asked to write the key words. Finally, the most difficult of all the language skills, Creative Writing, asks the students to write sentences of their own, using the key words and language from their long-term memories. This high level skill area calls upon the students to not only retrieve language, but to put the words in their correct order within the sentences, to spell the words correctly and to sequence their thoughts in the narrative.

A student's ability to comprehend well in listening and reading, and to be creatively expressive in speaking and writing, is dependent upon how much language he/she has in long-term memory.

The Developmental Language Process is represented in this chart:



It should be understood that these materials are not a *curriculum* - rather, they are resource materials designed to encourage academic achievement through intensive language development in the content areas.

These resource materials are *culturally responsive* in that they utilize teaching and learning styles effective with Native students. As the students progress through the steps of the Process, they move from a concrete introduction of the key vocabulary, to a symbolic representation of the vocabulary, and finally, to their abstract forms - reading and writing. This provides a format for the students to develop language and skills that ultimately lead to improved academic performance.

Alaska Content Standards for Science

A. Science as Inquiry and Process

A student should understand and be able to apply the processes and applications of scientific inquiry. A student who meets the content standard should:

1. develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments;
2. develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review; and
3. develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.

B. Concepts of Physical Science

A student should understand and be able to apply the concepts, models, theories, universal principals, and facts that explain the physical world. A student who meets the content standard should:

1. develop an understanding of the characteristic properties of matter and the relationship of these properties to their structure and behavior;
2. develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved;
3. develop an understanding of the interactions between matter and energy, including physical, chemical, and nuclear changes, and the effects of these interactions on physical systems; and
4. develop an understanding of motions, forces, their characteristics and relationships, and natural forces and their effects.

C. Concepts of Life Science

A student should understand and be able to apply the concepts, models, theories, facts, evidence, systems, and processes of life science. A student who meets the content standard should:

1. develop an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution;
2. develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms; and
3. develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

D. Concepts of Earth Science

A student should understand and be able to apply the concepts, processes, theories, models, evidence, and systems of earth and space sciences. A student who meets the content standard should:

1. develop an understanding of Earth's geochemical cycles;
2. develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth;
3. develop an understanding of the cyclical changes controlled by energy from the sun and by Earth's position and motion in our solar system; and
4. develop an understanding of the theories regarding the origin and evolution of the universe.

E. Science and Technology

A student should understand the relationships among science, technology, and society. A student who meets the content standard should:

1. develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events;
2. develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits; and
3. develop an understanding of how scientific discoveries and technological innovations affect and are affected by our lives and cultures.

F. Cultural, Social, Personal Perspectives and Sciences

A student should understand the dynamic relationships among scientific, cultural, social, and personal perspectives. A student who meets the content standard should:

1. develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology;
2. develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world; and
3. develop an understanding of the importance of recording and validating cultural knowledge.

G. History and Nature of Science

A student should understand the history and nature of science. A student who meets the content standard should:

1. develop an understanding that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building on prior knowledge;
2. develop an understanding that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in striving for the best possible explanations of the natural world;
3. develop an understanding that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s); and
4. develop an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base.

http://www.educ.state.ak.us/ContentStandards/Science.html

UNIT 1

Sealaska Heritage Institute

INTRODUCTION OF

Key Vocabulary

Culturally Responsive & Place-based Perspective
Introduction of Science Vocabulary

Base

PLACE-BASED PERSPECTIVE

Using a house as an example, discuss the importance of building the foundation as a *base* for the walls and roof. Discuss the function of pilings that must be used as a base in many parts of Alaska.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Totem poles have *bases* - the bases were provided by the opposite clan and served to secure the totem poles from sinking into the ground.

Components

PLACE-BASED PERSPECTIVE

Take apart a ball point pen (preferably a pen with a spring mechanism) and discuss the different *components* that make it work. Have the students suggest other items that have components.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

A number of traditional items had various *components*, such as the bow and arrow, gaff hook, canoes, clan houses, and so on. Many of the traditional Native masks had different components such as feathers, fur seal, hinged flaps, etc.

Efficient

PLACE-BASED PERSPECTIVE

Have the students imagine that they are commercial fishermen - they should decide if they want to use fishing poles or nets and *why*. Lead the students to suggest that the nets are more *efficient* for catching large numbers of fish.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

For centuries the Native fishermen used fish wheels, traps, and gaff hooks to *efficiently* harvest their fish. While these added efficiency to the harvesting, they did not deplete the natural resources.

Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

Energy Conversions

PLACE-BASED PERSPECTIVE

Discuss with the students how the energy from the sun enables plants to grow; people can eat the plants to gain energy to, for example, play basketball. In this way, energy conversion occurs from the sun to the plants to people.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Seal meat, seal oil, and compressed salmon eggs are eaten for high energy nutrition.

Energy Loss

PLACE-BASED PERSPECTIVE

Have students rub their hands together and hold them out in front of them. Discuss how the warmth from their hands equates to energy loss from their body.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Many traditional clothing items were designed to prevent *energy* loss. This included items such as land otter and wolf hats, waterproof and breatheable sealskin coats, as well as seal and moose hide boots trimmed with wolf fur. Sea otter hides, sealskin, moosehide and beaver pelts were all used to produce hats, mittens, and footwear to prevent energy loss.

Potential and Kinetic Energy

PLACE-BASED PERSPECTIVE

Angle a board on a table, using books to prop it up. Place a toy car at the top of the board. Use this to introduce *potential energy*. Release the car, allowing it to roll down the board. Use this to introduce *kinetic energy*.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

In the story, The Old Man and The Club, the old man had a club with special powers that helped him to gather fish. He would use the *potential energy* of the club to produce *kinetic energy* to harvest the fish.

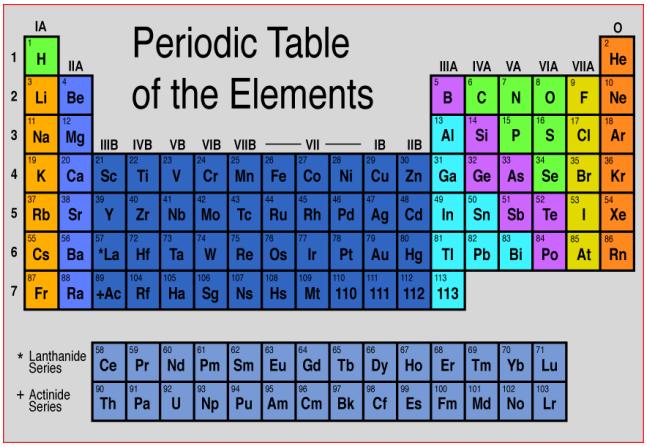
Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

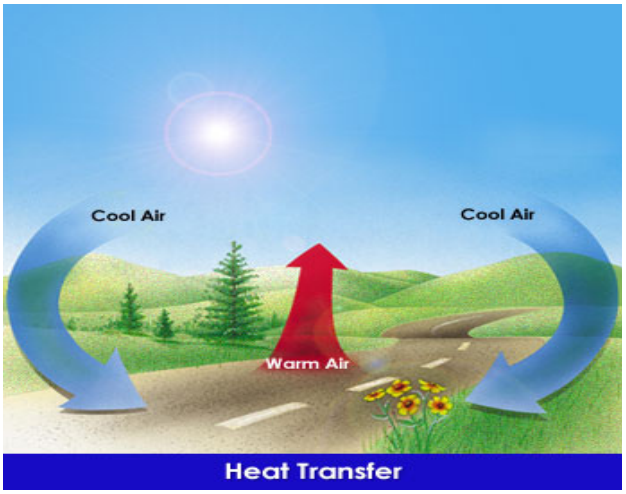
Periodic Table

PLACE-BASED PERSPECTIVE

Show a picture of the periodic table and discuss how and why the elements are organized in columns, rows, and groups.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.





Heat Transfer

Thermal Energy

PLACE-BASED PERSPECTIVE

Show an uncooked kernel of popcorn. Have the students suggest how we can cook the popcorn - microwave or stove top. Use this to introduce the concept of thermal energy - the heat causes the molecules to move quicky, thus "popping" corn. Relate this to a pot of boiling water.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

In a number of locations in Southeast Alaska, there are hot springs heated by *thermal energy* in the earth.

Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

Total Energy

PLACE-BASED PERSPECTIVE

Discuss with students that the heat from a piece of burning wood is the total energy that is stored in the wood.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Campfires are examples of *total engery*. This is also represented in forest fires and harnessed for the drying and smoking of fish and meat.

Transfer

PLACE-BASED PERSPECTIVE

Select a can of food that is a product of another country. Have the students imagine the steps it took to get the food item from its source to their community. Use this to introduce *transfer* to the students, as the food item was transferred from one location to another.Relate this to the transfer of energy - e.g., gasoline being transferred into mechanical energy by the engine. Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Traditionally Native peoples had both a winter village and a summer camp. People and household goods were *transferred* from one site to another by boats or by packing.

Transformations

PLACE-BASED PERSPECTIVE

Ask what butterflies, Superman, and Transformers have in common. Use this to introduce the concept of transformation.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

In the traditional story, Salmon Boy, the boy *transforms* from a human to a salmon. Later, he *transforms* again from a salmon to a boy.

Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

Useful Energy

PLACE-BASED PERSPECTIVE

Discuss with students how a generator produces useful energy in the form of electricity.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Traditional foods provided the peoples of Southeast Alaska with *useful energy* for daily survival and the development of a sophisticated culture.

Language Skills

Language & Skills Development

LISTENING

Use the activity pages from the Student Support Materials.

Flashlight Find

Mount the vocabulary illustrations on the walls, chalkboard, windows, etc. Have a student stand in the center of the classroom with a flashlight. Say one of the vocabulary words and the student must find the illustration for the vocabulary word you said using the light of the flashlight. This activity may also be conducted in team form. In this case, have two flashlights available. Have a player from each team stand in the center of the classroom. When you say the vocabulary word, each player must attempt to find the correct illustration with the light of his/her flashlight. The first player to correctly identify the illustration for the vocabulary word you said wins the round. Repeat until all players have played.

SPEAKING

Sheet Golf

Before the activity begins, obtain an old sheet. Cut a hole (approximately two inches in diameter) in each end of the sheet. Group the students into two teams. Have the first player from each team hold opposite ends of the sheet. Place a marble or small ball in the center of the sheet. When you say "Go," the players must then lift their ends of the sheet and attempt to cause the marble /ball to fall through the hole in the other player's side of the sheet. When the ball/marble falls through one of the holes, the player on that side of the sheet must then identify a vocabulary illustration you show or he/she should repeat a sentence you said at the beginning of the round. Repeat with other pairs of students until all students have participated. If the sheet is large enough, all students can play - divide the students into four groups (one group for each side). Cut a hole in the sheet near each side. When the marble/ball falls through, all the players on that side must say the name of a vocabulary illustration that you show. Repeat.

READING

Use the activity pages from the Student Support Materials.

Right or Wrong

Mount the sight words on the chalkboard. Point to one of the sight words and name it. The students should repeat the sight word. However, when you point to a sight word and say the wrong word for it, the students should remain silent. Repeat this process until the students have responded accurately to all of the sight words a number of times.

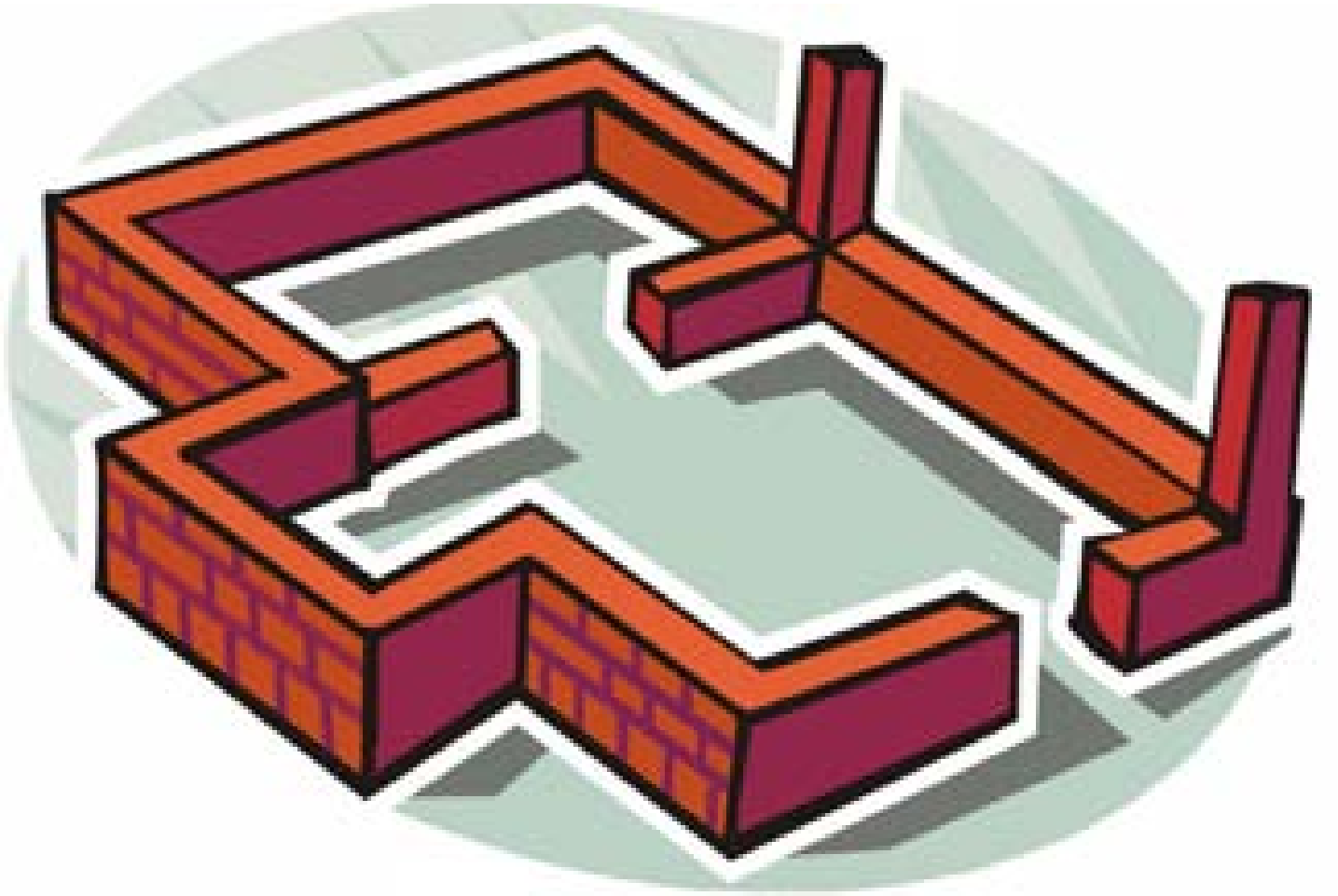
WRITING

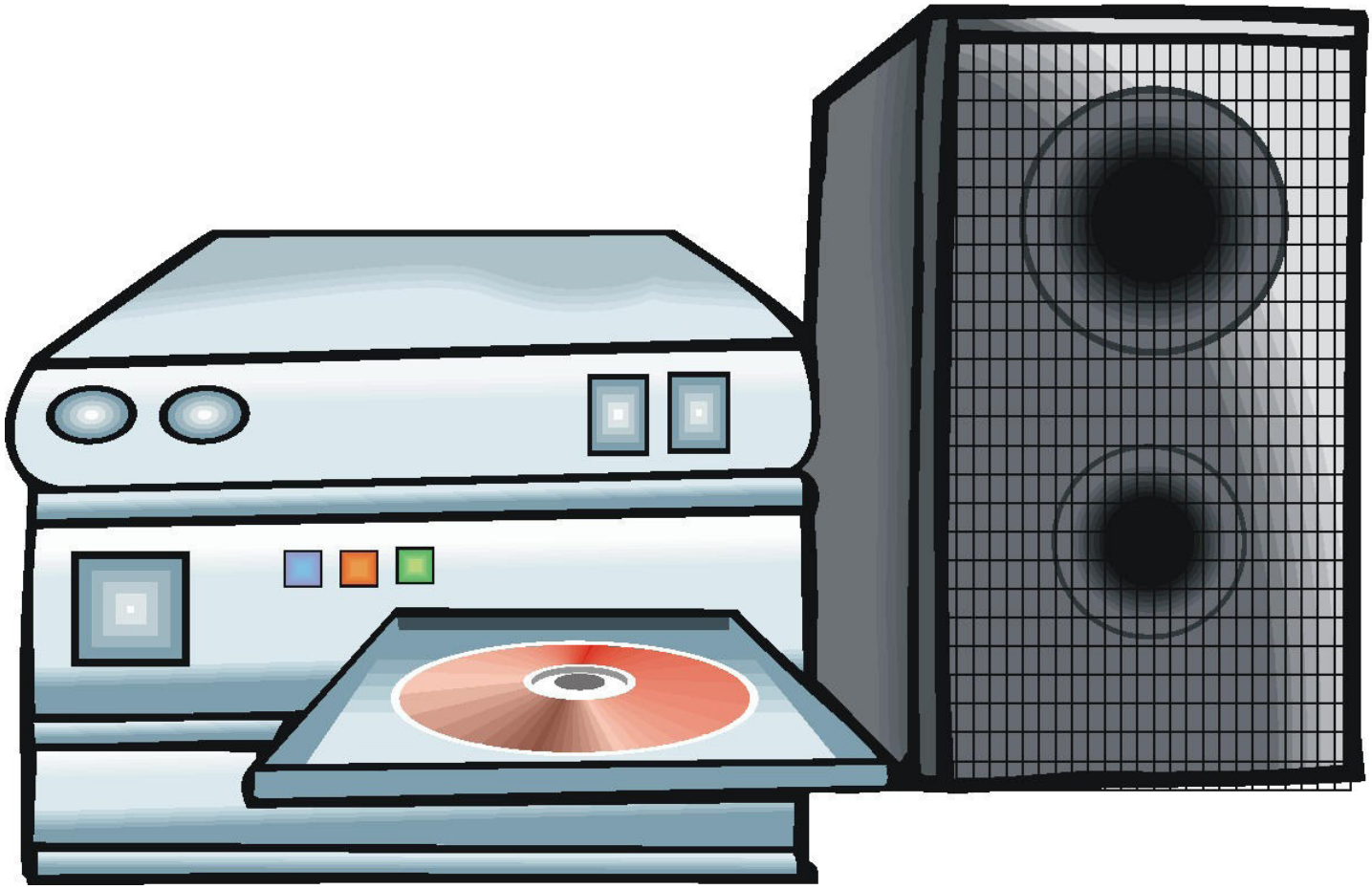
Use the activity pages from the Student Support Materials.

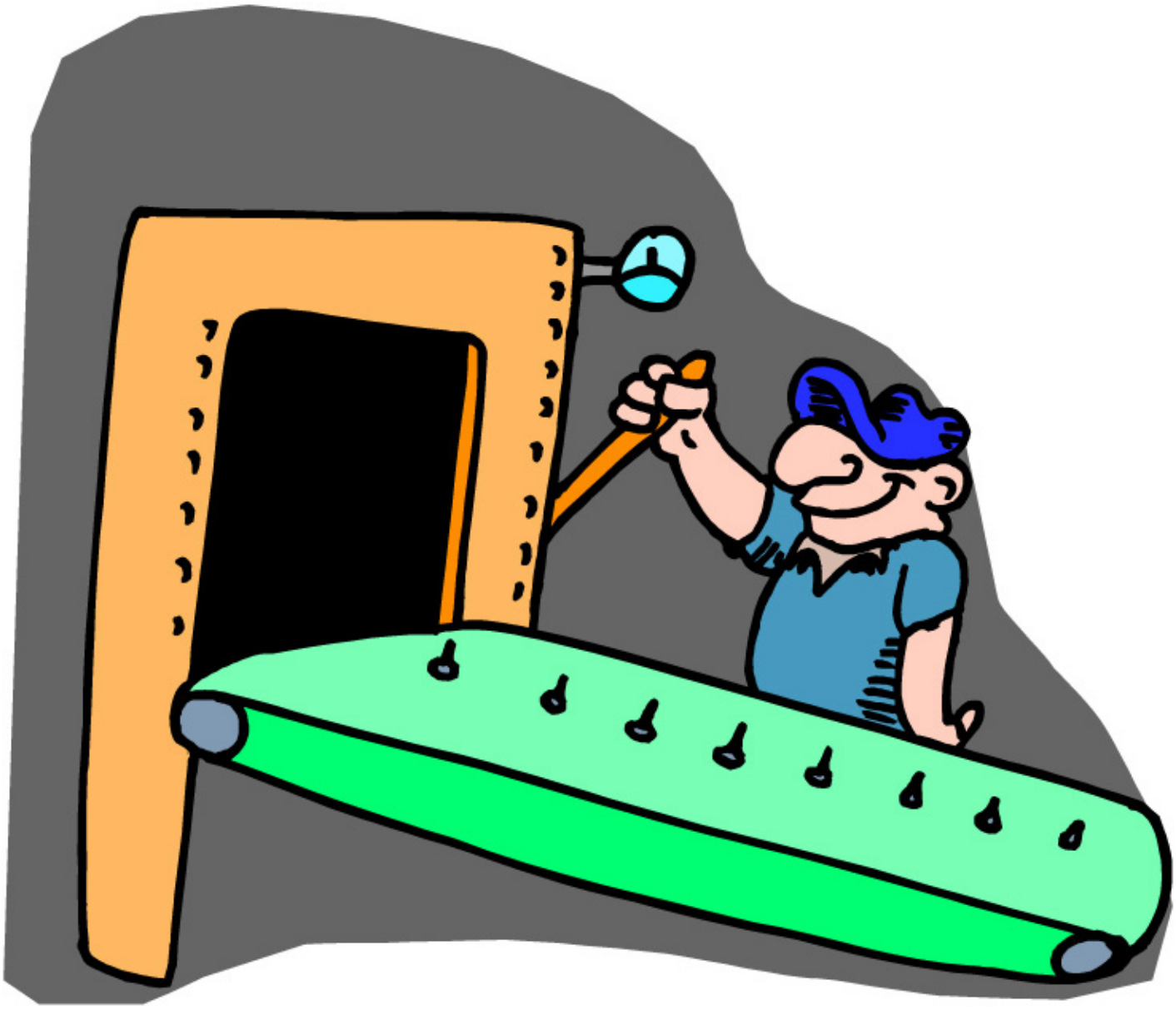
Horizontal Completion

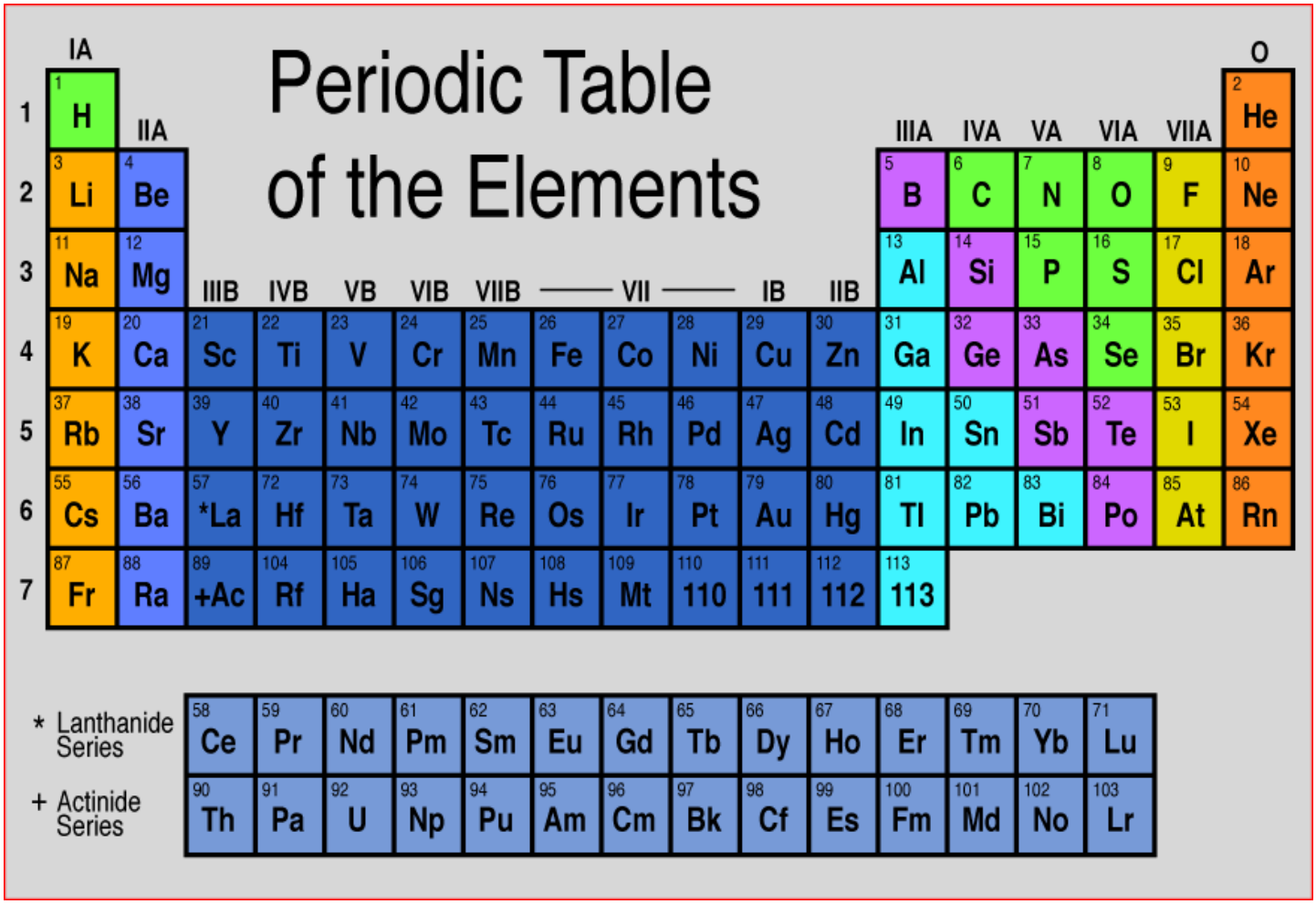
Before the activity begins, cut each of the sight word cards in half, horizontally. Provide each student with writing paper and a pen. Also, provide each student with one of the word halves. Each student should mount his/her word half on the sheet of writing paper. Then, the students should complete their words by writing-in the missing halves. Some students should have the upper halves of the sight words and other students should have the lower halves. Afterwards, review the students' responses. You may wish to provide each student with more than one half so that he/she completes more than one sight word.

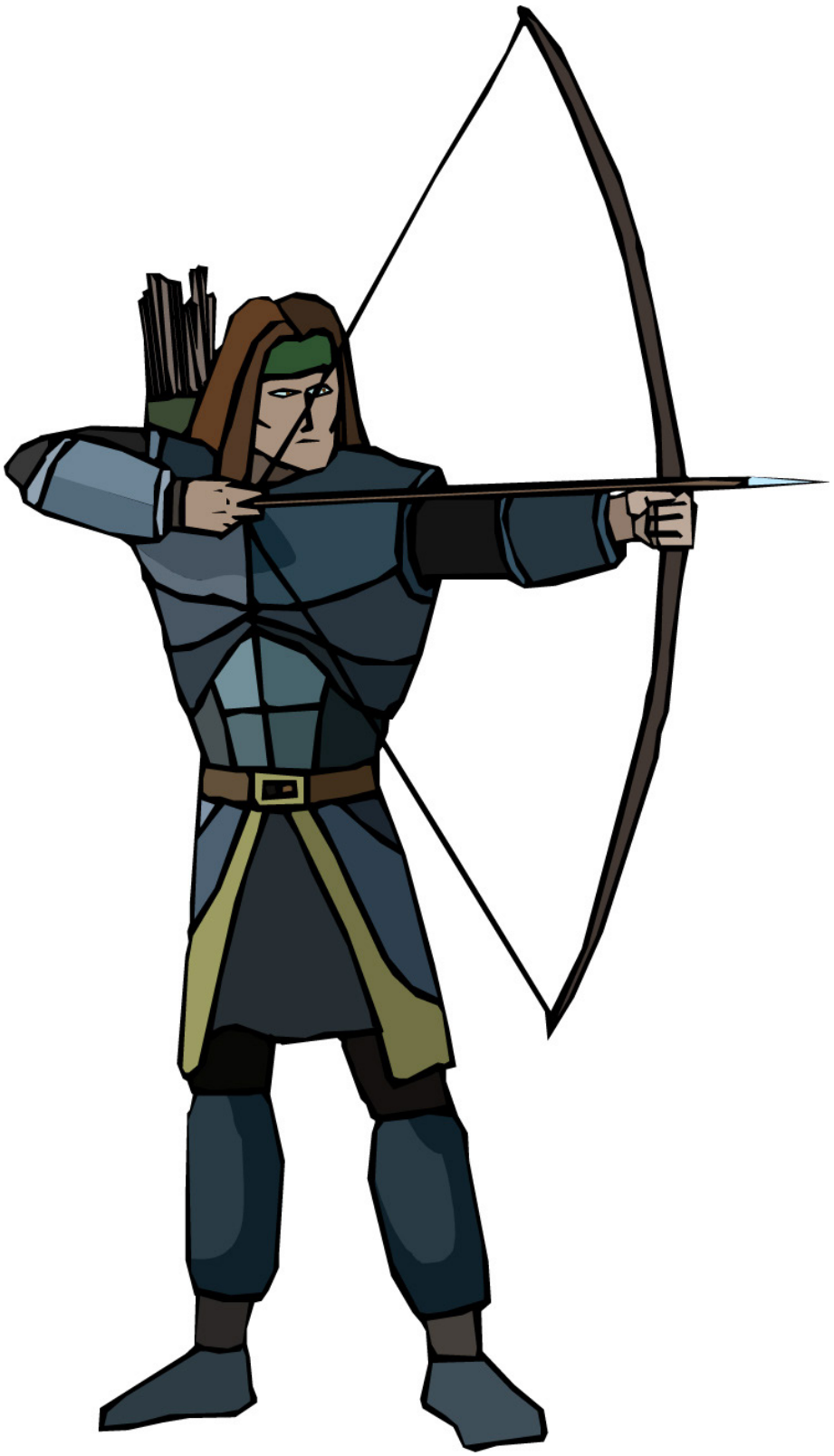
Vocabulary Images

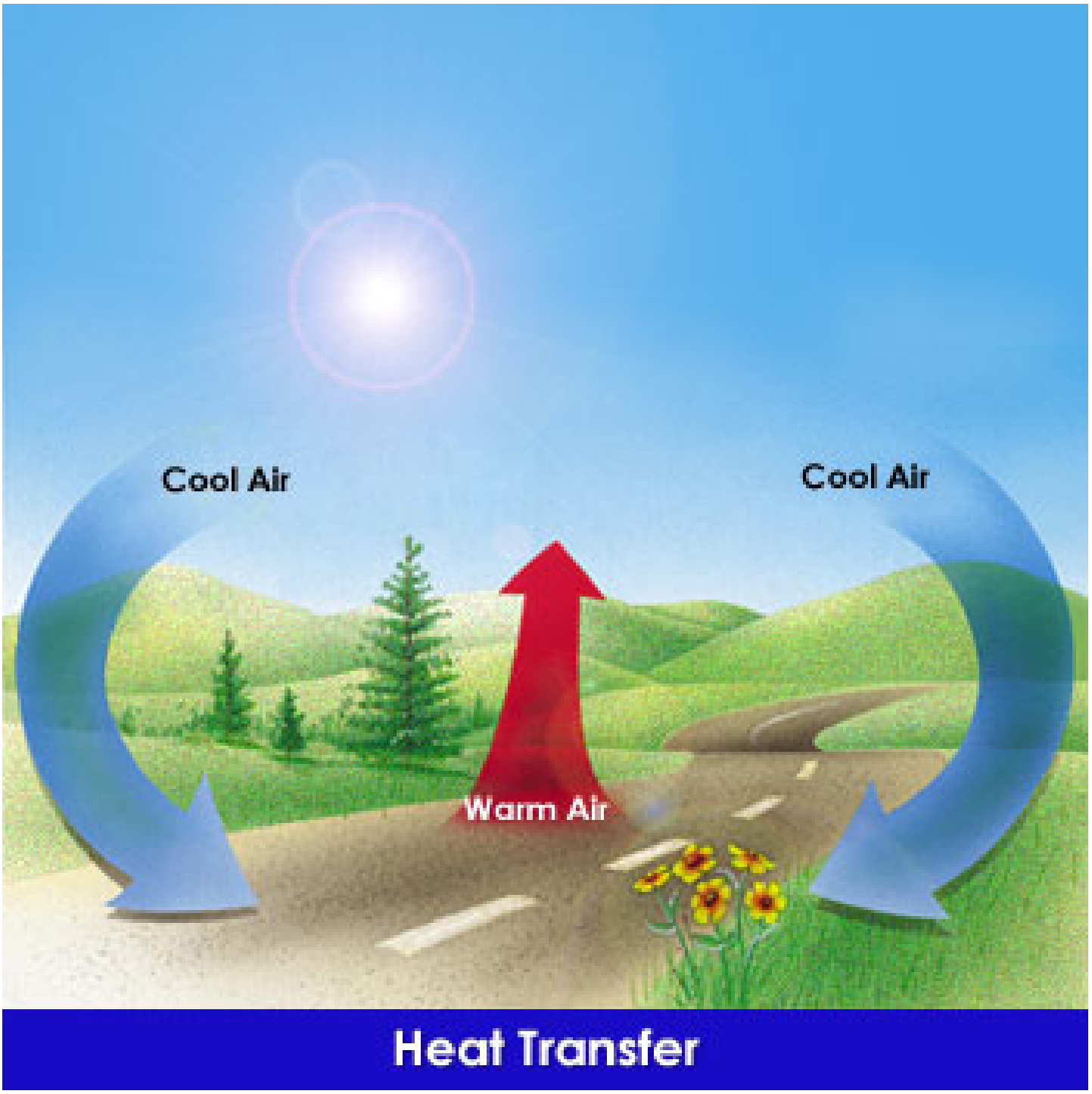







Periodic Table of the Elements
IA
IIA
IIIB
IVB
VB
VIB
VIIB
VII
IB
IIB
IIIA
IVA
VA
VIA
VIIA
O
1 H
2 He
3 Li
4 Be
5 B
6 C
7 N
8 O
9 F
10 Ne
11 Na
12 Mg
13 Al
14 Si
15 P
16 S
17 Cl
18 Ar
19 K
20 Ca
21 Sc
22 Ti
23 V
24 Cr
25 Mn
26 Fe
27 Co
28 Ni
29 Cu
30 Zn
31 Ga
32 Ge
33 As
34 Se
35 Br
36 Kr
37 Rb
38 Sr
39 Y
40 Zr
41 Nb
42 Mo
43 Tc
44 Ru
45 Rh
46 Pd
47 Ag
48 Cd
49 In
50 Sn
51 Sb
52 Te
53 I
54 Xe
55 Cs
56 Ba
57 *La
72 Hf
73 Ta
74 W
75 Re
76 Os
77 Ir
78 Pt
79 Au
80 Hg
81 Tl
82 Pb
83 Bi
84 Po
85 At
86 Rn
87 Fr
88 Ra
89 +Ac
104 Rf
105 Ha
106 Sg
107 Ns
108 Hs
109 Mt
110 110
111 111
112 112
113 113
* Lanthanide Series
58 Ce
59 Pr
60 Nd
61 Pm
62 Sm
63 Eu
64 Gd
65 Tb
66 Dy
67 Ho
68 Er
69 Tm
70 Yb
71 Lu
+ Actinide Series
90 Th
91 Pa
92 U
93 Np
94 Pu
95 Am
96 Cm
97 Bk
98 Cf
99 Es
100 Fm
101 Md
102 No
103 Lr

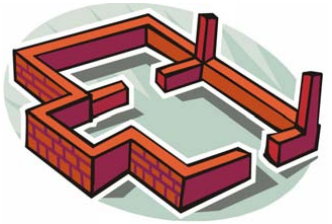


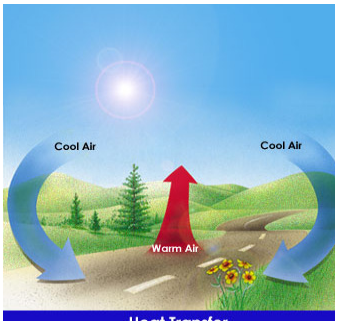

Cool Air
Cool Air
Warm Air
Heat Transfer

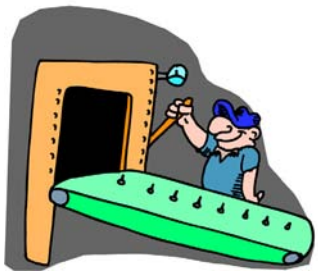
STUDENT SUPPORT MATERIALS

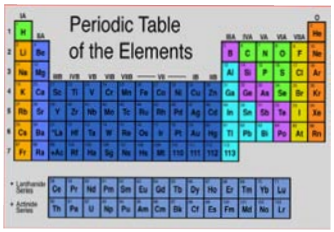
Listening

Say these words to the students - they write the numbers of the words under the pictures.
1. potential energy, 2. useful energy, 3. efficient, 4. base, 5. thermal energy, 6. transfer
7. components, 8. energy conversion, 9. kinetic energy, 10. transformation, 11. energy loss
12. total energy, 13. periodic table









Fill-in The Blanks, Paragraph

Read the sentences to the students. The students should name the "missing words."

Memorizing the _____1____ is very difficult. To be more _____2____, one should work toward understanding why the table is shaped how it is and what properties the elements in each group (column) and period (row) share and why. This fundamental knowledge of this complicated table will be the ____3____ on which other knowledge (such as element names and numbers) can be built. Most importantly, one's basic knowledge about the periodic table will _____4_____ into other aspects of chemistry, making it easier to understand.

Another topic that seems complicated, but that can be broken down into smaller _____5_____, is energy. While there are many kinds of energy that go into the ____6____ energy of a system, all energy is either a form of _____7____ energy (having to do with motion) and ____8____energy (having to do with position). ____9____ energy, for example, is due to the motion of molecules in matter, so it is a type of kinetic energy. Energy _____10____ is also complicated by many forms of energy ___11___, but the basic principle is that _____12____ energy is the energy that one can actually "use" to do work.

Relying on basics and fundamental understandings (instead of rote memorization) will ___13____ a bored student into a mature knowledge user.

ANSWERS

1. periodic table, 2. efficient, 3. base, 4. transfer, 5. components, 6. total, 7. kinetic, 8. potential 9. thermal, 10. conversions, 11. loss, 12. useful, 13. transform

True Or False?

Read the following sentences to the students. The students should write "true" or "false" for each of the sentences.

1. The periodic table takes its form from a piece of artwork that its developer, Dmitrij Mendeleev, admired.
2. Many houses in Southeast Alaska sit on concrete foundations, a solid base on which to build.
3. If your braking components are not well cared for you may end up with problems stopping at the bottom of a big hill.
4. Hot matter is said to have more thermal energy than cold matter.
5. When you put your hand over a hot stove you cannot feel the thermal heat in transfer.
6. In many martial arts films the hero undergoes a transformation through rigorous training.
7. If I am efficient in my work I spend most of my time procrastinating and the remaining time working slowly between naps.
8. The heat given off by power plants is useful energy because it heats stream water, which benefits riparian life.
9. The total energy of an object is the amount of energy lost through heat and friction.
10. On an air hockey table there is very little energy loss due to friction.
11. A light bulb performs an energy conversion every time you turn it on.
12. Kinetic energy is the same as momentum.
13. Potential energy is directly related to the speed of an object.

ANSWERS
1. T, 2. T, 3. T, 4. T, 5. F, 6. T, 7. F, 8. F, 9. F, 10, T, 11, T, 12. F, 13. F

STUDENT SUPPORT MATERIALS

Sight Words

base component efficient

energy conversion transfer

energy loss

kinetic energy

periodic table

transformation

potential energy

useful energy

thermal energy

total energy

STUDENT SUPPORT MATERIALS

Reading

Word Find

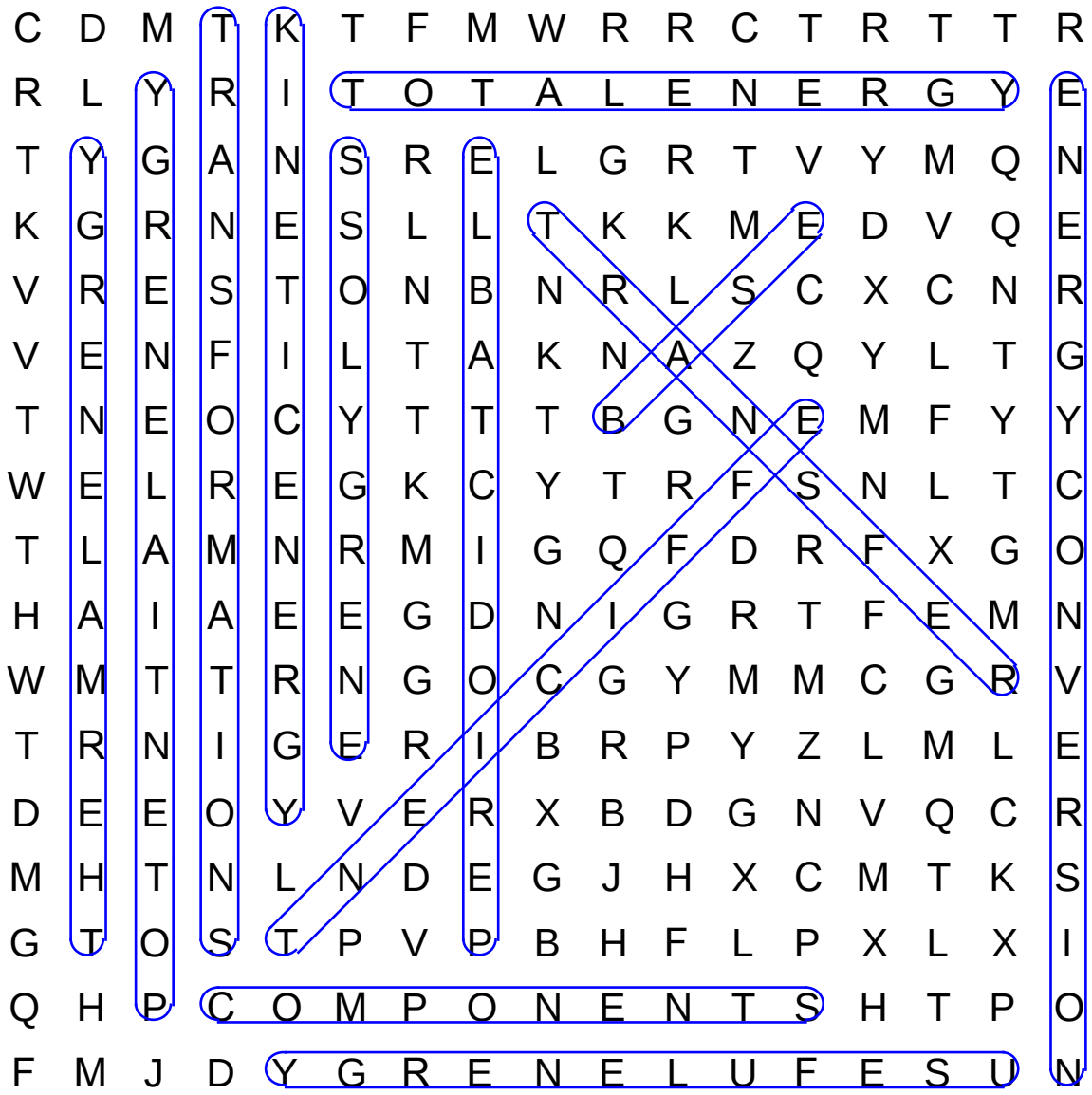
Find the words in the grid. Words can go horizontally, vertically and diagonally in all eight directions.

C D M T K T F M W R R C T R T T R
R L Y R I T O T A L E N E R G Y E
T Y G A N S R E L G R T V Y M Q N
K G R N E S L L T K K M E D V Q E
V R E S T O N B N R L S C X C N R
V E N F I L T A K N A Z Q Y L T G
T N E O C Y T T T B G N E M F Y Y
W E L R E G K C Y T R F S N L T C
T L A M N R M I G Q F D R F X G O
H A I A E E G D N I G R T F E M N
W M T T R N G O C G Y M M C G R V
T R N I G E R I B R P Y Z L M L E
D E E O Y V E R X B D G N V Q C R
M H T N L N D E G J H X C M T K S
G T O S T P V P B H F L P X L X I
Q H P C O M P O N E N T S H T P O
F M J D Y G R E N E L U F E S U N

www.WordSearchMaker.com

Base
Components
Efficient
Energyconversion
Energyloss
Kineticenergy
Periodictable
Potentialenergy
Thermalenergy
Totalenergy
Transfer
Transformations
Usefulenergy

Word Find Solution



Sight Words Activity Page

Have the students highlight or circle the words for the pictures.

base
component
efficient
energy conversion
energy loss
kinetic energy
periodic table
potential energy
thermal energy
total energy
transfer
transformation
useful energy

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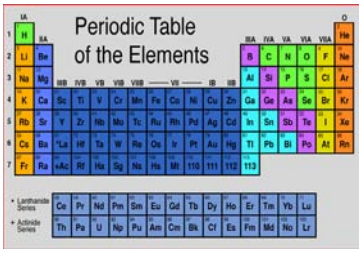

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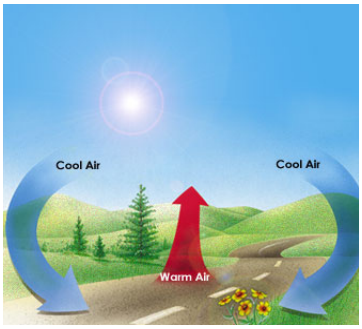

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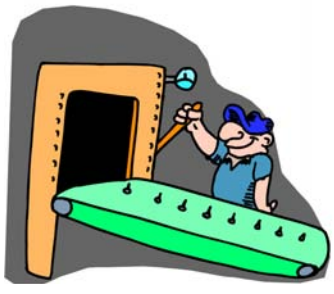

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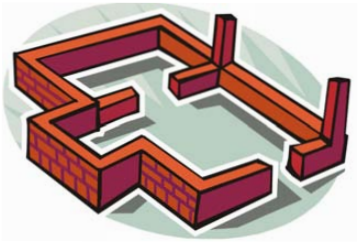
Have the students highlight or circle the words for the pictures.



base
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energy loss
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potential energy
thermal energy
total energy
transfer
transformation
useful energy

Sentence Halves

Have the students write the numbers/letters for sentence halves that match.

1. On most periodic tables you will find all of the elements'
2. The foundation of a building
3. Typically, all of the components of a system are required
4. Thermal energy from the sun
5. If my son does not go to college I will need to transfer
6. During high school, many student athletes undergo a transformation
7. As fuel prices rise homeowners are looking for more efficient
8. Useful energy is energy that
9. The total energy of a system does not change, but sometime much is "lost"
10. Sometimes the production of heat is considered an energy loss,
11. We experience energy conversions
12. A faster moving bullet of the same mass
13. An ax held over my head has more potential energy

A. Through friction and heat.
B. But this is not the case when burning fuel in a furnace.
C. Is the base on which everything else is built.
D. The funds from his educational account into my "new car for Dad" account.
E. From an inexperienced player to an elite athlete.
F. When we turn on a light, burn wood in a fire, or drive a car.
G. Than an ax that is sitting at my feet.
H. Will have more kinetic energy.
I. For the system to function properly.
J. Heats our planet, although geothermal energy plays a part as well.
K. Ways to heat their homes.
L. Atomic number, atomic symbols, and atomic masses.
M. Can be used to do work.

ANSWERS

1/L 2/C 3/I 4/J 5/D 6/E 7/K 8/M 9/A 10/B 11/F 12/H 13/G

Word & Definition Match

Have the students write the word numbers on their matching definitions.

energy that is related to or caused by heat	*of changing state*	*energy that is not able to be used*	*fundamental*	*to convey*
energy that is available for use	*all the chemical elements in an organized table*	*to perform with a minimum of waste*	*energy stored within a physical system*	*energy pertaining to motion*
	whole	*to change energy from one form to another*	*a constituent element of a system*	

1. base	2. components	3. efficient	4. energy conversion	5. energy loss
6. kinetic energy	7. periodic table	8. potential energy	9. thermal energy	10. total energy
	11. transfer	12. transformation	13. useful energy	

Which Belongs?

Have the students circle/identify the word that is correct for each sentence.

1. The periodic table/transformation groups the elements in columns (groups) and rows (periods) based on chemical properties.
2. Each of the base/transfer components of atoms (electrons, neutrons, and protons) can be divided into smaller components.
3. As time passes we are developing more and more electronic devices that are becoming transformation/components of our daily lives.
4. Thermal/potential energy always moves from warmer to cooler objects.
5. In order to repel down a wall, one must transform/transfer one's weight from the wall to the rope.
6. During the four hours I spent in the sweat lodge, a base/transformation occurred in my worldview.
7. A chef learns to be very transfer/efficient with a knife so that he does not waste time or energy.
8. In a light bulb, the useful energy/potential energy is easily seen with the naked eye.
9. When you convert energy from one form to another you will end up with the same amount of total energy/kinetic energy that you started with.
10. Energy loss/transformations in modern automobiles is still very high, with very little of the chemical energy actually getting converted to work.
11. To be efficient, one should try to lose as little energy during an energy conversion/loss as possible.
12. A bullet gets most of its kinetic/potential energy from its speed, not its mass.
13. If you throw a ball in the air, the ball will have its maximum total/potential energy when it is at its highest altitude.

ANSWERS

1. periodic table, 2. base, 3. components, 4. thermal, 5. transfer, 6. transformation
7. efficient, 8. useful energy, 9. total energy, 10. energy loss, 11. conversion, 12. kinetic
13. potential

What's The Answer?

Have the students read the questions and then select the correct answer for them. They should fill-in the appropriate circles, beside the answers of their choice.

1. Elements on the periodic table are arranged in order of increasing
   - (a) Atomic number
   - (b) Size
   - (c) Properties

2. What are the base components of atoms?
   - (a) Electrons, protons, neutrons
   - (b) Electrons, protons, and quarks
   - (c) Earth, wind, fire, and water

3. What are the components of a home sound system?
   - (a) Wheels, brakes, transmission, engine
   - (b) Roots, stem, flower, leaves
   - (c) Receiver, amplifier, player, speakers

4. Thermal energy is energy associated with
   - (a) Movement
   - (b) Heat
   - (c) Position

5. When would you transfer ownership of your car to another person?
   - (a) If they bought the car from you.
   - (b) If they stole the car from you.
   - (c) If they borrowed the car from you.

6. The heavy snowfall caused an immediate transformation in the landscape from drab brown to
   - (a) Pure white
   - (b) Greenish yellow
   - (c) Black

7. Why is it important to be efficient when doing homework?
   - (a) It is important to be efficient so that your friends don't see you doing it.
   - (b) It is important to be efficient so that you can still get it done but have time to do other things.
   - (c) It is important to be efficient so that you can drag it out into the middle of the night when you would rather be sleeping.

8. Useful energy is not
   - (a) Lost as heat or friction.
   - (b) Used to do work.
   - (c) Useful.

9. The total energy of a system
   - (a) Increases over time.
   - (b) Decreases over time.
   - (c) Does not change over time.

10. You can figure out the energy loss of a system by finding the difference between the _____ _____ and the total energy.
    - (a) Useful energy
    - (b) Kinetic energy
    - (c) Potential energy

11. Plants are able to change light energy into
    - (a) Heat energy.
    - (b) Kinetic energy.
    - (c) Chemical bond energy.

12. Kinetic energy is energy that is associated with
    - (a) Position.
    - (b) Heat.
    - (c) Movement.

13. Potential energy is energy that is associated with
    - (a) Heat.
    - (b) Position.
    - (c) Movement.

ANSWERS

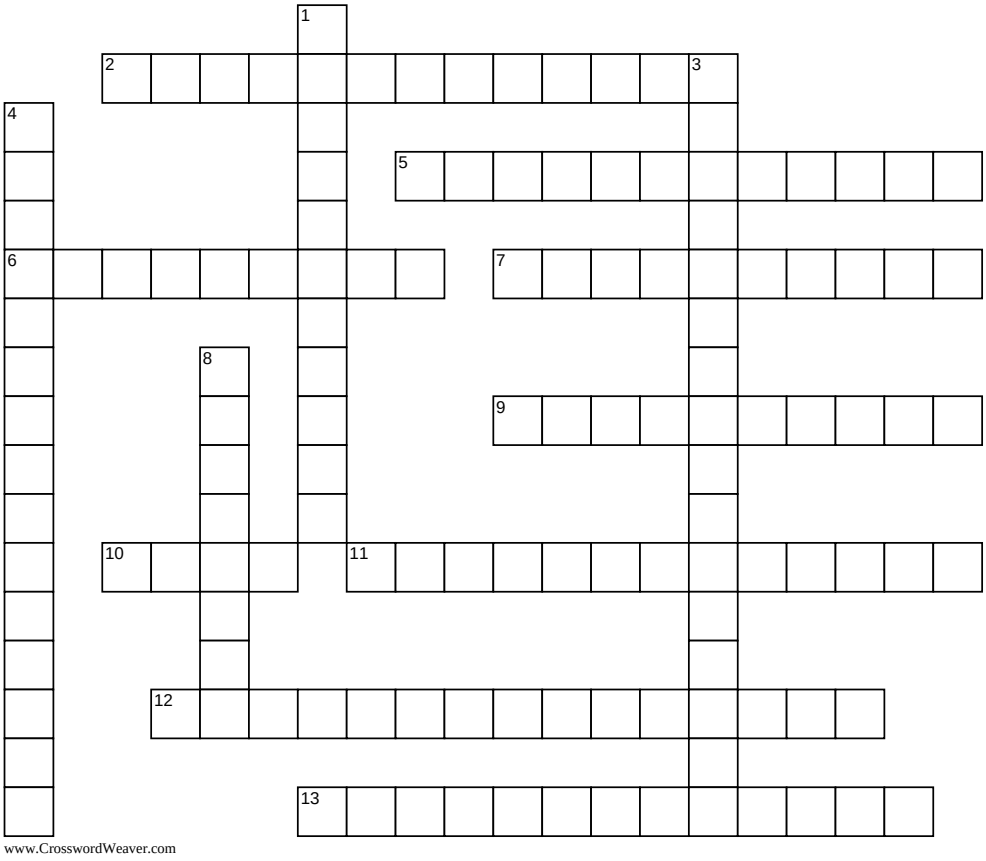
1. a, 2. a, 3. c, 4. b, 5. a, 6. a, 7. b, 8. a, 9. c, 10. a, 11. c, 12. c, 13. b

STUDENT SUPPORT MATERIALS

Writing

10th B-1 Concepts of Physical Science

Unit 1



ACROSS

2 a chart with all the chemical elements on it.
5 energy that is transformed into work.
6 to perform with a minimum of waste.
7 energy that is not able to be used, such as heat or friction loss.
9 a constituent element of a system.
10 fundamental, the bottom layer on which everything stands.
11 energy that is related to and/or caused by heat.
12 the act or process of transforming, of changing state.
13 energy pertaining to motion.

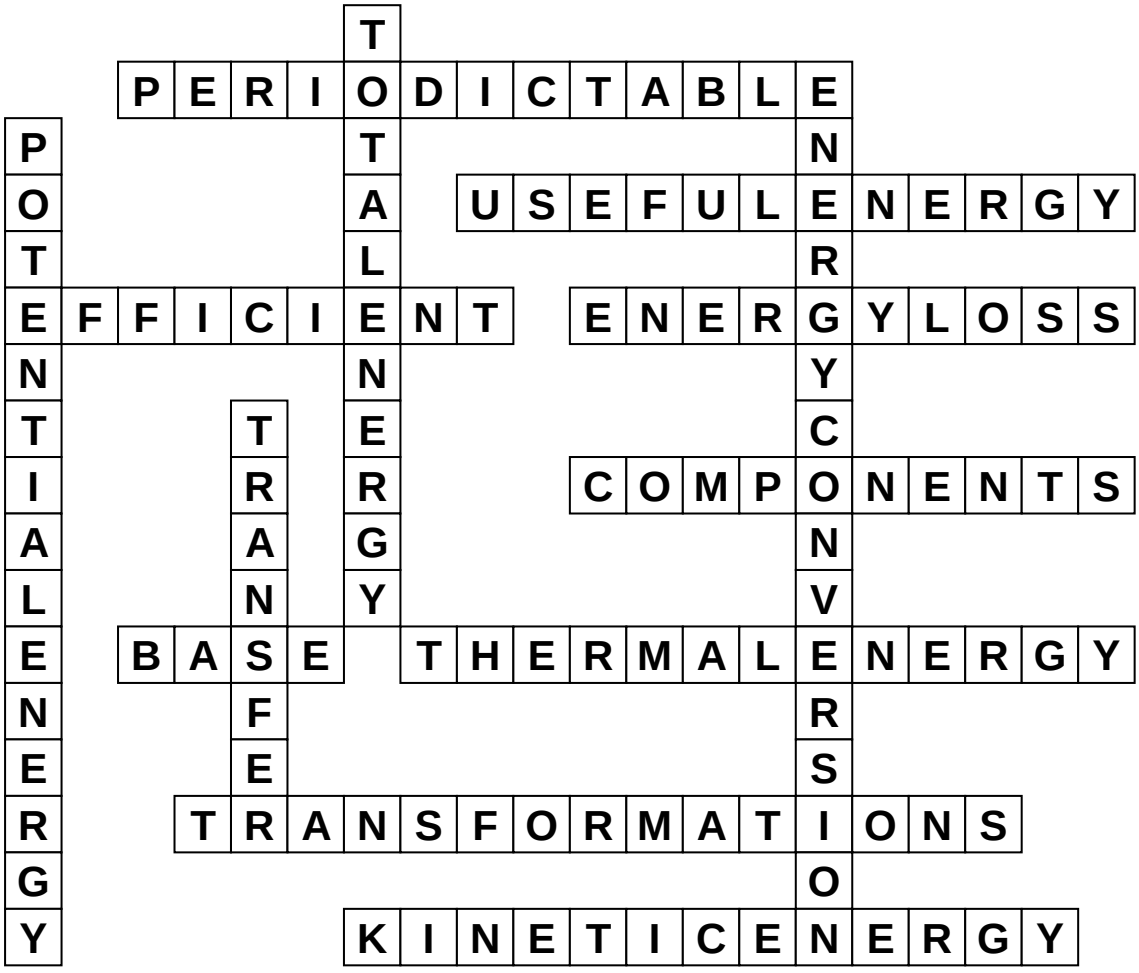
DOWN

1 comprising the whole.
3 to change energy from one form to another.
4 energy that is stored within a physical system, often related to an objects position.
8 to convey or move from one place to another.

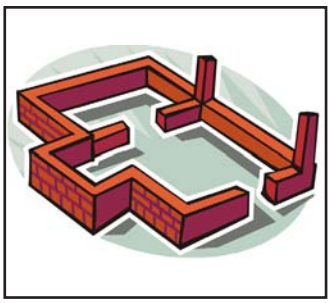
10th B-1 Concepts of Physical Science

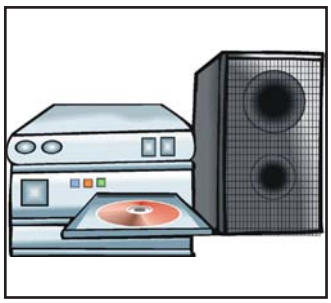
Unit 1

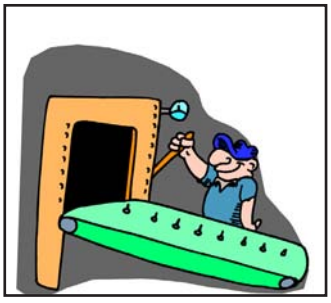
Solution:

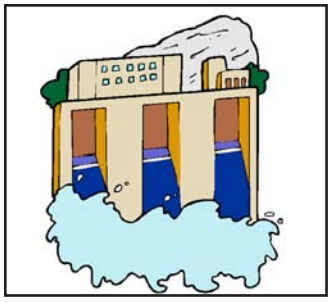


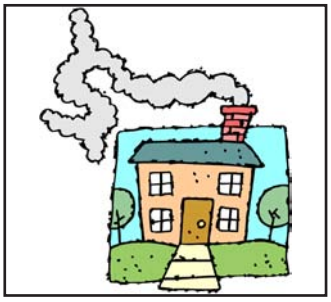
Write The Words!

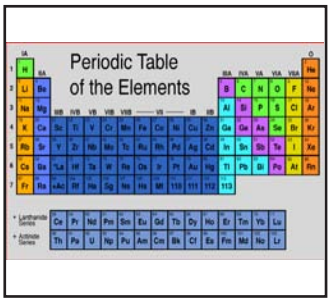


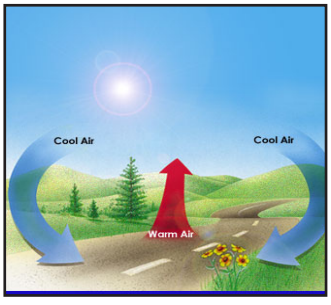




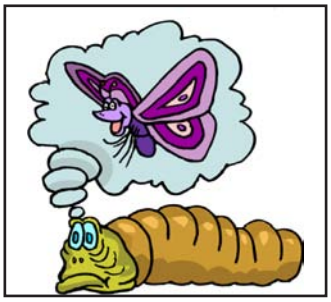








Write the Words!



Complete The Sentence

Have the students write the key words in the blanks.

1. The _____ of elements is an ordered chart with all of the chemical elements on it.
2. If one has a solid _____ on which to build, the structure has the potential to be very strong.
3. In order for a system to run properly, all of the _____ have to be in place.
4. _____ is energy that is associated with the movement of atoms and molecules in matter.
5. When changing from one yoga pose to another you may need to _____ your weight from one foot to the other and then back again.
6. During puberty, the human undergoes a predictable _____ from the child-like state to the adult-like state.
7. If a public transportation system is _____ it will get people where they need to go with little waste of time or energy.
8. You need the right technology to convert sunlight into _____, energy that can be used to do work.
9. The _____ of a system does not change over time, it merely changes from one form to another.
10. Most of the _____ in a car is due to engine losses—the fuel's chemical energy is converted to mechanical energy very inefficiently.
11. Changing energy from one form to another is called _____.
12. Since it is related to the square of an object's speed, a two-fold increase in speed results in a four-fold increase in _____.
13. The roller coaster has its maximum amount of _____ when it is at the highest point on the track.

ANSWERS

1. periodic table, 2. base, 3. components, 4. thermal energy, 5. transfer, 6. transformation, 7. efficient, 8. useful energy, 9. total energy, 10. energy loss, 11. energy conversion, 12. kinetic energy, 13. potential energy

Creative Writing Activity Page

Have the students write sentences of their own, using the key words from this unit. When the students' sentences are finished, have them take turns reading their sentences orally. The students should say "Blank," for the key words; the other students must name the "missing" words. You may wish to have the students write the "definitions" for the key words.

base

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components

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efficient

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energy conversion

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energy loss

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kinetic energy

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periodic table

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potential energy

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thermal energy

Creative Writing Activity Page

Have the students write sentences of their own, using the key words from this unit. When the students' sentences are finished, have them take turns reading their sentences orally. The students should say "Blank," for the key words; the other students must name the "missing" words. You may wish to have the students write the "definitions" for the key words.

total energy

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transfer

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transformation

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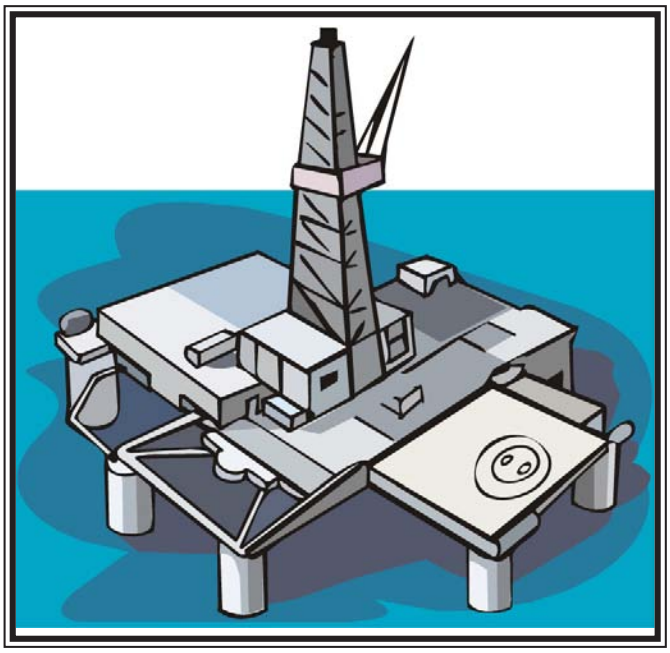
useful energy

Creative Writing Activity Page

Have the students write sentences of their own, based on the picture below. When finished, have each student read his/her sentences to the others.



STUDENT SUPPORT MATERIALS

Reinforcement Activities

Energy and Energy Transfer Lab

Thermal conduction:

The transfer of heat energy due to a transfer of kinetic energy by collisions between the atoms in physical contact with each other.

Thermal convection:

The transfer of heat in a liquid or gas

Thermal radiation:

The transfer of heat energy by infrared electromagnetic waves

To be able to see the differences of thermal conduction, convection and radiation, you are going to make a little sandwich and transfer heat and energy to the different parts, as you make it.

Please follow the instructions carefully and note the differences between the three different heat transfer methods. Be careful not to burn yourself. Remember: heat will transfer to you and may leave a nasty little mark to show it.

Before you start:

Turn on the burners to high and place the griddle (flat side up) on the burners.
Turn on the burner for station #2 to get the water boiling.

Thermal conduction station

1st – butter one side of two slices of bread
2nd – place the buttered bread on the skillet butter side down
3rd – wait until bread is golden brown and remove

Thermal convection station

1st – turn water from boil to simmer
2nd – crack one egg and place it into boiling water
3rd – let the egg stay in the water until cooked all the way through
4th – remove the egg from the water and place on a paper towel

Thermal radiation station

1st – place drained egg on browned toast
2nd – place a piece of cheese on the egg and toast
3rd – place the sandwich into the browning oven
4th – turn on for 5 min or until cheese is melted

Enjoy your science project back at your desk and answer the following questions:

1. Why was the energy transfer from the burner to the griddle to the bread representative of thermal conduction? _____
   _____
   _____
   _____

2. Give a different example of thermal conduction. _____
   _____
   _____
   _____

3. Why was the cooking of the egg representative of thermal convection? _____
   _____
   _____
   _____

4. Give a different example of thermal convection. _____
   _____
   _____
   _____

5. Why was the melting of the cheese representative of thermal radiation? _____
   _____
   _____
   _____

6. Give a different example of thermal radiation. _____
   _____
   _____
   _____

Unit Assessment

Unit 1 Quiz

Grade 10, B1, Unit 1 Concepts of Physical Science Quiz

Name: _____
Date: _____

1) **Fill in the Blank: Fill in each blank with the word that fits best . Choose from the words provided below. Some words may be used more than once.**

Chemical loss useful kinetic conversion potential mechanical wind

Energy has two forms. It is either _____ energy or _____ energy. _____ energy is energy that is stored in some way. Energy due to motion is _____ energy. When energy changes from one form to another it is called energy _____. When energy is transformed into work and is actually available to be used, it is _____ energy. When energy is not able to be used, then there is energy _____.

Multiple Choice: Read the items carefully and select your answer from the choices provided. Circle the correct answer.

2) Which of the following is an example of high kinetic energy?

a) a barrel of oil

b) a snowmachine racing at 75 miles an hour

c) a man getting ready to dive off a cliff

3) Which of the following statements is most likely to be true?

a) Thermal energy is related to and/or caused by heat.

b) Thermal energy is related to and/or caused by water.

Matching: Match the words on the left with the definition on the right. Place the letter from the correct definition on the right in front of the word it matches.

4) _____ to transfer

5) _____ to be efficient

6) _____ transformation

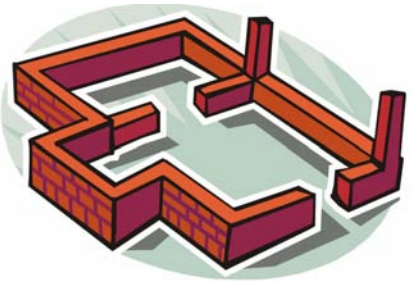
a. the act or process of changing state

b. convey or move from one place to another

c. to perform with a minimum of waste

Illustrations and Key Vocabulary:

7) Select from the illustrations provided below, the one that best represents the definition for word COMPONENTS. Place an X on the selected illustration.



8) Draw an illustration for the PERIODIC TABLE in the space provided below.

9) What is a single word definition for *fundamental*?

Grade 10, B1, Unit 1 Concepts of Physical Science Quiz

Name: _____
Date: _____

1) **Fill in the Blank: Fill in each blank with the word that fits best . Choose from the words provided below. Some words may be used more than once.**

Chemical loss useful kinetic conversion potential mechanical wind

Energy has two forms. It is either **kinetic/potential** energy or **potential/kinetic** energy. **Potential** energy is energy that is stored in some way. Energy due to motion is **kinetic** energy. When energy changes from one form to another it is called energy **conversion**. When energy is transformed into work and is actually available to be used, it is **useful** energy. When energy is not able to be used, then there is energy **loss**.

Multiple Choice: Read the items carefully and select your answer from the choices provided. Circle the correct answer.

2) Which of the following is an example of high kinetic energy?

a) a barrel of oil

b) a snowmachine racing at 75 miles an hour

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Matching: Match the words on the left with the definition on the right. Place the letter from the correct definition on the right in front of the word it matches.

4) **b** to transfer

5) **c** to be efficient

6) **a** transformation

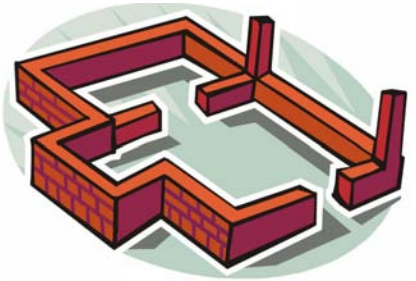
a. the act or process of changing state

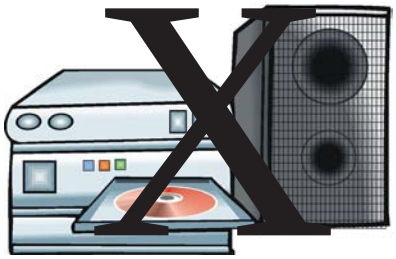
b. convey or move from one place to another

c. to perform with a minimum of waste

Illustrations and Key Vocabulary:

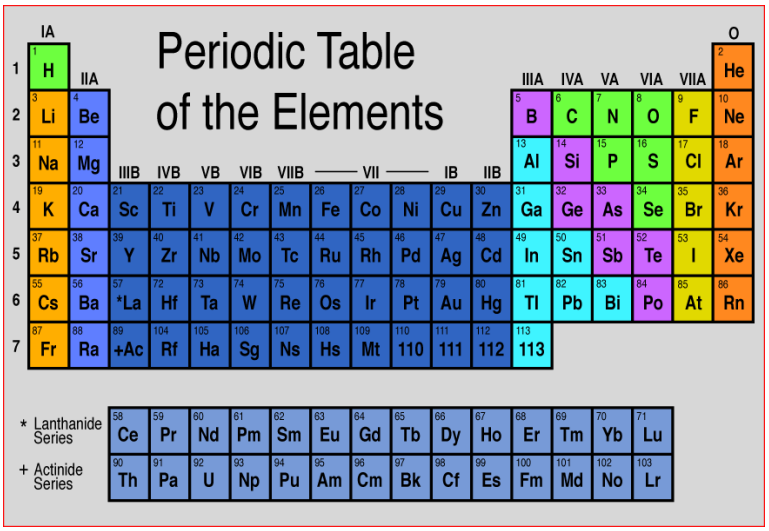
7) Select from the illustrations provided below, the one that best represents the definition for word COMPONENTS. Place an X on the selected illustration.





Correct answer not entered.

8) Illustrate the PERIODIC TABLE in the space provided below.



9) What is a single word definition for *fundamental*?

base


UNIT 2
Sealaska Heritage Institute

INTRODUCTION OF

Key Vocabulary

Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

Chemical Bonding

PLACE-BASED PERSPECTIVE

Show students a peanut butter sandwich and discuss how the peanut butter that is shared between both pieces of toast is similar to *chemical bonding*.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Traditionally, well boiled fish skins and heads were used to produce a *bonding* substance. For example, these substances were used to bond materials for the creation of artifacts.

Conductor

PLACE-BASED PERSPECTIVE

Show students pictures of wires and discuss how the metal in the wires is used as *conductors* to send electricity from one place to another.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

In Southeast Alaska, fish and other foods are often cooked in the ground using the *conducted* heat from very hot rocks. Sometimes a fire is built over the food items to *conduct* the heat to the food.

Decay

PLACE-BASED PERSPECTIVE

Show the students a picture of a fossil and discuss how scientists use carbon dating to find out the age of many fossils. Explain to the students that the process relies on the *decay* of material to determine the fossil's age.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Decayed wood is still used in the preparation of animal skins. Decayed entrails of the salmon and seaweed are used to fertilize gardens. The bark of old trees is usually mixed with these fertilizers.

Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

Electromagnetic

PLACE-BASED PERSPECTIVE

Explain that a simple generator uses *electromagnets* to create electricity by spinning a magnetic core with magnets inside a cylinder of conductive wires.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

Exert

PLACE-BASED PERSPECTIVE

Discuss how events at Native Youth Olympics require athletes to *exert* energy when competing.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

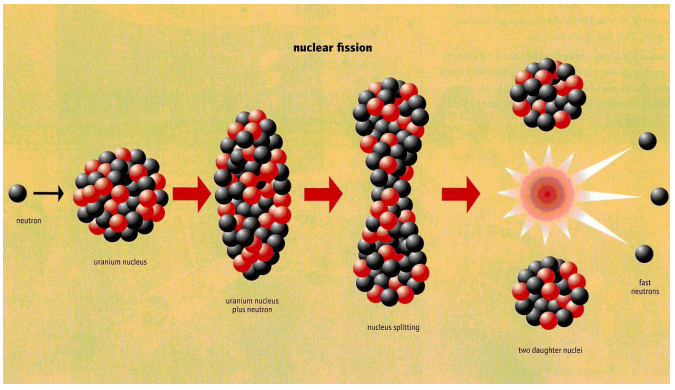
The traditional game of "tug of war" was a clear example of *exertion*. This game was played between clans, families, and communities for fun.

Fission

PLACE-BASED PERSPECTIVE

Show a picture of the sun and discuss how the *fission* of atoms creates heat and heavier elements.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.



Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

Force

PLACE-BASED PERSPECTIVE

Show a picture of someone spiking a volleyball and discuss how *force* is applied to the ball when it is being hit.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

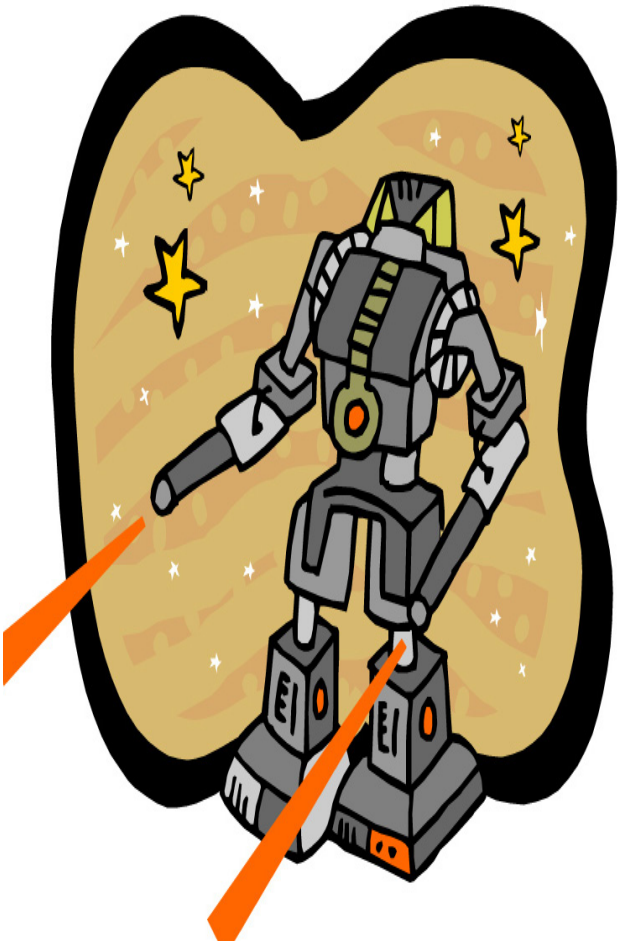
Traditional chisels were often made from meteorite iron. These chisels were very heavy and effective in applying *force* to logs and other building materials.

Fusion

PLACE-BASED PERSPECTIVE

Show a picture of an atomic bomb blast and discuss how *fusion* of atoms creates an atomic explosion.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.



Infrared

PLACE-BASED PERSPECTIVE

Show students a picture of a hunting scope that uses *infrared* and discuss how it is used when visual light is absent or impaired.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

Insulator

PLACE-BASED PERSPECTIVE

Show students a picture of a frying pan with a wooden or plastic handle and discuss how these materials are used as *insulators* because they retard the transfer of heat from the pan to a person's hand.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Gloves made from heavy duty moose hide or other animal hides would serve as *insulators* against hot containers.

Momentum

PLACE-BASED PERSPECTIVE

Discuss with students what would happen to people in a boat if it struck a reef or a sandbar when it was going fast. Introduce how *momentum* would force people forward in the boat.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

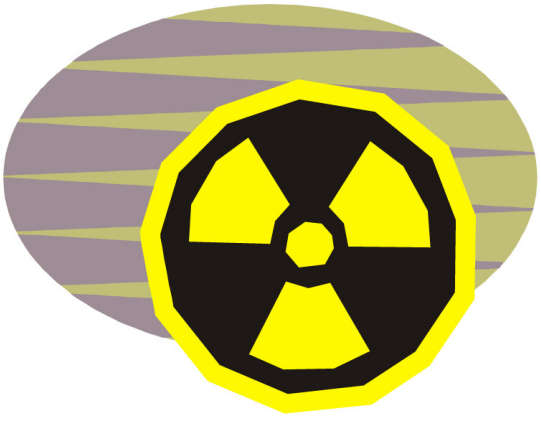
In Southeast Alaska landslides and avalanches are common. Both the landslides and the avalanches gain *momentum* as they move forward, picking up more snow and dirt.

Radiation

PLACE-BASED PERSPECTIVE

Show students a picture of an x-ray and explain how people use *radiation* to create images of bones and organs.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.



Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

Radioactivity

PLACE-BASED PERSPECTIVE

Show students a picture of a microwave and explain how it uses radioactivity to heat up food.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

Relative

PLACE-BASED PERSPECTIVE

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word *relative*.

HERITAGE CULTURAL PERSPECTIVE

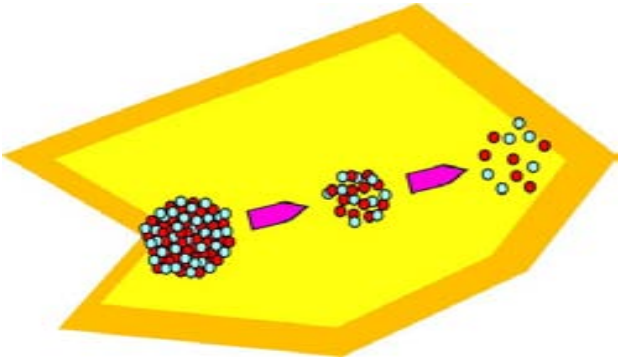
Traditional teachings for both boys and girls were *relative* to the environment and survival.

Unstable Nuclei

PLACE-BASED PERSPECTIVE

Show students a picture of a radioactive symbol and discuss that radioactive materials are radioactive because they have unstable nuclei.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.



Culturally Responsive & Place-based Perspective Introduction of Science Vocabulary

Wavelengths

PLACE-BASED PERSPECTIVE

Show a picture of wave on the beach and discuss how *wavelengths* are meausured.

Show the students the vocabulary picture for this word. Have the students suggest how the picture relates to the word.

HERITAGE CULTURAL PERSPECTIVE

Native peoples of Southeast Alaska were well aware of *wavelengths* and how they affected their travel and safety.

Language Skills

Language & Skills Development

LISTENING

Use the activity pages from the Student Support Materials.

Remote Find

Lay the vocabulary pictures on the floor, in a scattered form. Group the students around the pictures. Place a remote controlled car on the floor (2 cars can be used with separate controls). Give the controls to individuals. Say a word from this unit and the student must drive the car to the picture for that word.

Later, say a clozure sentence (leave out the key word from this unit). The students must determine the word that completes the sentence and then drive the car(s) to the picture for it. Repeat, until all students have participated.
lary word you said wins the round. Repeat until all players have played.

SPEAKING

Sheet Golf

Before the activity begins, obtain an old sheet. Cut a hole (approximately two inches in diameter) in each end of the sheet. Group the students into two teams. Have the first player from each team hold opposite ends of the sheet. Place a marble or small ball in the center of the sheet. When you say “Go,” the players must then lift their ends of the sheet and attempt to cause the marble /ball to fall through the hole in the other player’s side of the sheet. When the ball/marble falls through one of the holes, the player on that side of the sheet must then identify a vocabulary illustration you show or he/she should repeat a sentence you said at the beginning of the round. Repeat with other pairs of students until all students have participated. If the sheet is large enough, all students can play - divide the students into four groups (one group for each side). Cut a hole in the sheet near each side. When the marble/ball falls through, all the players on that side must say the name of a vocabulary illustration that you show. Repeat.

READING

Use the activity pages from the Student Support Materials.

Sight Word Bingo

Before the activity begins, prepare a stencil which contains the sight words. Provide each student with a copy of the stencil. The students should cut the sight words from their copies of the stencil. When the students have cut out their sight words, each student should lay all of the sight words but one, face down on his/her desk. Say a sight word. Any student or students who have that sight word face up on their desks should show the sight word to you. Then, those sight words should be placed to the side and other sight words turned over in their place. Continue in this way until a student or students have no sight words left on their desks. This activity may be repeated more than once by collecting, mixing, and redistributing the sight words to the students.

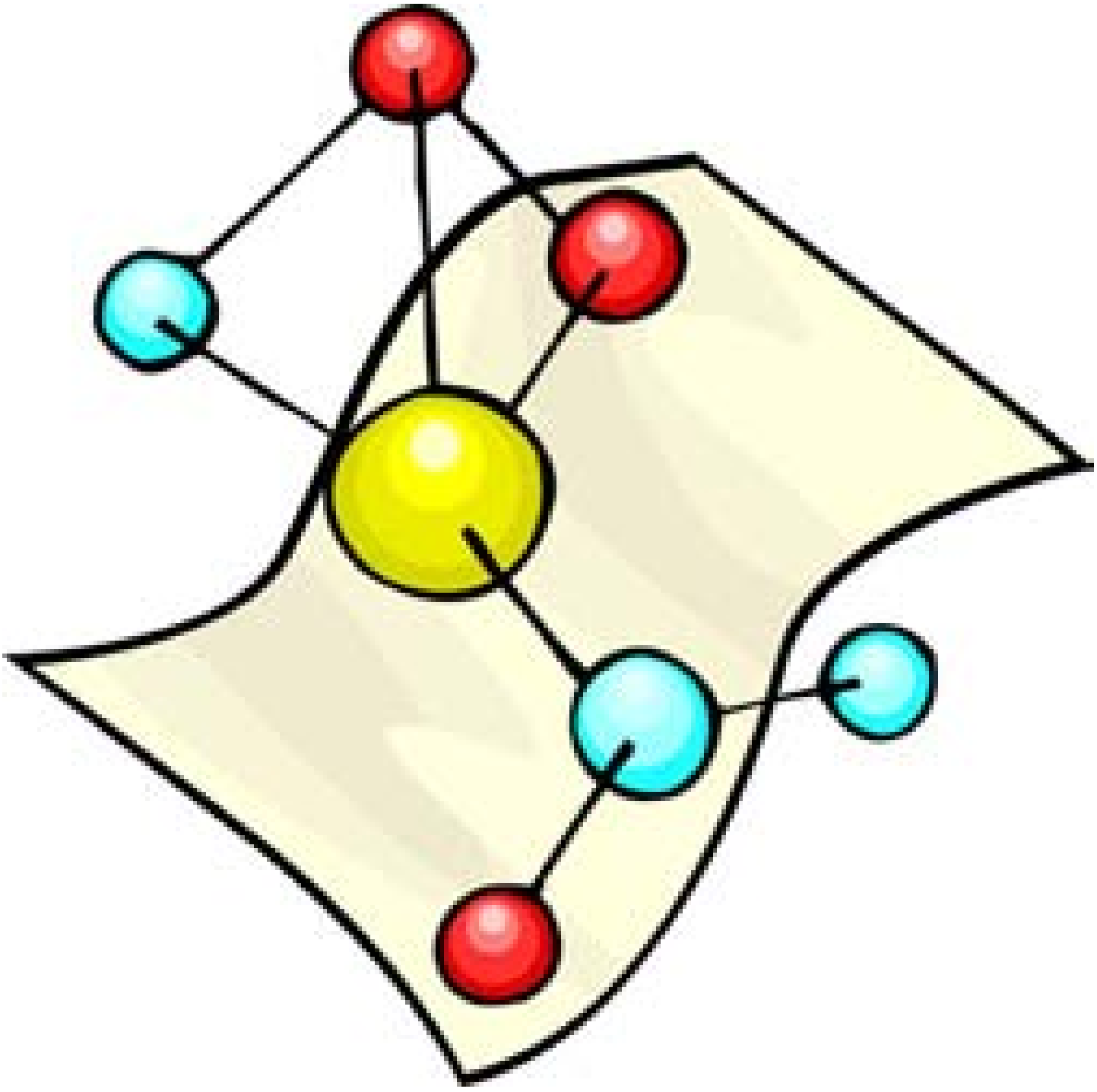
WRITING

Use the activity pages from the Student Support Materials.

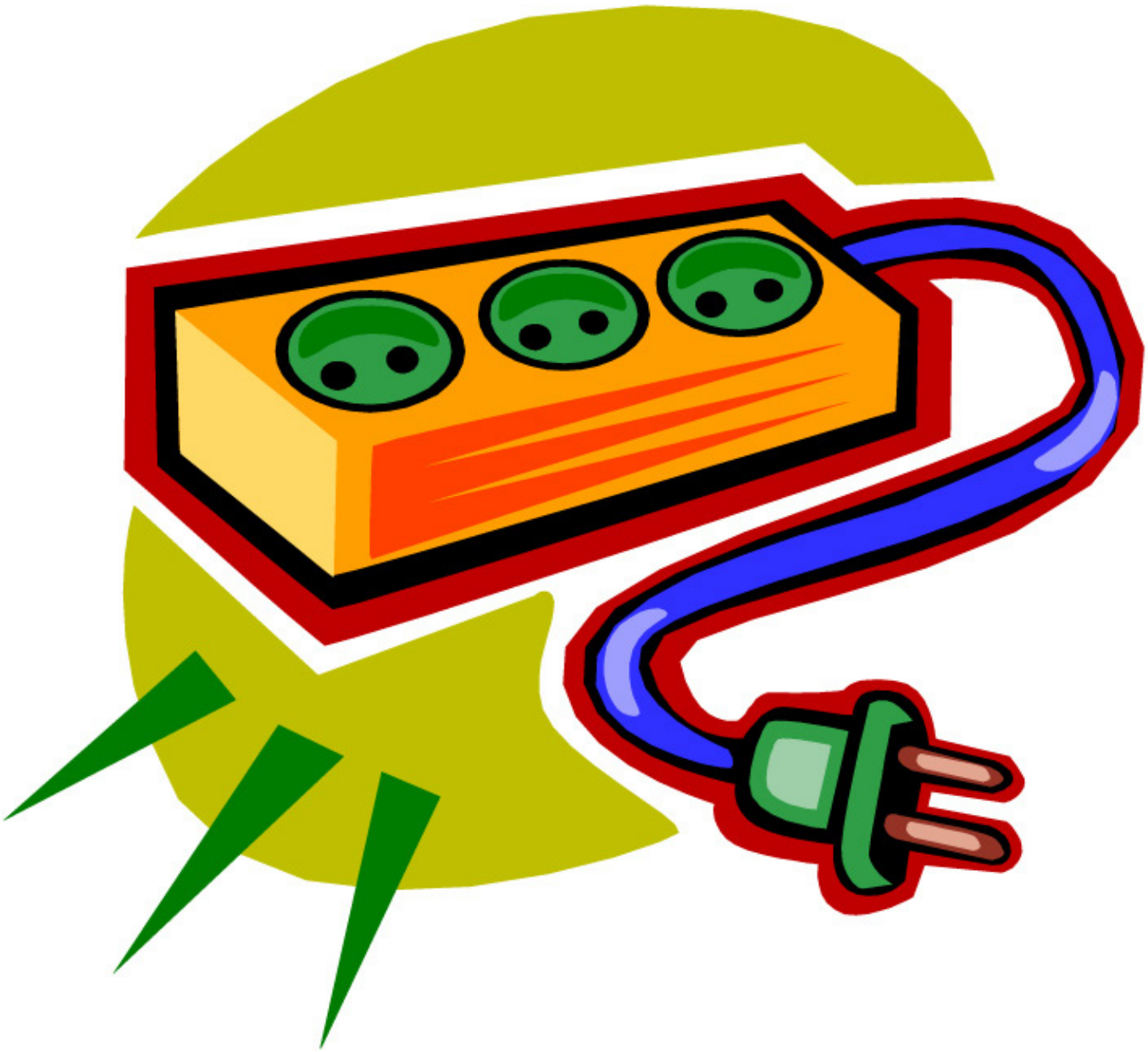
The Other Half

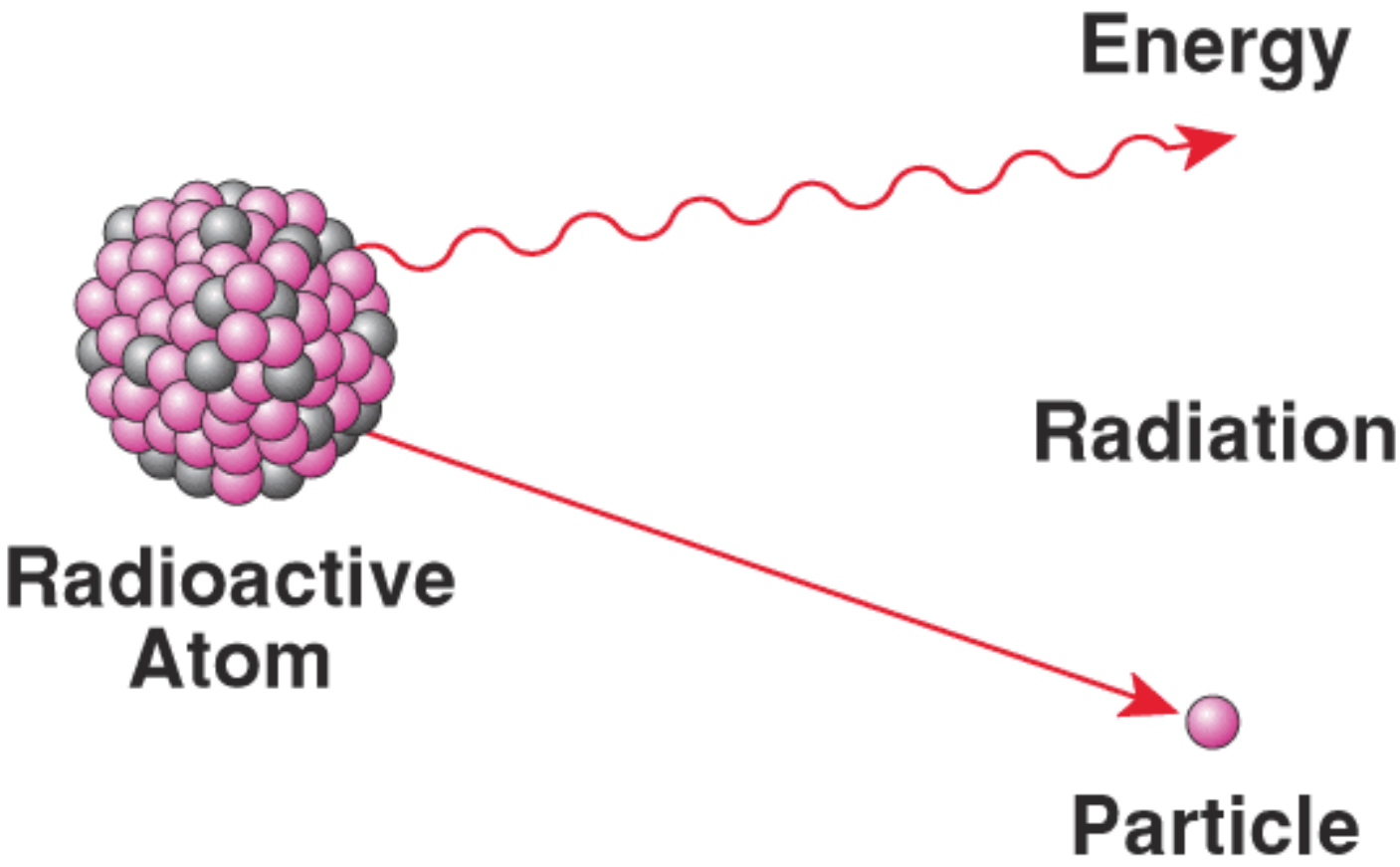
Cut each of the sight words in half. Give each student a sheet of writing paper, a pen and one of the word-halves. Each student should glue the word-half on his/her writing paper and then complete the spelling of the word. You may wish to have enough word-halves prepared so that each student completes more than one word. Afterwards, review the students’ responses.

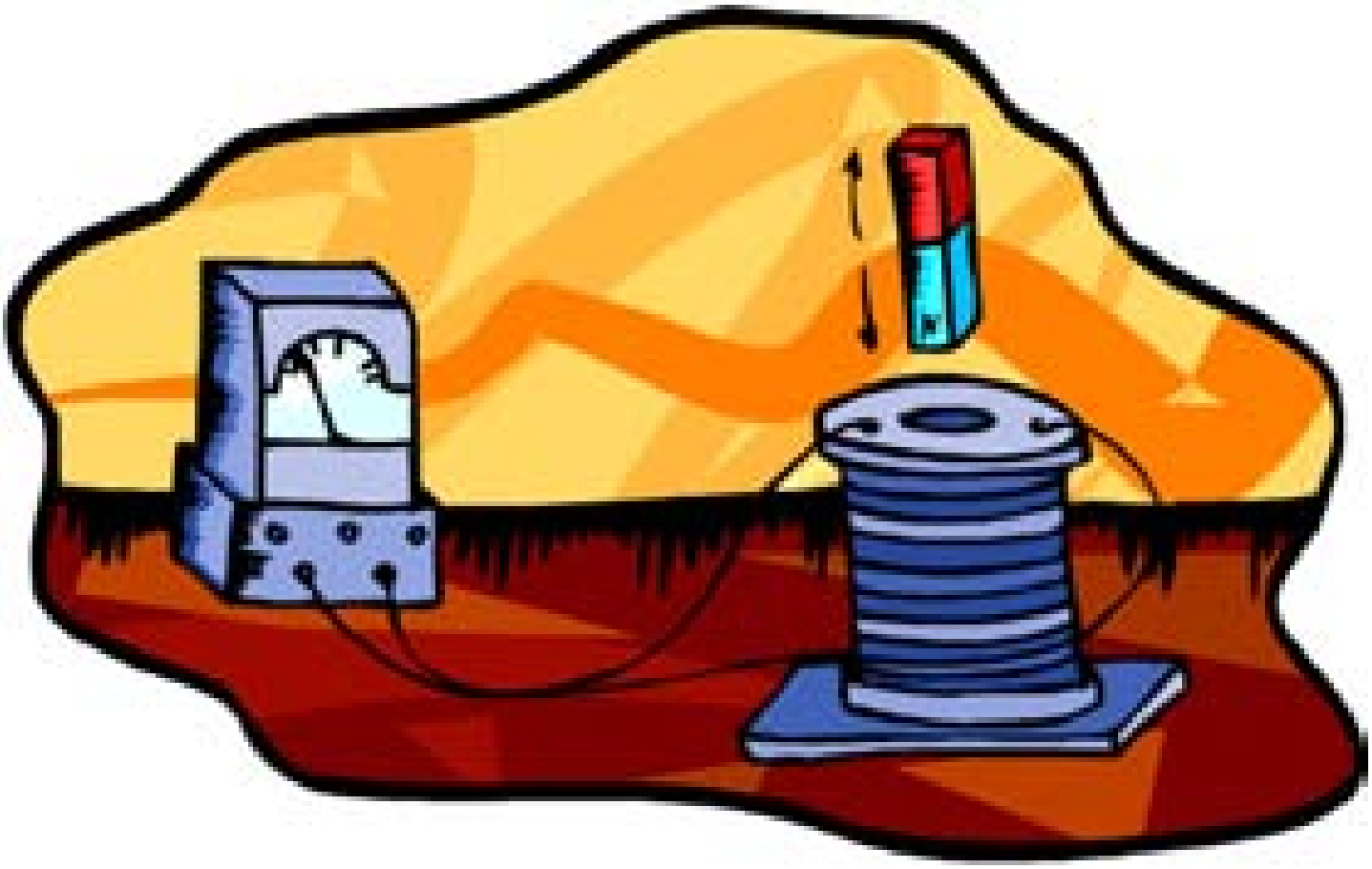
Vocabulary Images

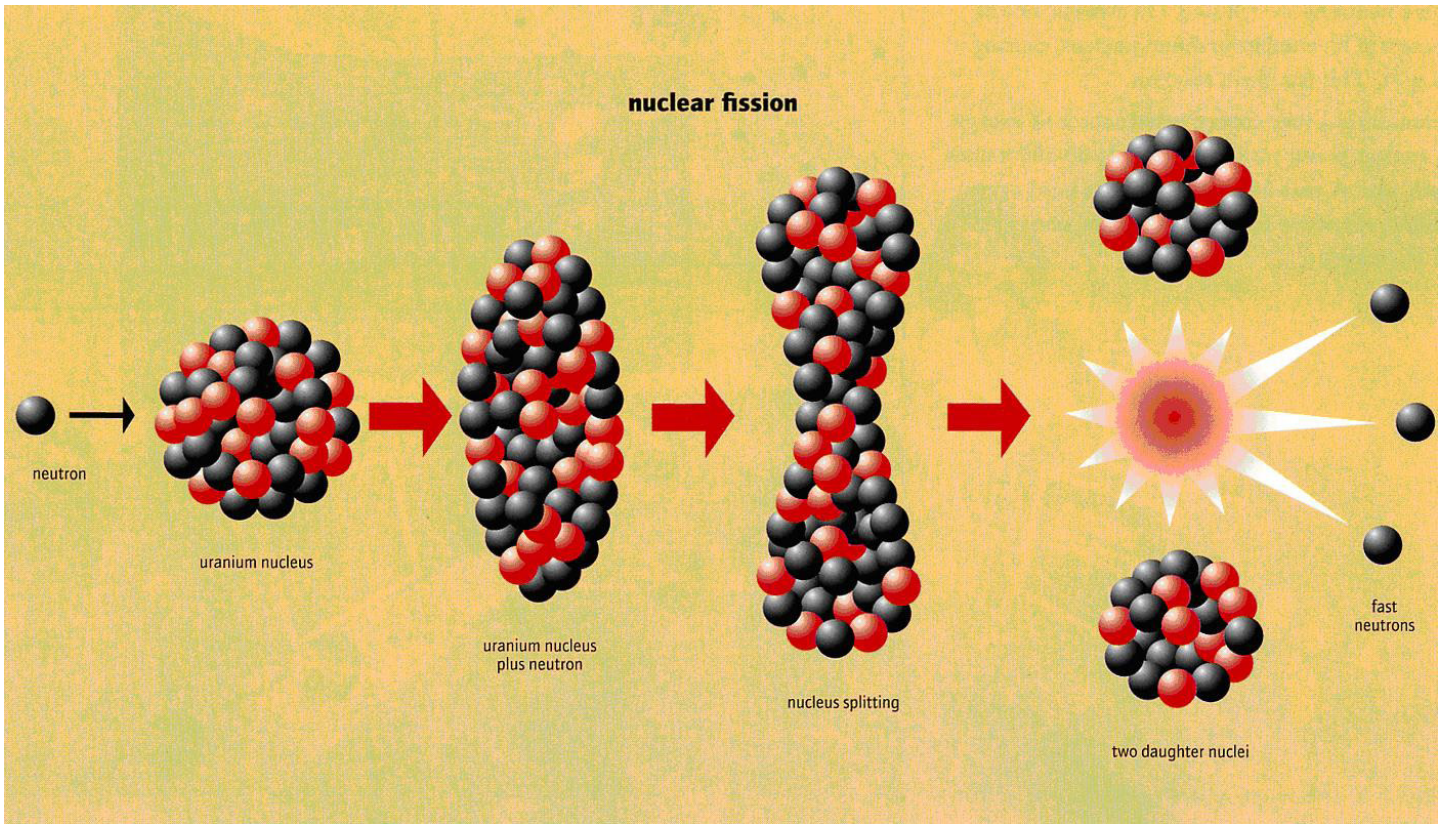


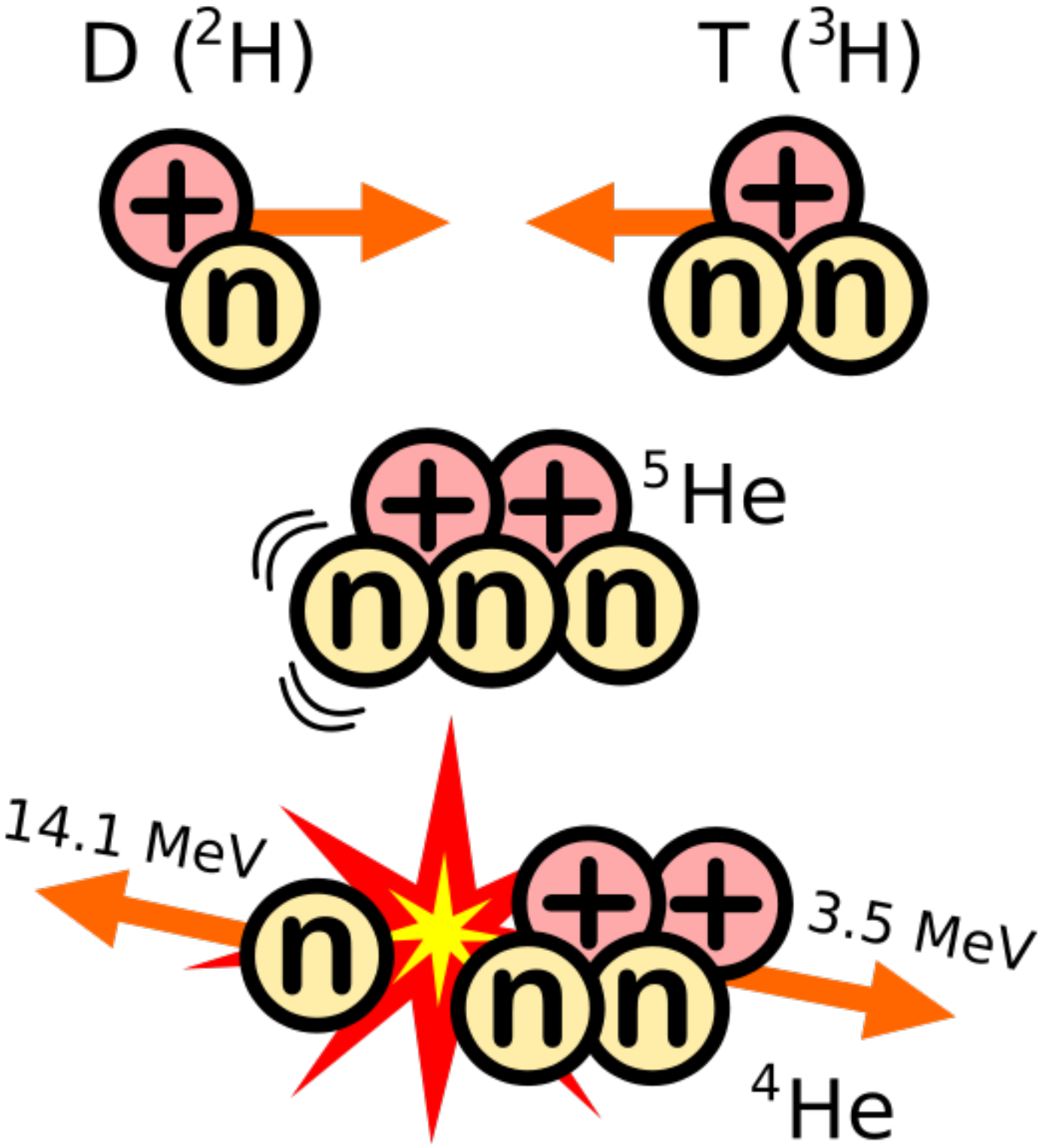
conductor



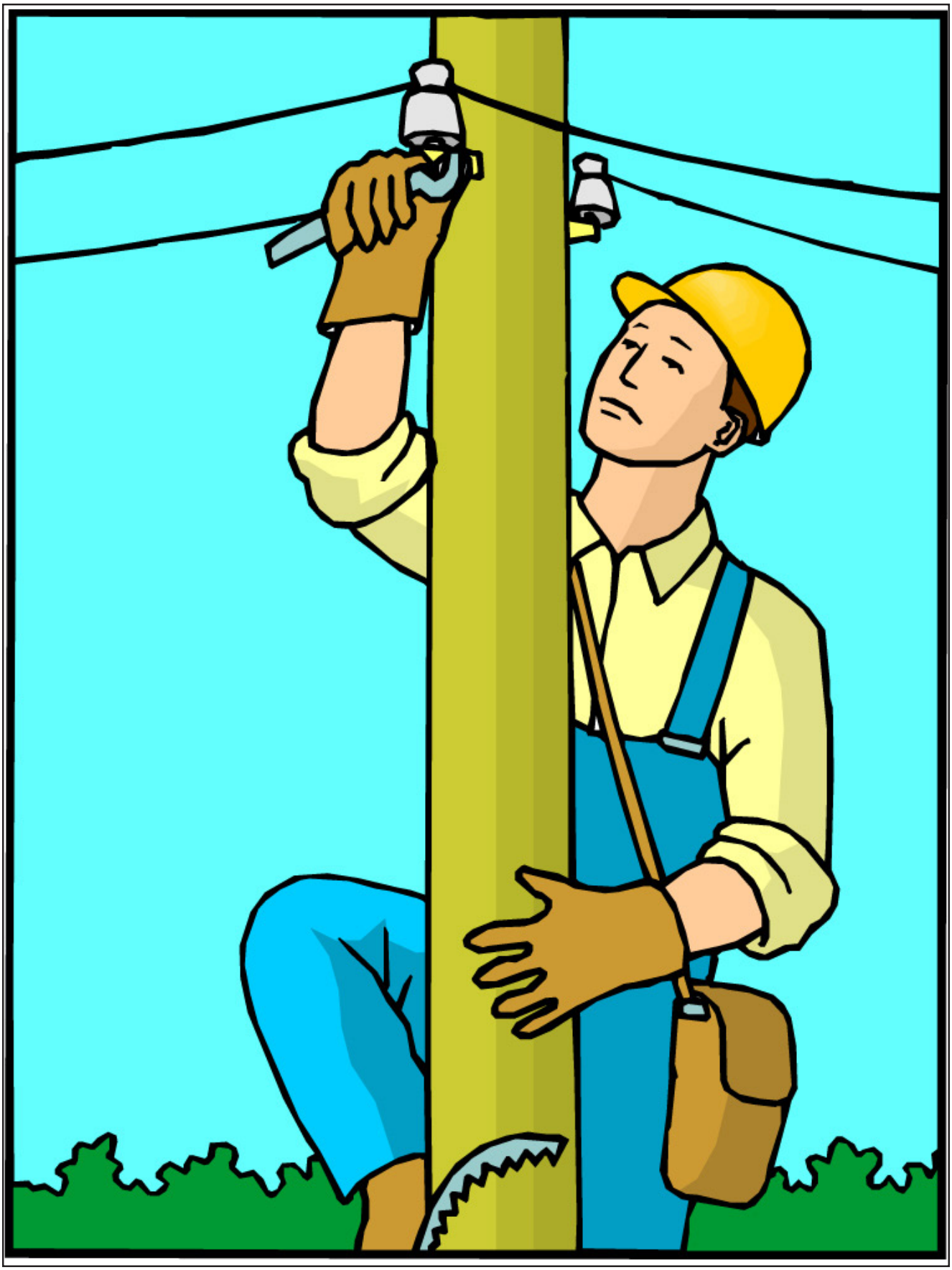

Energy
Radiation
Radioactive Atom
Particle



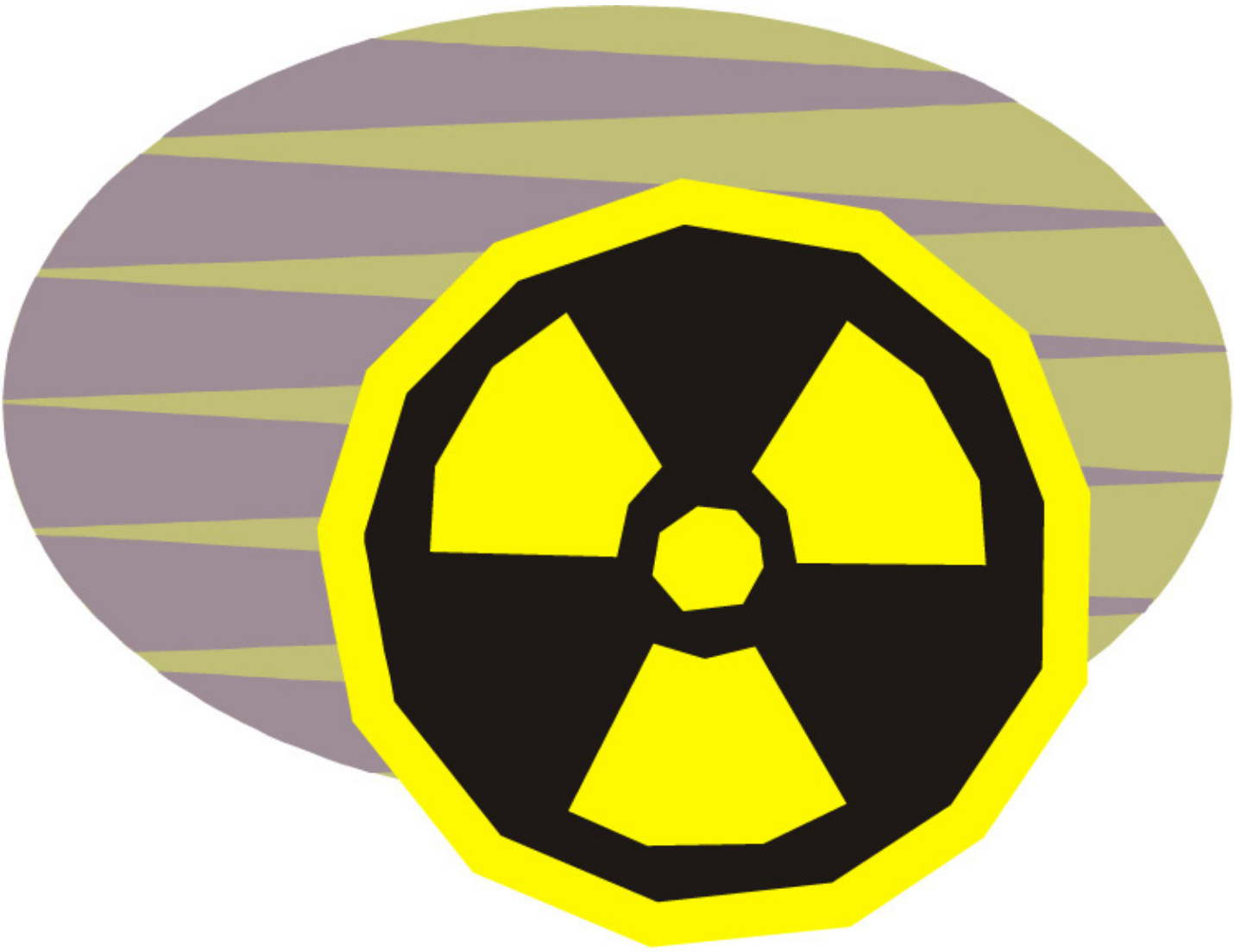

nuclear fission
neutron
uranium nucleus
uranium nucleus
plus neutron
nucleus splitting
two daughter nuclei
fast
neutrons


D (^{2}H)
T (^{3}H)
^{5}He
14.1 MeV
3.5 MeV
^{4}He

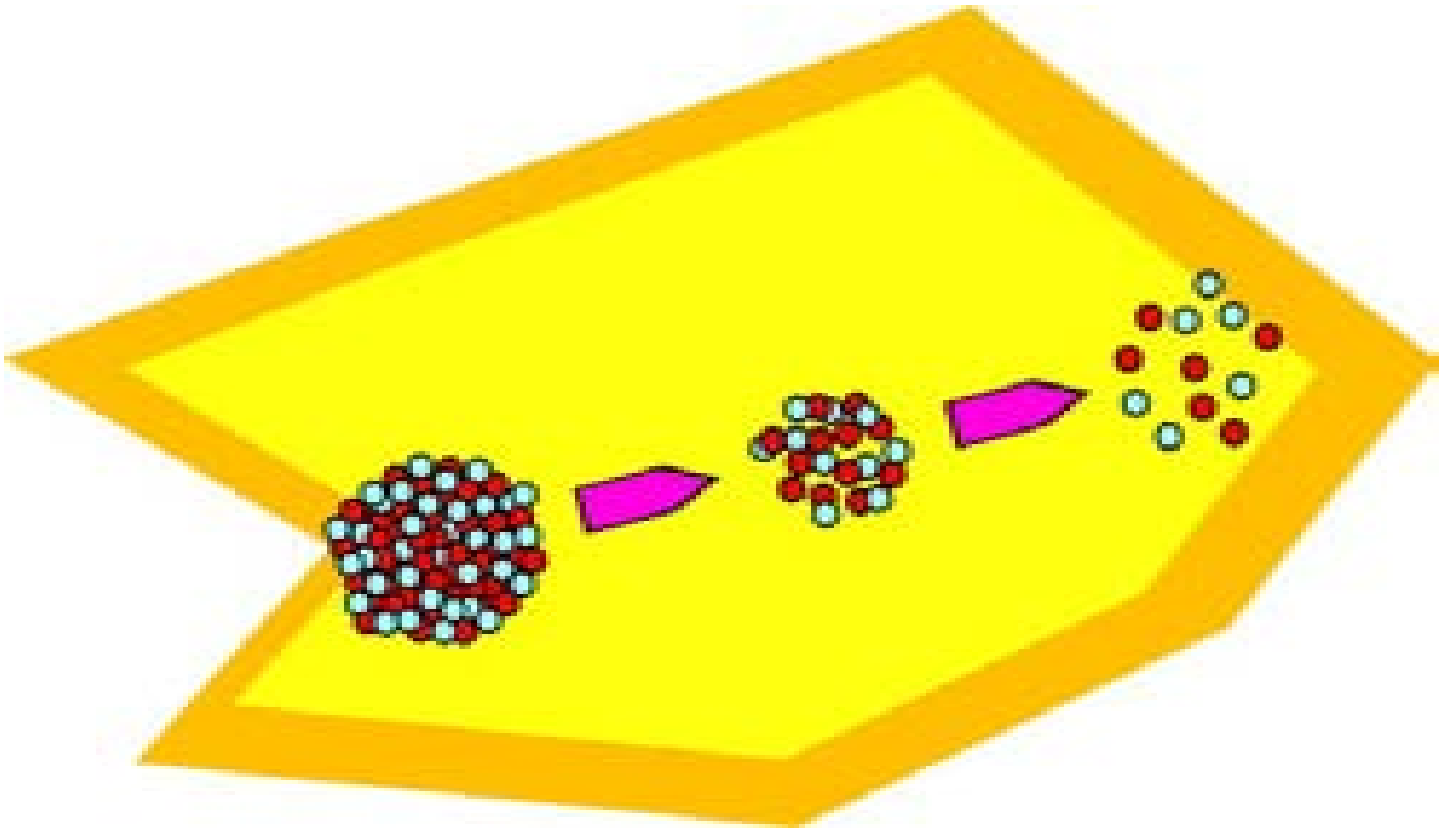
insulator



radiation



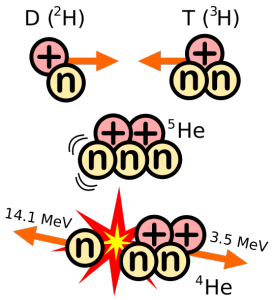
relative

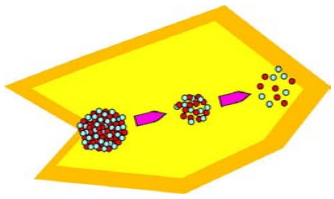


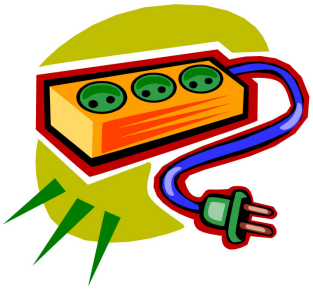
STUDENT SUPPORT MATERIALS

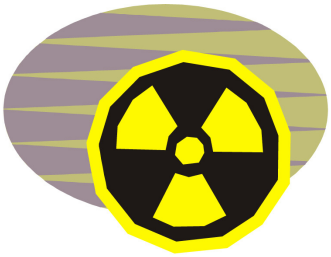
Listening

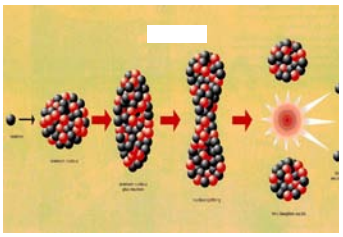
Say these words to the students - they write the numbers of the words under the pictures.
1. unstable nuclei, 2. fusion, 3. electromagnetic, 4. chemical bonding, 5. wavelengths, 6. relative
7. radiation, 8. fission, 9. insulator, 10. decay. 11. conductor, 12. momentum, 13. radioactivity
14. infrared, 15. force, 16. exert

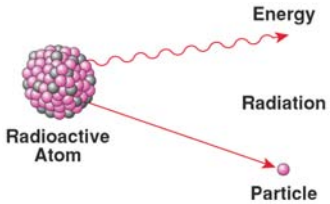


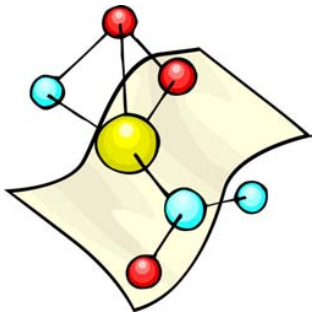












Say these words to the students - they write the numbers of the words under the pictures.
1. unstable nuclei, 2. fusion, 3. electromagnetic, 4. chemical bonding, 5. wavelengths, 6. relative
7. radiation, 8. fission, 9. insulator, 10. decay. 11. conductor, 12. momentum, 13. radioactivity
14. infrared, 15. force, 16. exert

Fill-in The Blanks, Paragraph

Read the sentences to the students. The students should name the "missing words."

The _____1_____ that the Earth receives from the sun is due to nuclear ____2_____reactions within the sun. These reactions send energy to our planet in the form of ultraviolet, visible, and _____3_____. Certain _____4_____are used by plants to power photosynthesis, which converts a _____5_____ small amount of available light energy to _____6_____energy in glucose molecules. The reactions in the sun are fueled by huge amounts of hydrogen, unlike the nuclear _____7_____power plants all over the world that are powered by _____8_____ of the _____9_____of elements such as Uranium-235. The process we use in our nuclear reactions is not as clean as the process that occurs in the sun.

Bond energy from glucose is used by us to fuel our bodies. Without this energy we would not be able to _____10_____on objects to do work. Likewise, electrical energy from power plants (nuclear and otherwise) runs through _____11_____strung between power poles and arrives at our home, enabling us to heat our homes, turn on our televisions, and run our dishwashers. We depend on energy from nuclear reactions every day—from the sun and from nuclear power plants. Perhaps the growing demand for energy and the shrinking supply (and rising cost) of fossil fuels will give nuclear energy technology development the _____12_____ it needs to develop cleaner and safer nuclear technology.

ANSWERS
1. electromagnetic radiation, 2. fusion, 3. infrared radiation, 4. wavelengths, 5. relatively
6. chemical bond, 7. fission, 8. radioactive decay, 9. unstable nuclei, 10. exert force
11. insulated conductors, 12. momentum

True Or False?

Read the following sentences to the students. The students should write "true" or "false" for each of the sentences.

1. If all of the water evaporates from a solution of NaCl, the sodium and chlorine will be not reform their ionic bonds.
2. Radioactivity can be viewed in terms of "half-life."
3. In Southeast Alaska it takes centuries for a spruce log to decay.
4. An atom with an unstable nuclei will not decay over time.
5. Wavelength can be defined as the distance between two peaks of a wave.
6. Carlos Boozer was a great basketball player relative to other players on the team in Juneau but also relative to high school players nationwide.
7. The electromagnetic spectrum includes alpha and beta particles.
8. The only kind of radiation is electromagnetic radiation.
9. Humans can see infrared radiation if they squint hard enough.
10. A good judo player will accomplish her goal without exerting herself very much.
11. When scientists talk about force they are referring to what Luke used when destroying the Death Star.
12. Salt water is a pretty good conductor of electricity.
13. Arctic people sometimes wear fur boots with felt (wool) bottoms because fur and felt are good insulators from the cold.
14. To fuse means to separate abruptly, with little regard for the consequences.
15. Fission means to join with force.
16. Momentum is the motion of a body and its resistance to slowing down.

ANSWERS
1. F, 2. T, 3. F, 4. F, 5. T, 6. T, 7. F, 8. F, 9. F, 10. T, 11. F, 12. T, 13. T, 14. F, 15. F, 16. T

STUDENT SUPPORT MATERIALS

Sight Words

chemical bonding

conductor

decay

electromagnetic

exert

fission

force

fusion

infrared

insulator

momentum

radiation

radioactivity

relative

unstable nuclei

wavelength

STUDENT SUPPORT MATERIALS

Reading

Word Find

Find the words in the grid. Words can go horizontally, vertically and diagonally in all eight directions.

E N G W A V E L E N G T H S U
L J N M B G L W G K B R V C N
E L I L P X D M J G A R W O S
C Q D X J Q W L P D V A J N T
T X N T R E X E I M D D B D A
R D O F L T E A B X V I S U B
O E B M J W T C C M P O R C L
M R L P O I R N R N M A O T E
A A A A O M N N O O Y C T E N
G R C N T J E I J A F T A R U
N F I K M I S N C G Q I L S C
E N M N N U V E T Q D V U W L
T I E Q F M D E D U Y I S L E
I Q H F I S S I O N M T N R I
C L C C N X Z N X J Z Y I W V

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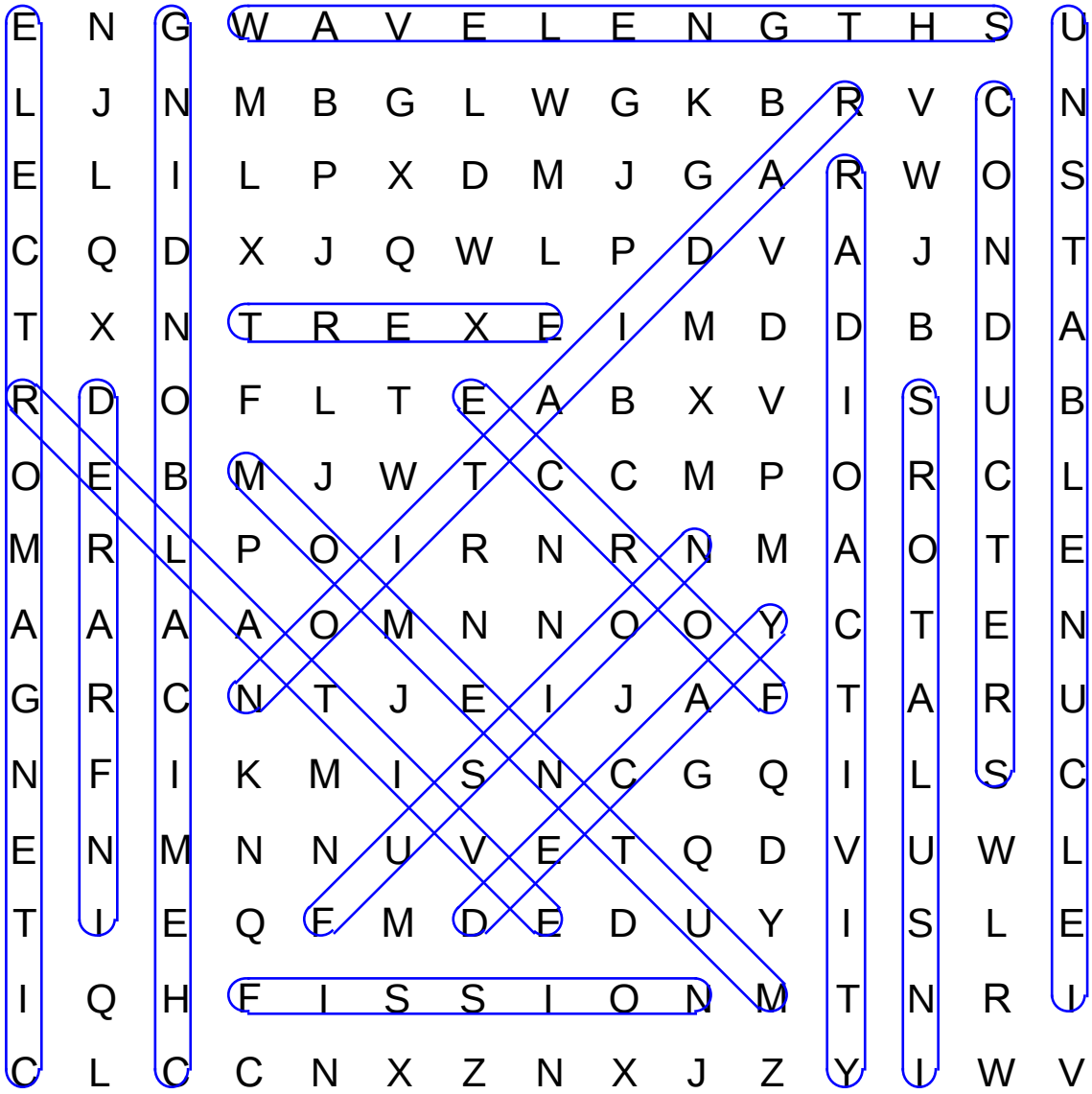
Chemicalbonding
Conducters
Decay
Electromagnetic
Exert
Fission
Force
Fusion
Infrared
Insulators
Momentum
Radiation
Radioactivity
Relative
Unstablenuclei
Wavelengths

Word Find Solution



Sight Words Activity Page

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insulator
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radiation
radioactivity
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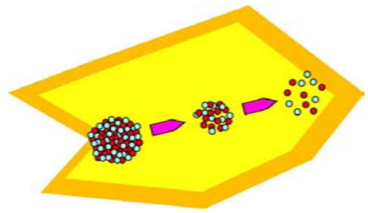
unstable nuclei
wavelengths



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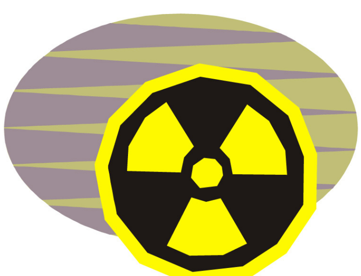

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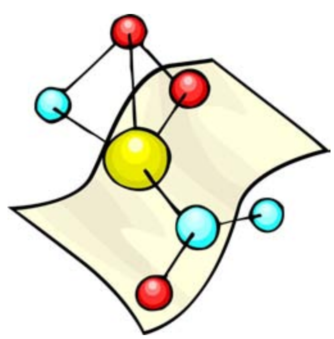

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Sight Words Activity Page

Have the students highlight or circle the words for the pictures.

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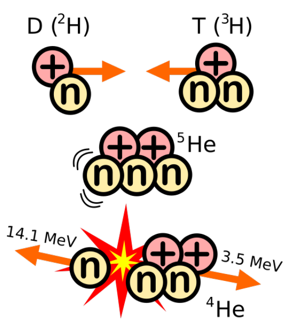

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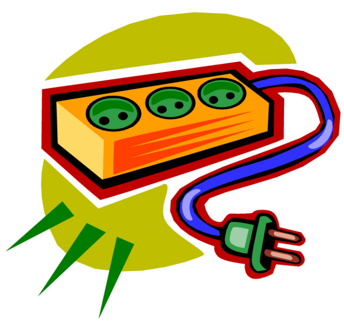

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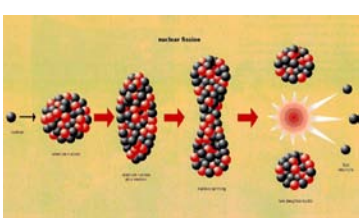

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force
fusion
infrared
insulator
momentum
radiation
radioactivity
relative
unstable nuclei
wavelengths

chemical bonding
conductor
decay
electromagnetic
exert
fission
force
fusion
infrared
insulator
momentum
radiation
radioactivity
relative
unstable nuclei
wavelengths

Sight Words Activity Page

Have the students highlight or circle the words for the pictures.

chemical bonding
conductor
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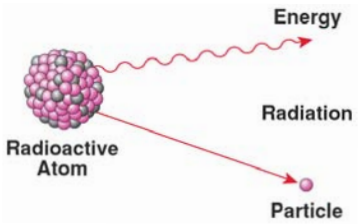

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Sentence Halves

Have the students write the numbers/letters for sentence halves that match.

1. A chemical reaction	A. Just like other waves.
2. Radioactivity at high levels	B. Due to radiation of the heat.
3. To decay	C. Means to break down or decompose.
4. Unstable nuclei	D. Would be a breakthrough.
5. The wavelength and frequency	E. it is difficult to stop.
6. An ant is fast relative	F. Decay spontaneously, that is, they lose mass.
7. Electromagnetic waves can be reflected	G. Fission.
8. When we sit in front of a fireplace we are warmed	H. Includes the breaking and forming of chemical bonds.
9. Infrared waves have frequencies between	I. Are indirectly proportional.
10. I exerted myself at the gym yesterday,	J. To a slug.
11. If I push on an object it will push on me	K. Visible light and radio waves.
12. Finding a conductor that conducts electricity at ambient temperature without line loss	L. So I'm sore today.
13. Insulators block the transfer	M. can be dangerous.
14. Fusion is the opposite of	N. Of heat, electricity, or sound.
15. Nuclear fission means to	O. Break apart nuclei.
16. If an object has a lot of momentum	P. With the same force.

ANSWERS

1/H 2/M 3/C 4/F 5/I 6/J 7/A 8/B 9/K 10/L 11/P 12/D 13/N 14/G 15/O 16/E

Word & Definition Match

Have the students write the word numbers on their matching definitions.

the distance between troughs or peaks	*nuclei of light atoms join to form nuclei of heavier atoms*	*the process of emitting radiation*	*where energy is emitted as particles or waves*	*something that resists transmission*
to put into vigorous action	*process of atoms and molecules sharing electrons*	*not visible in the color spectrum*	*the splitting of the nucleus of an atom*	*nuclei undergoing radioactive decay*
pertaining to electromagnetism	*something that can transmit electricity, heat, etc.*	*not absolute*	*it acts on a body to change speed or direction*	*a quantity expressing the motion of a body*
a process in which fission takes place				

1. chemical bonding	2. conductor	3. decay	4. electromagnetic	5. exert
6. fission	7. force	8. fusion	9. infrared	10. insulator
11. momentum	12. radiation	13. radioactivity	14. relative	15. unstable nuclei
16. wavelengths				

Which Belongs?

Have the students circle/identify the word that is correct for each sentence.

1. Hydrogen bonding/Chemical bonding typically involves the sharing or transfer of electrons.
2. Some isotopes have greater radioactivity/relative than others.
3. If you leave meat at room for several days you will notice that it radiates/decays quickly.
4. An unstable/stable nucleus will lose mass spontaneously by emitting radiation.
5. Once you know the wavelength/electromagnetic of the light you will know what color that our eyes will perceive when we see it.
6. Radiation/Relative to the dark side of Pluto, Alaska is quite warm in December.
7. Thanks to the conductors/electromagnetic radiation from the sun we are able to live on this planet.
8. You can witness radiation/infrared by throwing a rock in a still pond and watching the waves that form.
9. We cannot see electromagnetic/infrared radiation, but we can feel it.
10. “Please, don’t exert/relative yourself on the three problems I assigned tonight,” the math teacher sarcastically quipped.
11. “You can lead a horse to water but you can’t make it drink” is a saying that illustrates how one cannot conduct/force another to do something.
12. Water is a good insulator/conductor of heat—this is why one can get hypothermia so quickly when swimming in cold water.
13. These new gloves are great insulators/conductors from the cold—my fingers are toasty!
14. Welding is the practice of using electricity to cause the fusion/fission of two metal objects.
15. A fission/fusion is a long narrow crack, rip, or opening in a surface.
16. The fusion/momentum of the car was so great that it knocked the skier right off his skis.

ANSWERS

1. chemical bonding, 2. radioactivity, 3. decay, 4. unstable, 5. wavelength, 6. relative
7. electromagnetic radiation, 8. radiation, 9. infrared, 10. exert, 11. force, 12. conductor,
13. insulators 14. fusion, 15. fission, 16. momentum

What's The Answer?

Have the students read the questions and then select the correct answer for them. They should fill-in the appropriate circles, beside the answers of their choice.

1. What kinds of bonds are broken and reformed during chemical reactions?
   - (a) Nuclear bonds
   - (b) Chemical bonds
   - (c) Hydrogen bonds

2. Scientists sometimes wear a Geiger counter when around what sort of activity?
   - (a) Radioactivity
   - (b) Chemical Activity
   - (c) Extracurricular Activity

3. What factors will affect the rate of decay of a piece of wood?
   - (a) Moisture and temperature
   - (b) Altitude and barometric pressure
   - (c) Nitrogen levels and parasitic load

4. Why do we use uranium235 for fuel in nuclear power stations?
   - (a) Uranium-235 is totally safe to use since it decays without releasing radiation.
   - (b) Uranium-235 is as inexpensive as lead since it is so abundant and easy to store.
   - (c) Uranium-235 has unstable nuclei, which tend to break up and release large amounts of energy.

5. The frequency of a wave is dependent on the wave's wavelength and
   - (a) Height.
   - (b) Speed.
   - (c) Distance between peaks.

6. What is one thing that is very obvious when comparing the relative wavelengths of visible light?
   - (a) The lighter colors have shorter wavelength.
   - (b) Green has the longest wavelength.
   - (c) Red has the longest wavelength and violet has the shortest.

7. On the electromagnetic spectrum, which types of waves/rays have the most energy?
   - (a) Gamma rays
   - (b) Radio waves
   - (c) Visible light

8. Which of the following is NOT a form of radiation?
   - (a) Electromagnetic radiation
   - (b) Ionizing radiation (e.g., nuclear weapons)
   - (c) Glychemic radiation

9. Infrared radiation from a household electric heater is a form of
   - (a) Thermal radiation
   - (b) Ionizing radiation
   - (c) Homeopathic radiation

10. What is not a benefit of exerting yourself at basketball practice?
    (a) You get in shape.
    (b) You learn to play when you are tired.
    (c) You get sore.

11. Which is the best way listed to describe a force?
    (a) Power
    (b) Attraction
    (c) Push or Pull

12. Which of the following is a good conductor of heat?
    (a) Foam insulation
    (b) Copper
    (c) Air

13. What are you doing when you strip the insulation from a wire?
    (a) Removing the nylon or plastic coating and exposing the metal wire.
    (b) Soaking the wire in salt water.
    (c) Bending the wire.

14. What do doctors do when they perform a spinal fusion?
    (a) Stabilize the spine by locking together two or more vertebrae.
    (b) Stabilize the spine by separating two or more vertebrae.
    (c) Stabilize the spine by removing two or more vertebrae.

15. What is it called when you split the nucleus of a large atom into two smaller atoms?
    (a) Nuclear Fusion
    (b) Nuclear Fission
    (c) Nuclear Explosion

16. Momentum is one of the many things that is _____ in a closed system.
    (a) Lost
    (b) Gained
    (c) Conserved

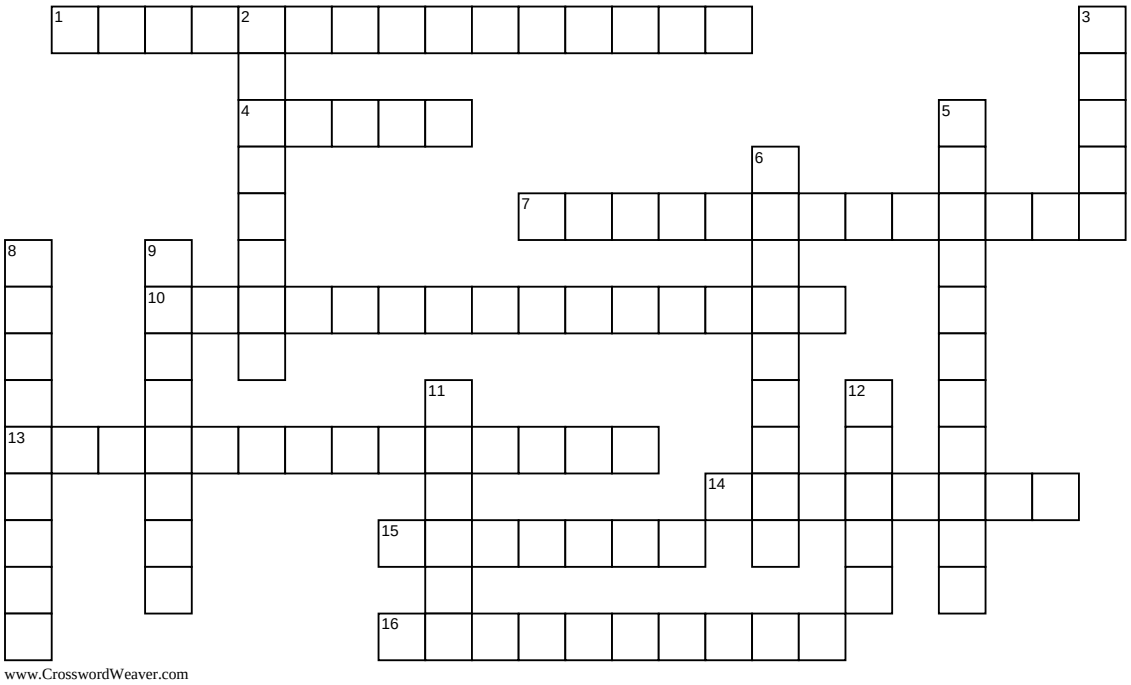
ANSWERS
1. b, 2. a, 3. a, 4. c, 5. b, 6. c, 7. a, 8. c, 9. a, 10. c, 11. c, 12. b, 13. a, 14. a, 15. b, 16. c

STUDENT SUPPORT MATERIALS

Writing

10th B-1 Concepts of Physical Science

Unit 2



ACROSS

1 the physical process responsible for the attractive interactions between atoms and molecules that is associated with the sharing of electrons.
4 anything that acts on a body to accelerate it.
7 the process of spontaneously emitting radiation resulting from changes in the nuclei of atoms of an element.
10 of or pertaining to electromagnetism or electromagnetic fields.
13 the nuclei that undergo radioactive decay.
14 a quantity expressing the motion of a body, equal to the product of the mass of a body and its velocity.
15 the splitting of the nucleus of an atom into nuclei of lighter atoms accompanied by the release of energy.
16 something which resist the transmission of electricity, heat, light, or sound.

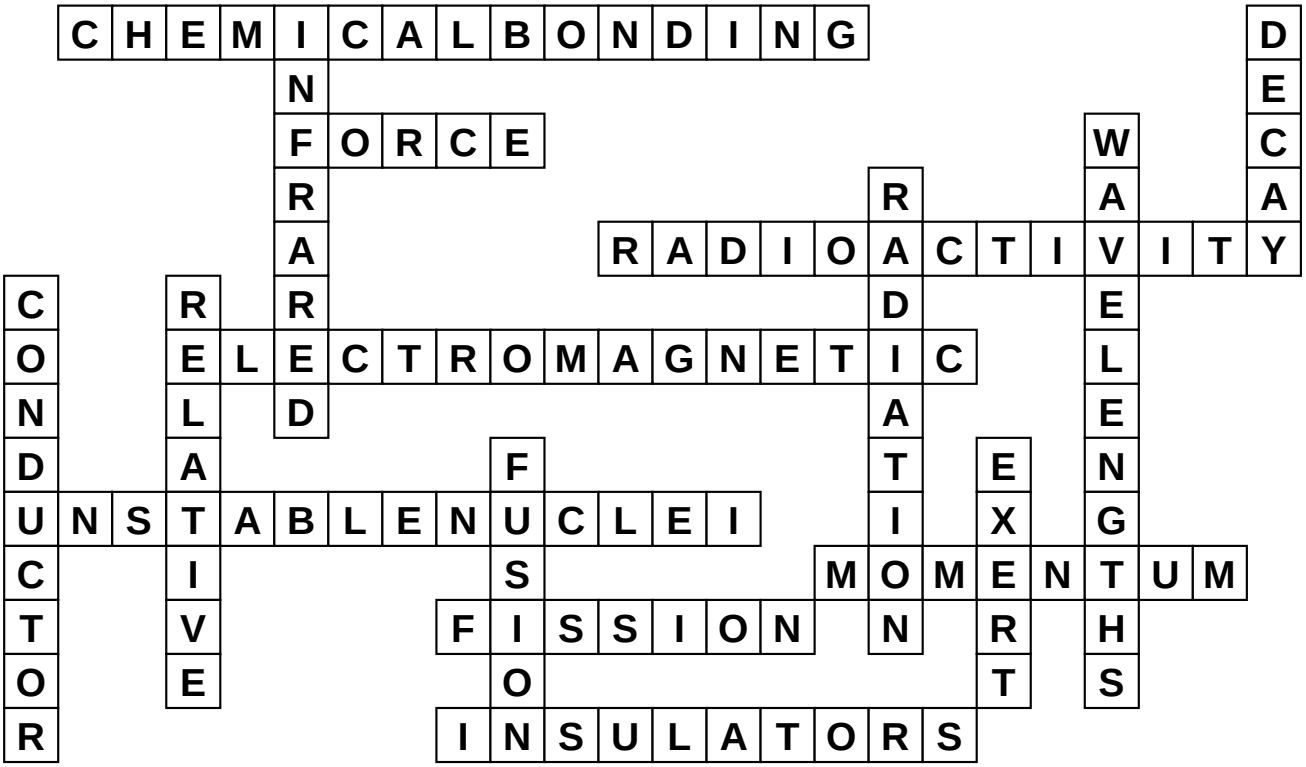
DOWN

2 the part of the invisible spectrum that is contiguous to the red end of the visible spectrum, whose wavelength is longer than that of visible light, but shorter then radio waves or microwaves.
3 to change spontaneously into one or more different nuclei in a process in which atomic particles are are emitted from the nucleus, electrons are captured or lost or fission takes place.
5 the distance between the starting and ending point of one cycle of a wave, the distance between troughs or peaks.
6 the process in which energy is emitted as particles or waves.
8 something which can transmit electricity, heat, light, or sound.
9 not absolute or independent.
11 a thermonuclear reaction in which nuclei of light atoms join to form nuclei of heavier atoms.
12 to put forth or into use.

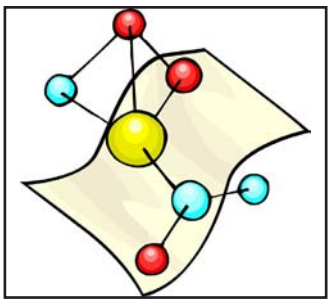
10th B-1 Concepts of Physical Science

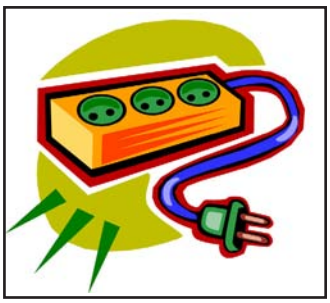
Unit 2

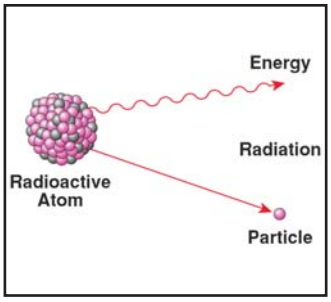
Solution:

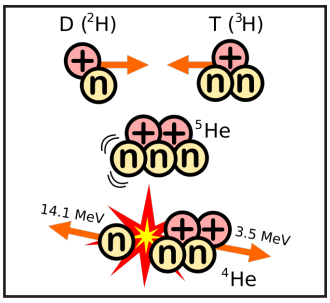


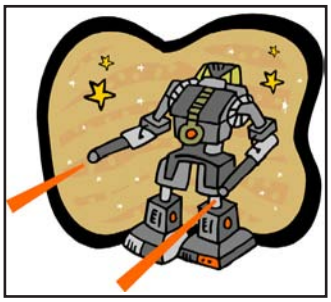
Write The Words!

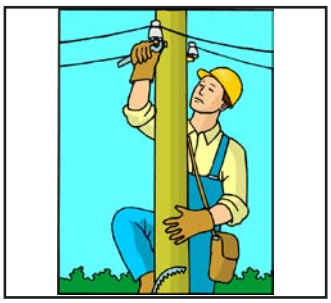


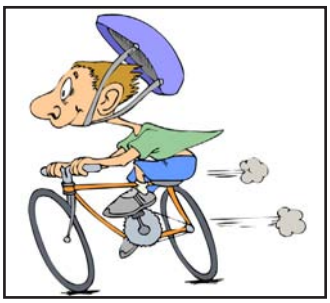












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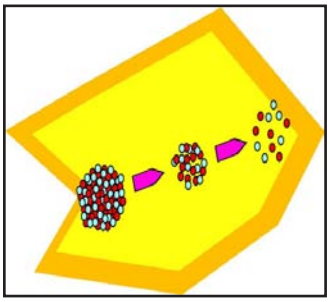
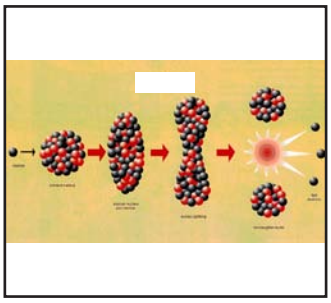




Complete The Sentence

Have the students write the key words in the blanks.

1. Generally speaking, strong _____ is due to the sharing or transfer of electrons between two atoms.
2. After the invention of the atom bomb, science fiction writers were quite prolific in creating monsters and situations that were a direct result of exposure to _____.
3. To _____ means to break down into simpler or smaller molecules or parts.
4. During radioactive decay, _____ lose energy by emitting radiation.
5. If the _____ of a wave is small, its frequency is high.
6. I weigh a lot, but I'm not very heavy _____ to my height since I am very tall.
7. Visible light and x-rays occupy different parts of the _____ spectrum.
8. The sun emits electromagnetic _____.
9. _____ radiation is invisible to human eyes since its wavelength is slightly longer than red visible light.
10. The sprinter _____ herself too much and pulled a muscle.
11. If a _____ acts upon an object it tends to change the object's movement or shape.
12. I was lucky that my body was not the most efficient _____ of electricity—the current found a different path than through me.
13. Electrical workers wear thick rubber gloves which act as _____ from electric shock.
14. _____ is the melding together of two things.
15. During nuclear _____ atoms are broken apart into smaller elements.
16. To get a rough idea about how much a rifle kicks, one can calculate how much _____ the bullet has when fired from that particular rifle.

ANSWERS

1. chemical bonding, 2. radiation or radioactivity, 3. decay, 4. unstable nuclei, 5. wavelength, 6. relative, 7. electromagnetic, 8. radiation, 9. infrared, 10. exerted, 11. force, 12. conductor, 13. insulators, 14. fusion, 15. fission, 16. momentum

Creative Writing Activity Page

Have the students write sentences of their own, using the key words from this unit. When the students' sentences are finished, have them take turns reading their sentences orally. The students should say "Blank," for the key words; the other students must name the "missing" words. You may wish to have the students write the "definitions" for the key words.

chemical bonding

_____

conductor

_____

decay

_____

electromagnetic

_____

exert

_____

fission

_____

force

_____

fusion

_____

infrared

_____

Creative Writing Activity Page

Have the students write sentences of their own, using the key words from this unit. When the students' sentences are finished, have them take turns reading their sentences orally. The students should say "Blank," for the key words; the other students must name the "missing" words. You may wish to have the students write the "definitions" for the key words.

insulator

_____

momentum

_____

radiation

_____

radioactivity

_____

relative

_____

unstable nuclei

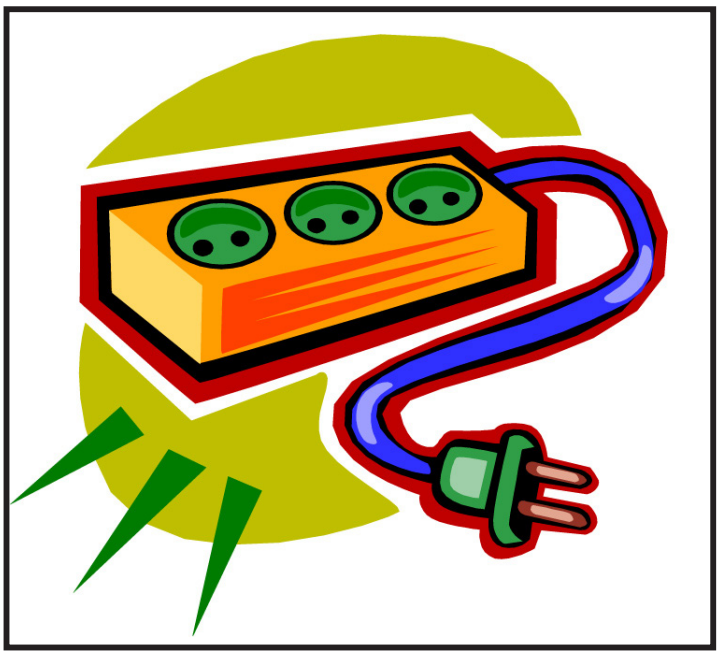
_____

wavelengths

_____

Creative Writing Activity Page

Have the students write sentences of their own, based on the picture below. When finished, have each student read his/her sentences to the others.



STUDENT SUPPORT MATERIALS

Reinforcement Activities

1st Law

Take an empty cup and place a playing card with a coin on top of the cup. Flick the card with your finger, so that the coin drops in the cup

2nd Law

Make a “teeter-totter” using a wooden ruler and an eraser. Place a toy car on one end.

Changing Mass (M)

1st time: place a light weight marker on the UP side of the teeter-totter.
2nd time: place a heavy rock on the UP side of the teeter-totter.

Changing Acceleration (A)

1st time: press down slowly on the UP side of the teeter-totter.
2nd time: press down fast on the UP side of the teeter-totter.

Try other experiments that change the amount of (M)ass and (A)cceleration on the toy car.

3rd Law

Tie a string stretched between two chairs at opposite ends of the room, with an empty pen tube on the string.
Blow up a balloon (but don’t tie it) and tape it to the pen tube
Let the balloon go

QUESTIONS:

1 Explain how the first experiment demonstrates the two parts of Newton’s First Law.
2 Define F= M * A
3 Explain how each of the four experiments in the second experiment demonstrates the formula F=M*A. What happens each time you change the experiment? (four dif-fer ent answers)
4 How does the third demonstration show Newton’s Third Law of Motion.

Rubric

___/ 4 Completes the 1st Law experiment
___/ 8 Describes both parts of the 1st Law
___/ 8 Describes what happens in all four 2nd Law experiments
___/ 4 Defines the formula F=M*A
___/ 12 Explains how these experiments change M & A and how this affects the for mula
___/ 4 Completes 3rd Law experiment
___/ 8 Explains demonstration of 3rd Law
___/ 48 Total points
43 pts * advanced
38 pts + proficient

Enjoy your science project back at your desk and answer the following questions:

1. Why was the energy transfer from the burner to the griddle to the bread representative of thermal conduction? _____
   _____
   _____
   _____

2. Give a different example of thermal conduction. _____
   _____
   _____
   _____

3. Why was the cooking of the egg representative of thermal convection? _____
   _____
   _____
   _____

4. Give a different example of thermal convection. _____
   _____
   _____
   _____

5. Why was the melting of the cheese representative of thermal radiation? _____
   _____
   _____
   _____

6. Give a different example of thermal radiation. _____
   _____
   _____
   _____

Unit Assessment

Unit 2 Quiz

G 10, B1 Unit 2, Concepts of Physical Science Quiz

Name: _____
Date: _____

Multiple Choice: Read each statement below and choose the best answer from the choices provided. Circle your answer.

1) The force of attraction that holds together atoms in a compound; the force that is responsible for the attractive interactions between atoms and molecules that is associated with the sharing of electrons is called_____.

   a) chemical bonding.

   b) radiation.

   c) fusion.

2) When a situation is not absolute or independent, it is said to be_____.

   a) relational.

   b) relative.

   c) realistic.

3) When you sit on a chair and you push the chair and the chair pushes back at you, this is an example of_____.

   a) gravity

   b) force

   c) mass

   d) weight

Unscramble and Fill in the Blank: Unscamble the groups of letters to form a science word. Write the corrected word in the blank. Use the definition to help figure out the answer.

4) ncitamgorcteel (pertaining to fields which convert electric current into magnetic force) _____

5) atcviiytodiar (the process of spontaneously emitting radiation resulting from changes in the nuclei of atoms of an element) _____

6) adrerfni (the part of the invisible spectrum that is contiguous to the red end of the visible spectrum, whose wavelength is longer than that of visible light, but shorter than radio waves or microwaves.) _____

7) dartianoi (the process in which energy is emitted as particles or waves) _____

Complete the spelling of each of the following science words by inserting the correct letters. Use the definitions to help with your answers.

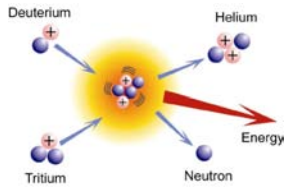
8) I N__ __ A __O R S. Something which resists the tranmission of electricity, heat, light or sound.

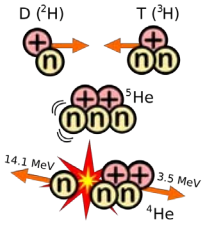
9) __ O __ E __ T U __. A quantity expressing the motion of a body, equal to the product of the mass of a body and its velocity.

10) C__N__U__T O __S. Something which can transmit electricity, heat, light or sound.

Illustrations: illustrations will be used in the following questions about key science vocabulary.

11) There are two illustrations of key vocabulary words below. One is of **FUSION.** The other is **FISSION.** Write the correct label beside each illustration in the space provided beside the illustration.





_____ _____

12) Wavelength is the distance from any point on one wave to a corresponding point on an adjacent wave. It can also be defined as the distance between the starting and ending point of one cycle of a wave, or the distance between the troughs or peaks. Draw one **WAVELENGTH** in the space provided below.

13) **Fill in the Blank: Choose from the following words to correctly complete each sentence. Choose from the words provided below.**

unstable radiation decay fusion

When a radioactive nucleus changes spontaneously into one or more different nuclei in a process in which atomic particles are emitted from the nucleus, electrons are captured or lost and fission takes place. This is called radioactive _____.

A nuclei that undergoes this process is considered _____.

G 10, B1 Unit 2, Concepts of Physical Science Quiz

Name: _____
Date: _____

Multiple Choice: Read each statement below and choose the best answer from the choices provided. Circle your answer.

1) The force of attraction that holds together atoms in a compound; the force that is responsible for the attractive interactions between atoms and molecules that is associated with the sharing of electrons is called_____.

a) chemical bonding.

b) radiation.

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2) When a situation is not absolute or independent, it is said to be_____.

a) relational.

b) relative.

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b) force

c) mass

d) weight

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6) adrerfni (the part of the invisible spectrum that is contiguous to the red end of the visible

spectrum, whose wavelength is longer than that of visible light, but shorter than radio waves or microwaves.) **infrared**

7) dartianoi (the process in which energy is emitted as particles or waves) **radiation**

Complete the spelling of the following science words by inserting the correct letters. Use the definitions to help with your answers.

8) I N__ __ A __O R S. Something which resists the transmission of electricity, heat, light or sound.

Insulators

9) __ O __ E __ T U __. A quantity expressing the motion of a body, equal to the product of the mass of a body and its velocity.

Momentum.

10) C__N__U__T O __S. Something which can transmit electricity, heat, light or sound.

Conductors

Illustrations: illustrations will be used in the following questions about key science vocabulary.

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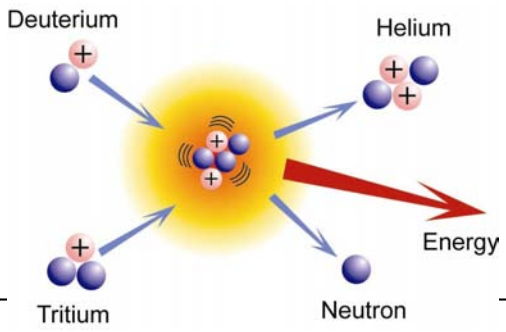

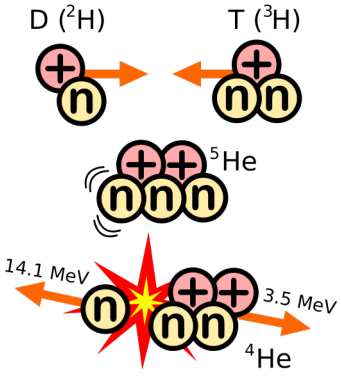

illus. of FUSION_____ Illus. of FISSION_____

12) Wavelength is the distance from any point on one wave to a corresponding point on an adjacent wave. It can also be defined as the distance between the starting and ending point of one cycle of a wave, or the distance between the troughs or peaks. Draw one **WAVELENGTH** in the space provided below.

student draws wavelength.

13) **Fill in the Blank: Choose from the following words to correctly complete each sentence. Choose from the words provided below.**

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When a radioactive nucleus changes spontaneously into one or more different nuclei in a process in which atomic particles are emitted from the nucleus, electrons are captured or lost and fission takes place. This is called radioactive **decay** .

A nuclei that undergoes this process is considered **unstable** .