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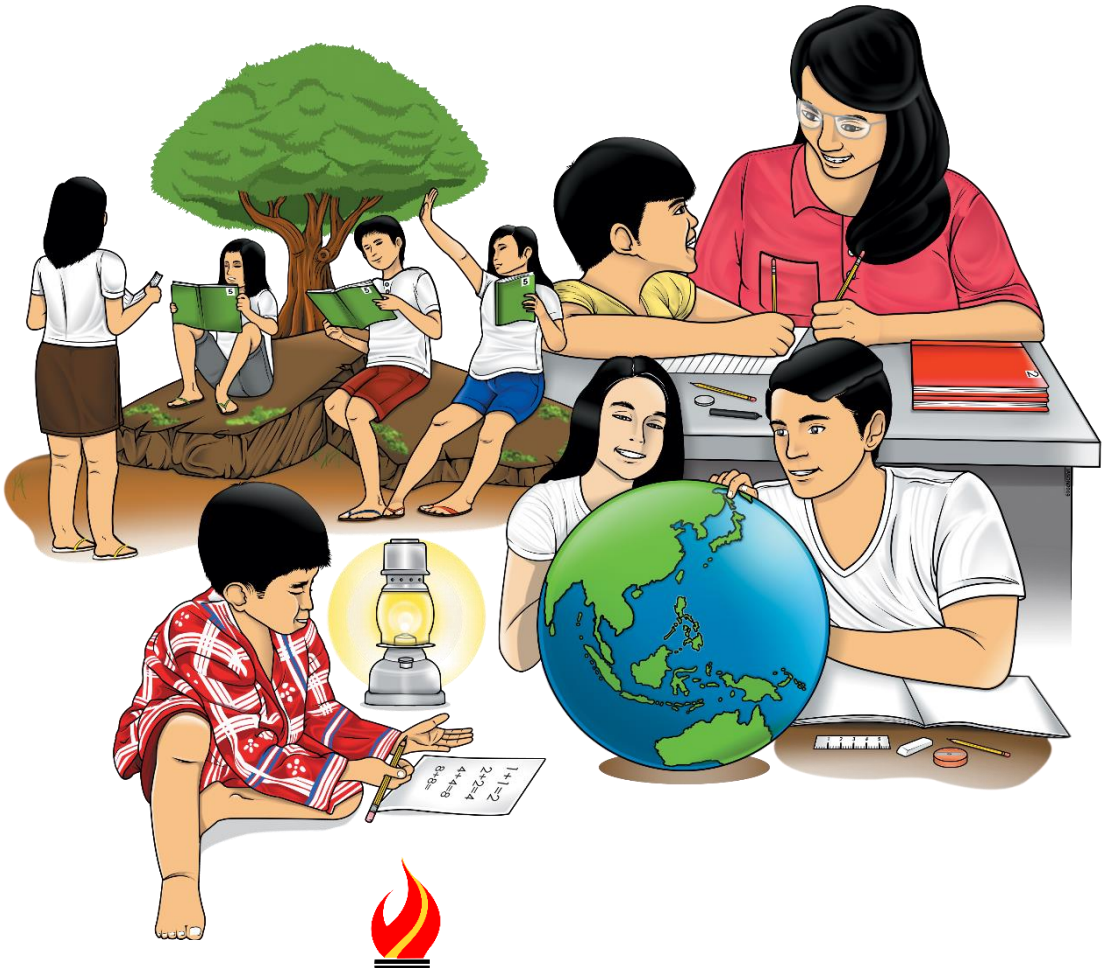
DEPARTMENT OF EDUCATION

Science

Quarter 3 – Module 6
It's Getting Hot In Here!



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Science

Quarter 3 – Module 6
It's Getting Hot In Here!

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

Hi! Have a great day! Welcome to our new lesson which is 'It's Getting Hot In Here!'. For sure, you have used the word 'heat' many times in your life. You have experienced it; you have observed its effects. But have you ever wondered what heat really is?

In this module we will explore and understand together how energy is transferred between objects or places and how is this related to heat. You will also distinguish the conducting materials from nonconducting materials as we discuss how heat transfer occur in our everyday life.

Most Essential Learning Competency

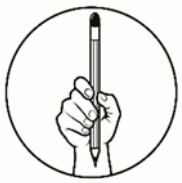
Infer the conditions necessary for heat transfer to occur. (S7LT-IIIh-i12)

This module is divided into:

Lesson 1 – Heat's Amazing
Lesson 2 – Heat In Our Daily Life!

After going through this module, you are expected to:

1. define heat and explain the process of heat transfer;
2. identify and distinguish the methods of heat transfer;
3. distinguish conducting materials from non-conducting materials;
4. briefly discuss some examples of heat transfer used in everyday life.



What I Know

Directions: Read and understand the questions carefully. Write the letter of your answer on a separate sheet of paper.

1. It refers to the transfer of heat that occurs within a body or between two bodies in contact.
   A. conduction
   B. convection
   C. fusion
   D. radiation

2. Which of the following is TRUE about conductors?
   A. Conductors are the materials that conduct heat well
   B. Conductors are the materials that conduct heat poorly.
   C. Conductors refers to the process of heat transfer from one object to another.
   D. Conductor refers to the process in which heat is carried from place to place by the bulk movement of a fluid.

3. This describes the one direction, natural flow of heat.
   A. hot to cold
   B. cold to hot
   C. both *a* and *c*
   D. none of the above

4. The substance where heat transfer by convection occurs due to different temperatures.
   A. fluids only
   B. gases only
   C. liquids only
   D. solids only

5. The transfer of heat due to electromagnetic waves and does not need a material medium.
   A. conduction
   B. convection
   C. fusion
   D. radiation

6. Which of the following situations BEST describes heat transfer due to radiation?
   A. Boiling of hot water in a pan.
   B. Algal blooms in ponds and lakes.
   C. Warm water rises in a swimming pool.
   D. Feeling warm while standing near a bonfire.

7. Which phrase BEST describes temperature?
   A. Energy in transit due to differences in temperature.
   B. Sum of all potential and kinetic energy of a system.
   C. Degree of hotness or coldness of an object or a system.
   D. The natural flow of heat transfer from hot to cold.

8. Which of the following is **NOT** an example of a conductor?
   A. Aluminum
   B. Metal
   C. Steel
   D. Wood

9. Which of the following are examples of ~~a~~ materials that conduct heat **POORLY**?

I.	ceramic, fabric, glass
II.	brass, silver, steel bars
III.	plastic, paper, rubber gloves
IV.	aluminum, electrical wires, iron nails

   A. I and III only
   B. I, II, and III only
   C. II, III and IV only
   D. I, II, III and IV

10. Which of the following is **NOT** true for a black object?

I.	It is a good emitter of radiation.
II.	It is a poor emitter of radiation.
III.	It is a good absorber of radiation.
IV.	It is a poor absorber of radiation.

   A. I and III only
   B. I and IV only
   C. II and III only
   D. II and IV only

11. Which materials can be best used as handles/grips of cooking utensils?
   A. Iron and silver
   B. Copper and steel
   C. Plastic and rubber
   D. Aluminum and iron

12. Heat transfer due to conduction occur between objects that are in contact with each other. Which of the following scenario~~/~~s are examples of heat transfer due to conduction?

I.	Heat of the sun striking your skin will cause sunburn.
II.	Hot coffee is stirred with a spoon, soon the spoon gets hot.
III.	Hot food will heat a stoneware or porcelain plate for a time.
IV.	The metal skewer gets so hot that you drop your marshmallow in the campfire.

A. I and II only
B. II and III only
C. II, III and IV only
D. I, II, III and IV

13. Inside an air-conditioned room, metallic objects generally feel cooler to touch than wooden objects. Why is this so?

I.	Metal conducts heat better than wood.
II.	Wood contains more heat than a metal of the same mass.
III.	Metallic objects feel colder to touch because they are good insulators.
IV.	Metallic objects feel colder to touch because they are good thermal conductors.

A. I and III only
B. I and IV only
C. I, II and IV only
D. I, III and IV only

For items 14-15 only, tell whether the scenario is an example of a conduction, convection, or radiation.

14. The type of heat transfer as shown when the person feels warm from the heat of the sun.
A. conduction
B. convection
C. radiation

15. The type of heat transfer observed during daytime when it is too hot and the ice on the glass easily melts.
A. convection
B. conduction
C. radiation

Lesson 1

Heat's Amazing

What's In

There you go! Now, may I ask you, have you ever wondered how you can feel the heat even if the sun is so far away from us? Or why is it cooler to wear a white shirt on a sunny day than a black shirt? In your earlier grades, you learned that heat moves from the source to other objects or places. Example is the kettle with water placed on top of a burning stove. What do you think will happen to the water? Do you think the water will get hot or remain cold?

This module will give you a better understanding about the methods of heat transfer and how it is being used in your everyday lives. But before that let us try to guess the word described by the letters and pictures below. Write your answer on a separate sheet of paper.

H +  **=** _____

1. It is a form of energy that is transferred between systems or objects with different temperatures.

Illustrator: Richele Mae Cajandig

T +  **+ MO +**  **=** _____

2. A device that is used to measure the hotness or coldness of a substance

Illustrator: Richele Mae Cajandig

What's New

Hello dear! I hope you have a good day! Now let us proceed with a new lesson to be presented through a poem. This poem will give your ideas that will lead you to answer the following activities given in this module. Are you excited? Let's start!

Activity I

Define heat and determine methods of heat transfer.

Heat's Everywhere
by: Princess C. Bagaforo

Heat that keeps our days warm
Can be transferred in three ways
Conduction, convection, radiation
All are in motion

Heat that flows from hot object to cold object
Is a natural process of heat effect
As temperature is to hotness or coldness of an object
Thermal energy is to temperature differences between objects

Heat affects you in so many ways
From the warmth of the fireplace and
Light of the sun that strikes you in every ways
All are in motion due to heat's radiation

Heat that is hard to beat
Can be carried from place to place without retreat
When warm air and cold air compete
All fluids and gases are in motion due to convection of heat

Heat can be transferred through direct contact of a material
Is a process which is essential
Conductor is to metal objects, as insulator is to plastic objects
All are in motion due to heat's conduction.

Guide Questions:

1. What are the three methods of heat transfer stated in the poem?
2. What is 'heat' as stated in the poem?
3. How do you differentiate heat from temperature?
4. How does the heat flow on materials having different temperatures?

Activity II:

Distinguish conducting materials from non-conducting materials.

Materials: 3 types of spoon (wooden, metal, and plastic), hot water, mug

Procedure:

1. Fill the mug with boiling water.
2. Put all three spoons (wooden spoon, plastic spoon, and metal spoon) into the mug.
3. Arrange the spoons properly. Their handles should not touch one another.
4. After five minutes, feel the handle of each spoon. Try to observe which spoon still feels hot and which spoon already feels cold.

Direction: Answer the following questions based from the given activity you performed. Write your answer on a separate sheet of paper.

1. Which spoon stays cooler when submerged in boiled water?

2. What type of object/s felt warm?

3. Which spoon is hot even though the handle is not submerged in the boiled water?

4. How do you differentiate ~~a~~ conducting materials from non-conducting materials?

Rubric for Activity II				
Category	**4**	**3**	**2**	**1**
Accuracy & Content	All the answers are correct. Completely relates to and expands the ideas based on the lesson.	Most of the answers are correct. Related ideas cover what we have on the lesson.	Some of the answers are correct. Somewhat related ideas, but does not add to what we have on the lesson	None of the answers are correct. Ideas are not related to what we have on the lesson.
Spelling & Grammar	All spelling and grammar are correct.	Most of the words and grammar are spelled correctly.	Some of the words are spelled correctly and some grammar are correct.	Spelling and grammar errors are frequent.

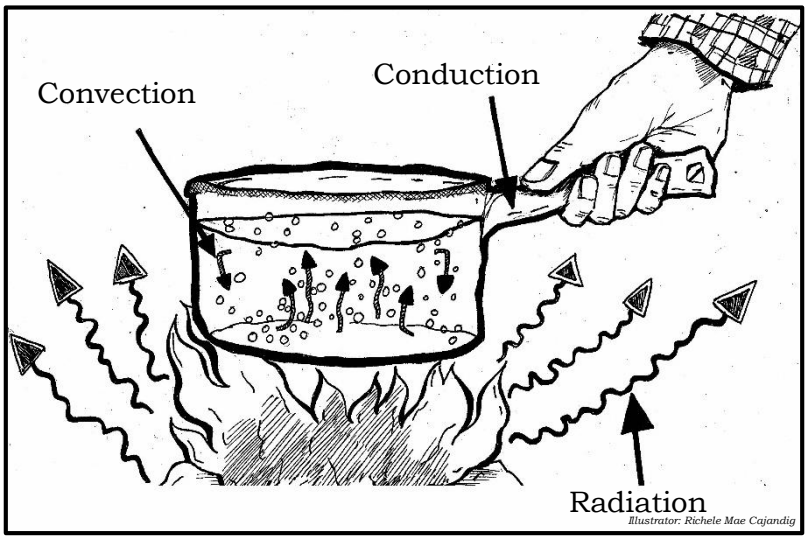
What is It

What is Heat?

Have you ever heard of the term "thermal energy" before? Any object is said to possess thermal energy due to its particles whether at rest or in motion. How is heat related to thermal energy? Thermal energy refers to the energy contained within a system that is responsible for its temperature. Heat is the flow of thermal energy.

When energy is transformed, such as thermal energy, heat is always produced. *Heat* is an energy that is transferred from one object to another object due to the *difference in their temperature*. It is simply called as *'energy in transit'*. Heat transfer is related to change in temperature. *Temperature* refers to the relative hotness or coldness of an object. An instrument used for measuring and indicating temperature is called *'thermometer'.*

Methods of Heat Transfer



Conduction

Conduction takes place between objects that are in contact with each other. The energy is transferred through particles that are close or in contact with each other, but it is dominant in solids only. Materials that conduct heat well are called thermal conductors (good conductors) such as metals like copper, iron, aluminum, steel, silver, brass, lead etc. Whereas materials that conduct heat poorly are known as thermal insulators (poor conductors) some examples are non-metals like wood, rubber, plastic, glass, paper etc.

These insulators have many important applications. Have you ever wondered why some utensils have handles that are made of wood or plastic? Wood and plastic, being thermal insulators, reduces the heat flowing from the food being cooked to the utensils and finally to the person cooking the food.

Convection

Convection is the process in which heat is carried from place to place by the bulk movement of a fluid against its surroundings. *Fluids* are materials that can flow, and they include both *gases and liquids*. The movement of steam or the motion of boiling water in a pot are examples of convection.

Radiation

Radiation is a method of heat transfer in the *absence of matter* or through space. Objects with dark surfaces absorbs more heat than objects with bright surfaces. When you stay under the sun, your body feels hot because it absorbs energy from the sun. The same thing happens when you put your hand near a lightbulb or stand near a bonfire. The electromagnetic waves carry energy from the fire to your body. Thus, fire and lightbulbs also emit electromagnetic waves. The process of transferring energy through electromagnetic waves is called *radiation.*

The color black is associated with the nearly complete absorption of visible light, whereas the color white is associated with shiny surfaces reflecting so much visible light. A material that is a good absorber of heat is also a good emitter of heat. Similarly, a material that is a poor absorber of heat is also a poor emitter of heat.

People are uncomfortable wearing dark clothes during the summer because the color black is a good absorber of heat. Dark clothes absorb a large fraction of the sun's radiation. On the other hand, white fabric or light-colored clothes feels cooler because it absorbs less heat from the sun's radiation. The color white is a good reflector of heat.

What's More

Activity I.

Directions: Read and understand the questions carefully. Identify the method of heat transfer taking place in each of the following situations whether it is a *Conduction*, *Convection* or *Radiation*. Write your answer on a separate sheet of paper.

1. A chair is placed several feet from a fire in a fireplace with a glass screen. After some time, the side of the chair close to fireplace gets warm.

2. Hot coffee is stirred using a metal spoon, after a while the spoon gets hot.

3. Your face gets warm as you stay exposed under the sun.

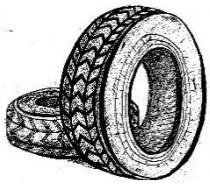
4. In weather the longitudinal transport of heat and moisture is usually from a warmer to a cooler area of the atmosphere.

5. Boiling water releases steam or water vapor.

Activity II.

Directions: Determine which of the following pictures are example of conductors and insulators? Write letter *I* if the answer is insulator and *C* if the answer is conductor on a separate sheet of paper.

Rubber tire

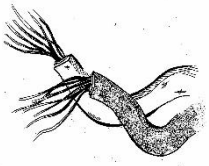


1.)

Cooking pan

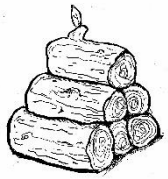
2.)

Copper wire



3.)

Wood



4.)

Illustrator: Richele Mae Cajandig

Activity III.

Directions: Identify and explain which figure shows an example of a heat transfer due to convection? Write your answer on a separate sheet of paper.

(1) ***Boiling of hot water***

Illustrator: Richele Mae Cajandig

A

(2) ***Heat of the sun***

Illustrator: Richele Mae Cajandig

B

What I Have Learned

Activity I.

Directions: Group the following materials inside the box whether it is a Conductor or an Insulator. Write your answer on a separate sheet of paper.

Aluminum pan	Electrical wires	Glassware
Iron nails	Paper	Plastic cups
Rubber	Steel bars	

Conductor	Insulator

Activity II.

Directions: Read the paragraph and choose the appropriate word/s from the box that will complete the given sentences. Write your answers on a separate sheet of paper.

Conduction	Conductors	Convection
Energy in transit	Heat	Insulators
Radiation	Temperature	Thermometer
Three		

All objects, even ordinary ones, gives off heat into the surroundings. (1) _____ is energy that is transferred from one object to another due to their difference in their temperature and it is simply called as (2) _____.
(3) _____ refers to the hotness or coldness of a substance, which can be measured using an instrument called (4) _____. Heat can be transferred in (5)_____ ways through (6) _____, (7) _____ and (8) _____. Heat is said to be transferred through (9) _____ when heat is directly transferred through a material, however not all materials can transfer heat. Materials that conduct heat poorly are known as (10) _____ while materials that conduct heat well are called (11) _____. Another way to transfer heat is through the movement of fluids such as liquid and gases between areas of different temperature, this is called (12) _____. Unlike other mode of heat transfer, (13) _____ is a heat transfer in the absence of matter or through space where objects with dark surfaces absorbed more heat than objects with bright surfaces.

What I Can Do

Activity I.

Directions: Give at least one scenario for each method of heat transfer (Conduction, Convection and Radiation) which you ~~can~~ observe taking place at home or in your neighborhood. For example: Conduction – A metal spoon becomes hot from the boiling water inside the cup as I make coffee. Write your answer on a separate sheet of paper

A. Conduction

_____

B. Convection

_____

C. Radiation

_____

Activity II.

Directions: Answer the given question below. Write your answer on a separate sheet of paper.

A. Which keeps you cooler during sunny days a black shirt or a white shirt? Why?

_____

_____

Rubric for What I Can Do				
Category	**4**	**3**	**2**	**1**
Accuracy & Content	All the answers are correct. Completely relates to and expands the ideas based on the lesson.	Most of the answers are correct. Some Related ideas cover what we have on the lesson.	Some of the answers are correct. Somewhat related ideas, but does not add to what we have on the lesson. Some ideas are not part of the lesson	None of the answers are correct. Ideas are not related to what we have on the lesson.

Spelling & Grammar	All spelling and grammar are correct.	Most of the words (and grammar) are spelled correctly and with one error in sentence construction	Some of the words are spelled correctly and some grammar are correct.	Spelling and grammar errors are frequent.

Assessment

Directions: Read and understand the questions carefully. Write your answer on a separate sheet of paper.

For items 1 to 4: The illustrations on the right shows a man and a woman making a noodle soup using a pan made of metal. Use this illustration to answer the questions below.

1. Heat travels through the pan by _____.
   A. conduction
   B. convection
   C. dispersion
   D. radiation
2. Heat travels through the soup by_____.
   A. conduction
   B. convection
   C. dispersion
   D. Radiation
3. Which of the following explains why the lady is able to hold the handle of the pan with her bare hands?

   I. The handle has high thermal expansion.
   II. The handle has low thermal conductivity.
   III. The handle is made of good insulator of heat.

   A. I and II
   B. I and III
   C. II and III
   D. I, II, and III
4. Which of the following is **NOT** taking place in the given situation?
   A. conduction
   B. convection
   C. dispersion
   D. Radiation
5. Which of the following processes of heat transfer requires the presence of a fluid?
   A. conduction
   B. convection
   C. dispersion
   D. radiation

6. Which type of heating causes sunburn?
   A. conduction
   B. convection
   C. dispersion
   D. Radiation

7. Which of the following will likely happen when a hot and a cold object are put in contact with one another?
   A. The hot object will become hotter.
   B. The cold object will become colder.
   C. The hot and cold object will both become colder.
   D. The cold object will become warmer, and the hot object will become colder.

8. Which of the following is **NOT** true about heat?
   A. Heat is energy in transit.
   B. A substance does not contain heat.
   C. Heat can be contained in a substance
   D. Heat is molecular energy being transferred.

9. The energy transfers from one object to another because of temperature difference is called _____.
   A. heat
   B. temperature
   C. kinetic energy
   D. internal energy

10. One end of a copper rod is placed in a flame of a Bunsen burner. Small pieces of wax placed along the rod melt at progressively larger distance from the plane. Heat is transferred through the rod by conduction. Which of the following is/are TRUE about conduction?

I. Conduction is one of the methods of heat transfer.
II. Conduction takes place between objects that are in contact.
III. Conduction is a process wherein heat is transferred directly through a material.
IV. Conduction can be transferred through fluids such as liquids and gases of different temperature.

   A. I and II
   B. I, II, and III
   C. II, III, and IV
   D. I, II, III, and IV

11. All objects, even ordinary ones, gives off heat into the surroundings by radiation. Which of the following is/are TRUE about radiation?

I. Radiation can be transferred between fluids.
II. Radiation takes place even in the absence of matter.
III. Radiation is an energy that is transferred from one object to another due to the difference in their temperature.
IV. All objects emit and absorb radiation although some objects are better at emitting or absorbing radiation than others.

A. I and II
B. II and III
C. II and IV
D. I, II, and III

Material A	Material B
Steel bars	Wood
Electrical wires	Plastic
Aluminum	Glass

12. What can be inferred from the list above?

I.	All materials from A and B are good conductors of heat.
II.	All materials from A and B are examples of thermal insulator.
III.	Aluminum conducts heat well compared to plastic.
IV.	Material A are example of object that allows the transfer of heat, while material B are objects that conduct heat poorly.

A. I and II
B. II and III
C. III and IV
D. I, II, III, and IV

13. Which of the following materials are example of thermal insulator?
A. Glass, Plastic, Wood
B. Steel bars, Aluminum, Glass
C. Plastic, Electrical wires, Glass
D. Aluminum, electrical wires, steel bars

14. Frying a pancake would be an example of which type of heat transfer?
A. Conduction
B. Convection
C. Cooking
D. Radiation

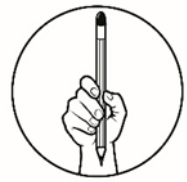
15. A girl's hands become warm after holding a mug of hot coffee would be an example of which type of heat transfer?
A. Conduction
B. Convection
C. Cooking
D. Radiation

Additional Activities

Directions: Look for the words being described in each of the statements below. Write your answer on a separate sheet of paper. Let's start!

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

1. Instrument used in measuring the temperature of an object.
2. It describes the hotness or coldness of a body.
3. A material that allows the transfer of heat easily.
4. Thermal energy that is in transit.
5. Mode of heat transfer that does not need particles or a medium to take place.
6. A material that does not allow the transfer of heat easily.
7. The transfer of heat through a fluid (liquid or gas) caused by molecular motion.
8. A transfer of heat from one substance to another by direct contact.



What I Know

Directions: Read and understand the questions carefully. Write your answers on a separate sheet of paper.

1. Heat transfer that takes place in liquids and gases is essentially due to _____.
   A. conduction
   B. convection
   C. insolation
   D. radiation
2. Heat transfer by radiation occurs _____.
   A. through electromagnetic waves
   B. through movement of a fluid
   C. through physical contact
   D. through sea water
3. When you touch a piece of ice _____.
   A. energy does not flow
   B. energy flows from the ice to the finger
   C. energy flows everywhere
   D. energy flows from your finger to the ice
4. Conduction is the transfer of heat by_____.
   A. molecular contact
   B. density differences
   C. electromagnetic waves
   D. movement through a vacuum
5. Heat conduction in gases is due to _____.
   A. mixing of gases
   B. movement of particles
   C. electromagnetic waves
   D. elastic impact of molecules
6. Walking on the hot sand with your bare feet is an example of what type of heat transfer?
   A. conduction
   B. convection
   C. insolation
   D. radiation
7. When will heat transfer stops?
   A. When both objects are of the same temperature.
   B. When one of the objects reaches its coldest temperature.
   C. When one of the objects reaches its highest temperature.
   D. When both objects temperature turns zero degrees Celsius.
8. Which statement is true regarding heat transfer?
   A. Heat exchange is constant.
   B. It is the internal energy of the system.
   C. It is a function of space and time coordinates.
   D. There is a variation in temperature in the course of time.

9. Which statement is the best example of heat by conduction?
   A. Heat is transferred from the sun to the earth.
   B. Heat is transferred from the bottom to the top of a lake.
   C. Heat is transferred from the surface of the soil to the rocks below.
   D. Heat is transferred from the Earth's surface to the upper atmosphere.

10. You are holding an ice cream while walking on the street, and you noticed your ice cream is starting to melt. What type of heat transfer is this?
   A. conduction
   B. convection
   C. isolation
   D. radiation

11. Which action would save energy and money on using air conditioner during a hot, sunny summer day?
   A. Opening curtains and window covers
   B. Adding insulation in the walls and ceiling
   C. Turning on lights and heat producing appliances
   D. Replacing light colored roofing materials with dark colored

Container A and B contained water of different amounts and were exposed to the same quantity of heat.

Container A	1/4 cup water
Container B	3/4 cup water

12. How will you compare the temperature reading in container A and B?
   A. A has the same temperature as B.
   B. A has greater temperature than B.
   C. A has a temperature three times less than B.
   D. A has a temperature three times greater than B.

13. Cup A contains 100 grams of water and Cup B contains twice as much water. Both cups were initially at room temperature. Cup A was heated to 50 degrees Celsius and Cup B was heated to 25 degrees Celsius. Which cup had more thermal energy transferred to it?
   A. No heat transfer occurred in both cups.
   B. Cup B had more thermal energy transferred.
   C. Cup A had more thermal energy transferred.
   D. Both cups had the same amount of thermal energy transferred.

14. Linda is a chef in an Italian restaurant which sells pasta, pizza and salad. She is using a metal pan with a rubber handle to make the pastas. Her boss bought a new pan, which is made entirely of metal. Should Linda use the new metal pan instead of the old one?
   A. Yes, because it new and it is made of metal.
   B. No, because the new pan is smaller than the old pan.
   C. No, because the heat will directly flow from the pan handle to the hand.
   D. Yes, because it is from the boss and it is not good to disobey him.

15. Tony is spending his summer vacation in Boracay, he decides to walk on the beautiful white sand under the scorching sun at noontime. He takes off his slippers to feel the sand between his toes. Should Tony walk at the beach barefoot at noontime?
   A. Yes, to feel the texture of the soft sand.
   B. Yes, to make the most out of the summer vacation.
   C. No, because it is unhygienic to walk without slippers.
   D. No, because his feet will be burned while walking on hot sand.

Lesson 2 Heat Transfer

What's In

Directions: Read and understand the questions carefully. Write your answer on a separate sheet of paper

Test I. Complete the words below by filling in the missing boxes. Write a brief description of each word below the box.

1. D o c I
2. c v t n
3. e t
4. r d a i
5. P r U E

Test II: Write TRUE if the statement is correct and FALSE if the statement is wrong.

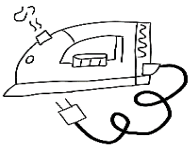
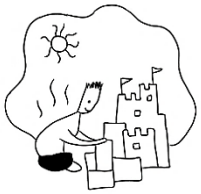
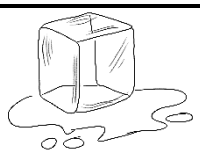
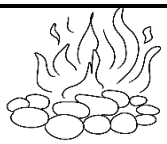
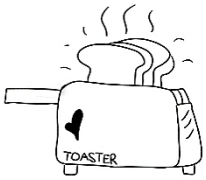
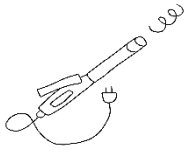
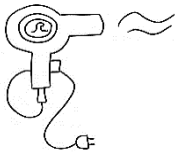
1. Thermometer is a device used to measure temperature.
2. Convection is the transfer of heat energy by direct contact.
3. Conduction is the transfer of energy with the help of electromagnetic waves.
4. Heat is the total energy of molecular motion in a substance.
5. Convection is the transfer of heat by the circulation or movement of the heated parts of a liquid or gas.

What's New

Directions: Read and understand the questions carefully. Write your answer on a separate sheet of paper.

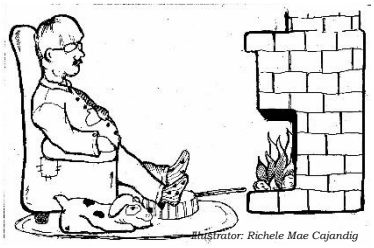
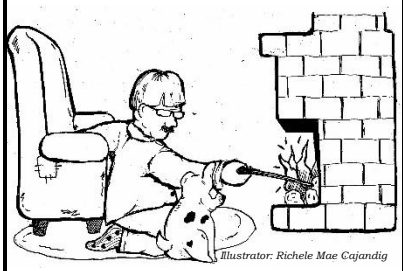
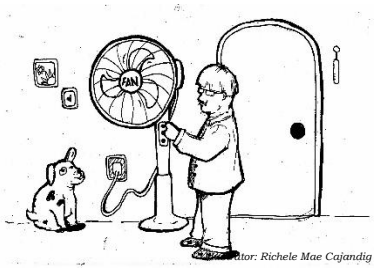
Activity I:

Identify whether the following pictures show conduction, convection or radiation.

1	 Steaming cup of hot tea	6	 Ironing clothes	11	 Ultraviolet light from the sun
2	 Ice cube melting on the floor	7	 Heat from fire	12	 Walking barefoot on hot sand
3	 Cooking egg in a pan	8	 Boiling Water	13	 Heat from grill burner
4	 Hot air balloon rising	9	 Thawing meat with water	14	 Toasting a bread
5	 Microwave from an oven	10	 Using curling iron to style hair	15	 Using blower to dry hair *Illustrator: Jilea A. Yson*

Activity II:

Label each picture as either conduction, convection and radiation and describe how the picture shows each type of heat transfer.

The man and his dog are enjoying the warmth from the fireplace.	The man tries to move the coals using a metal pole.	The man turns on the fan to regulate the temperature.
		
Type of Heat Transfer:	Type of Heat Transfer:	Type of Heat Transfer:
Description:	Description:	Description:

What is It

When energy is transformed, such as thermal energy, heat is always produced. Heat is an energy that is transferred from one object to another due to the difference in their temperature. It is simply called as energy in transit. Heat naturally transfers from a high temperature object to a low temperature object. Heat transfer stops when both objects are of the same temperature. Heat can be transferred in three ways: through conduction, convection and radiation.

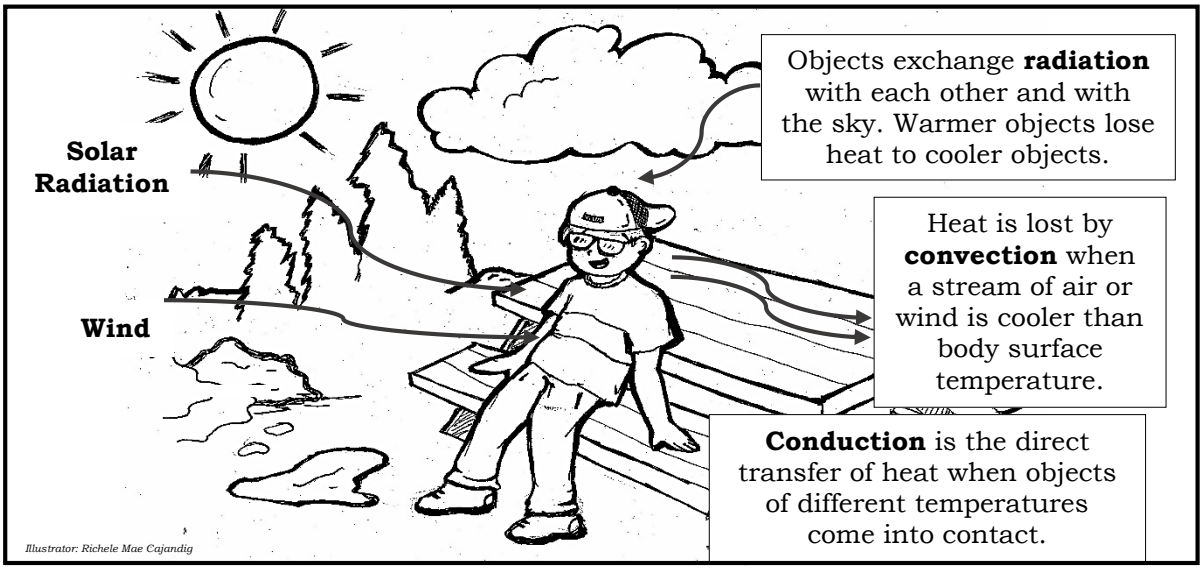
Conduction takes place between objects that are in contact with each other. The energy is transferred through particles that are in contact with each other. Particles that are in contact with the higher temperature object tend to vibrate faster therefore transferring the energy to the adjacent particles

Convection is a heat transfer between fluids as liquids and gases of different temperature which involves mass movement of the fluids. Particles receiving the energy tend to move faster thus it spreads out and becomes less dense. Hot fluids are less dense and it rises.

Radiation is ~~a~~ heat transfer in the absence of matter or through space via electromagnetic waves. Objects with dark surfaces absorb~~ed~~ more heat than objects with bright surfaces. Particles can absorb radiation gaining heat energy.

Heat transfer continues until the two objects have reached thermal equilibrium where the objects have the same temperature. The discussion of heat transfer has been structured around some everyday examples such as the cooling of a hot mug of coffee and the warming of a cold can of pop.

Heat transfer is evident everywhere around us. The illustration depicts several situations that involve heat transfer.



How energy moves through the atmosphere

Conduction, radiation and convection all play a role in moving heat between Earth's surface and the atmosphere.

Energy can travel as electromagnetic waves through air or empty space. The Sun's energy travels through space by radiation. After sunlight heats the planet's surface, some heat radiates back into the atmosphere. Most energy transfer by conduction occurs near the Earth's surface. Conduction directly affects air temperature only a few centimeters into the atmosphere. During the day, sunlight heats the ground, which in turn heats the air directly above it via conduction. At night, the ground cools and the heat flows from the warmer air directly above the surface to the cooler ground via conduction. Convection happens in a liquid or a gas. Air near the ground is warmed by heat radiating from Earth's surface. The warm air is less dense, so it rises. As it rises, it cools. The cool air is dense, so it sinks to the surface. Convection is the most important way that heat travels in the atmosphere.

How Heat is Transferred in Cooking

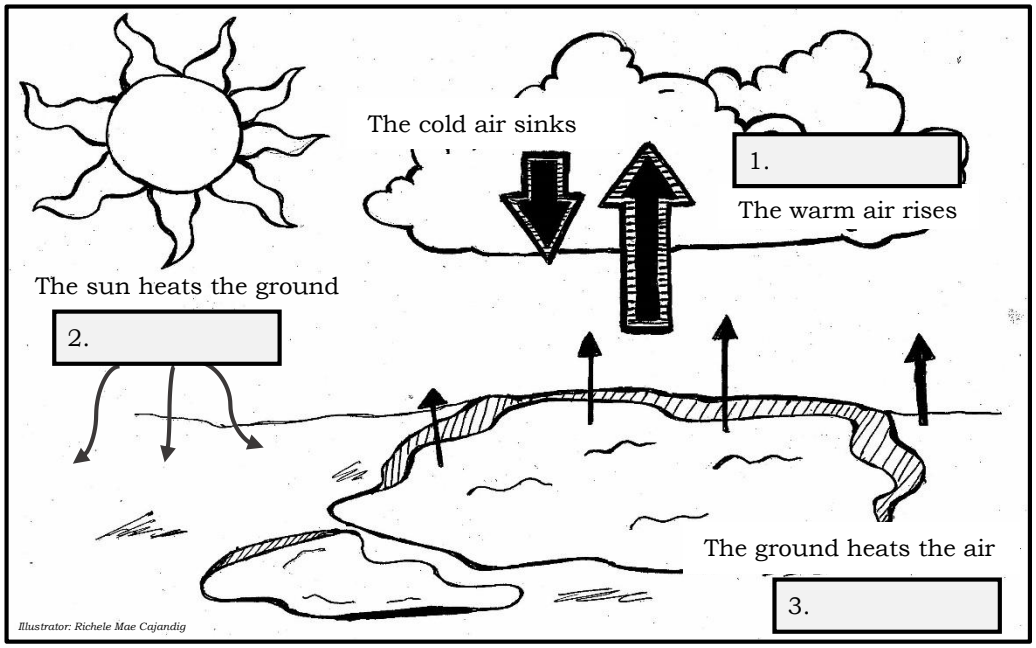
Cooking of food makes use of the different methods of heat transfer. **Conduction** is heat transfer through direct contact. When cooking on the stovetop, the heat from the flame or electric grill is applied directly to the frying pan. This means that only the flat surface of the pan is sufficiently hot enough to cook anything and we must flip and toss around the food to cook it properly. It is important to note that most pans are made of metals, like copper, that conduct heat very efficiently and do not melt on the stove top. **Convection** is heat transfer through a fluid. The fluid can be liquid or gas and in the case of a convection oven, the fluid we care about is air. An oven is a confined area that gets hot by flames or electric coils. The air inside is warmed to a desired temperature and, as a result, cooks the food from all directions. This method of heat transfer is responsible for cooking pizzas, cakes, and

other baked treats. **Radiation** is the transfer of heat using electromagnetic radiation. A microwave oven uses microwaves, a form of electromagnetic radiation with long wavelength and low frequency and energy. Microwave ovens work by causing water molecules inside the food to vibrate. This causes friction, which produces heats that cooks the food.

What's More

Directions: What type of heat transfer takes place? Write your answer on a separate sheet of paper.

Energy is transferred between the earth's surface and the atmosphere.



What I Have Learned

Directions: Read, understand, and answer the question carefully. Write your answer on a separate sheet of paper.

Conduction:

This is the movement of heat from hotter parts to cooler parts from one atom or particle to another particle without any movement of the substance itself.

1. What will happen when a metal rod is placed in a hot water?

Convection:

This is transfer of heat through the movement of fluid (liquid or gas) from hotter to cooler parts.

2. Draw a diagram to show the movement of particles when water was heated. Use three arrows to represent your diagram.

Radiation:

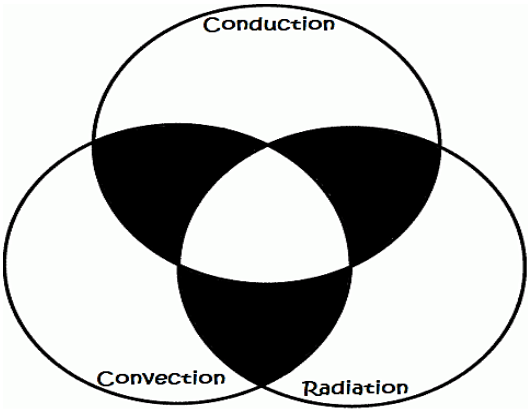
This is the transfer of heat by electromagnetic waves. This type of energy transfer travel through space without a medium.

3. Why do you feel the heat from a fire when you seat near it?
4. Why does an ice cream melts on a hot day?

Rubric				
Category	**4**	**3**	**2**	**1**
Accuracy & Content	All the answers are correct. Completely relates to and expands the ideas based on the lesson.	Most of the answers are correct. Related ideas cover what we have on the lesson.	Some of the answers are correct. Somewhat related ideas, but does not add to what we have on the lesson	None of the answers are correct. Ideas are not related to what we have on the lesson.
Spelling & Grammar	All spelling and grammar are correct.	Most of the words (and grammar) are spelled correctly. With 1-2 sentences grammatically incorrect	Some of the words are spelled correctly and 3 sentences are grammatically incorrect.	Spelling and grammar errors are frequent.

What I Can Do

Directions: In the Venn diagram write the words or phrases that best describes the types of heat transfer. In the center write the words or phrase that are common in three topics. Choose your answers from the box. Draw the Venn diagram and write your answer on a separate sheet of paper.



- Direct contact
- Liquid and gases move heat
- Energy waves
- Transfer heat
- No particles required
- Vibrate faster when heated
- Moves in cycle or circle

Rubric				
Category	**4**	**3**	**2**	**1**
Primary Source Content	Students exhibits mastery of the topics as evident by attention to detail.	Students illustrates a firmer understanding of most of the similarities and differences.	Students displays a limited understanding with some details pertinent to the subject matter.	Students show little or no understanding of topic.
Linking Content Together	Reflects all factual information that corresponds with appropriate section of diagram.	Most of the information is factual and seemingly corresponds with appropriate section of diagram.	Reflects some factual information and attempts to put it in corresponding section of diagram.	Contains nonfactual information that does not correspond to the appropriate section diagram.

Assessment

Directions: Read and understand the questions carefully. Write your answer on a separate sheet of paper.

1. What mode of heat transfer takes place due to the vibrating and colliding particle of objects that are in contact?
   A. Conduction
   B. Convection
   C. Heat
   D. Radiation

2. It is described as the hotness or coldness of a body.
   A. Heat
   B. Insulator
   C. Radiation
   D. Temperature

3. What mode of heat transfer does not need particles or a medium to take place?
   A. Conduction
   B. Convection
   C. Heat
   D. Radiation

4. What mode of heat transfer takes place in fluids because their particles can move around?
   A. Conduction
   B. Convection
   C. Heat
   D. Radiation
5. Which of the following is **not** an example of radiation?
   A. Sun's rays
   B. Heat from a fire
   C. Stir frying in a pan
   D. Baking in an oven
6. Blowing on your hands to warm them up during a cold weather is an example of which type of heat transfer?
   A. Condensation
   B. Conduction
   C. Convection
   D. Radiation

7. Which of the following is an example of convection?
   A. Heating water on the stove.
   B. Heat from a light bulb.
   C. Touching a stove and being burned.
   D. Ice cooling down your hand.

8. Which of the following is the case of heat transfer by radiation?
   A. Blast furnace
   B. Heating of building
   C. Cooling of parts in furnace
   D. Heat received by a person from fireplace

9. Earth's atmosphere is important to us because _____.
   A. it's primarily made from oxygen
   B. it's primarily made from carbon dioxide
   C. it protects Earth from the sun's harmful radiation
   D. it protects Earth from excess heat from the asthenosphere

10. A girl is stirring a hot cup of milk with a metal spoon with rubber handle. Which of the following explains why the girl is able to hold the handle of the spoon with her bare hands even when the cup of milk is hot?

I.	The handle is made of good insulator of heat.
II.	The handle is made of good conductor of heat.
III.	The handle has low thermal conductivity.

   A. II and III only
   B. I and III only
   C. I and II only
   D. I, II and III

11. Inside an air-conditioned room, metallic objects generally feel cooler to touch than wooden objects. Why is this so?
   A. Heat tends to flow from metal to wood
   B. Metal conducts heat better than wood
   C. Wood contains more heat than a metal of the same mass
   D. The human body resembles wood more closely than it resembles metal.

12. You're holding hands with your best friend. Your friend's hands are really warm and yours are really cold. After a few minutes, this has changed. How do you explain what happened?
   A. The energy from your friend's hand transferred to your hand through conduction.
   B. The energy from your hand transferred to your friends' hand through convection.
   C. The energy from your friend's hand transferred to your hand through convection.
   D. The energy from your hand transferred to your friends' hand through conduction.

13. On a summer morning, Johnny walks barefoot across his paved driveway with no problem. However, later that afternoon he steps barefoot onto the same driveway and must quickly run off because the bottoms of his feet feel like they are burning. Why is this so?
   A. As the temperature increased during the day, the particles in the pavement moved slower and the thermal energy increased.
   B. As the temperature increased during the day, the particles in the pavement moved slower and the thermal energy decreased.
   C. As the temperature increased during the day, the particles in the pavement moved faster and the thermal energy increased.
   D. As the temperature increased during the day, the particles in the pavement moved faster and the thermal energy decreased.

14. It is boring sitting in the house on your day off, so you go to the pool to meet with your friends. You jump in the water but it was too cold and you don't want to look like weak, so you try to get used to it. Your lips are turning blue and your skin now feels cold. Should you get out of the pool and warm yourself?
    A. No, because you friends will tease you.
    B. Yes, because it will make body look good.
    C. No, because it is not good to back out after deciding to spend time with your friends.
    D. Yes, because staying in the water for too long might affect to numbness and swelling of the skin.

15. You wake up on a Saturday morning and are glad since you don't have to go to school. You sit outside in the sun because you don't really feel like doing anything at all. The heat from the sun is starting to make you sweat. Is the heat transfer caused by radiation?
    A. Yes, because radiation is transfer of heat by means of rays.
    B. Yes, because radiation is transfer of heat by direct contact.
    C. No, because radiation is the transfer of heat by direct contact.
    D. No, because radiation is the transfer of heat through fluid and gases.

Additional Activities

Directions: Listed below are scrambled letters, arrange the letters to form the words related to heat transfer. Match column I with column II, write the letter of your answer on a separate sheet of paper.

Column I	**Column II**
1) NDCTOINUCO	A-It is the measure of hotness or coldness of an object.
2) OEIONTCVNC	B-Heat transfer between fluids as liquids and gases of different temperature.
3) RDTNAIAIO	
4) AEHT	C-It refers to the transfer of energy from hotter body to the colder.
5) TMPRTREEAUE	D-Heat transfer that takes place between objects that are in contact with each other.
	E-Heat transfer in the absence of medium or matter in contact.

Answer Key

Lesson 2
Assessment

1. A
2. A
3. D
4. B
5. C
6. C
7. A
8. D
9. C
10. B
11. B
12. A
13. C
14. D
15. A

Lesson 2
What I Know

1. B
2. A
3. D
4. A
5. B
6. A
7. A
8. A
9. C
10. D
11. B
12. C
13. C
14. C
15. D

Lesson 1
Assessment

1. A
2. D
3. C
4. C
5. B
6. D
7. D
8. B
9. A
10. B
11. C
12. C
13. A
14. A
15. A

Lesson 1
What I Know

1. A
2. A
3. A
4. A
5. D
6. D
7. C
8. D
9. A
10. A
11. C
12. C
13. B
14. C
15. A

References

Asuncion, A. J., Catalan, M. D., Catris, L. V., & Ferido, M. B. (2017). *Science 7 Learners Material.* Pasig City: Department of Education - Bureau of Learning Resources.

Nalda, N. F., Salvaleon, L. L., & Pabellon, J. L. (2004). *Science and Technology - Physics Textbook.* Pasig City: Vibal Publishing House.

Pabellon, J. L., Bentillo, E. N., Austria, A. B., Cervantes, V. V., & Bacay, V. (1992). *Science and Technology IV.* Quezon City: Book Media Press, Inc.

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