



Grade 7 - Quarter 3_Week 7

Name: _____ Grade & Section: _____
Teacher: _____ Score: _____

Activity Sheet No. 6: Infer the Conditions Necessary for Heat Transfer to Occur



START UP

At the end of this worksheet, the learners will be able to:

1. Infer the conditions necessary for heat transfer to occur.
2. Describe the effect of temperature difference in the rate of heat transfer
3. Apply and appreciate importance of heat transfer in our daily life

Many times, in our life we have experienced heat; you have observed its effects. But have you ever wondered what heat really is?

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. The water gets hot because heat from the burning stove is transferred to it.

This activity aims to reinforce your understanding of heat as an energy in transit from one object to another. You will determine the conditions necessary for heat to transfer and the direction by which the energy transfers by examining the changes in the temperature of the objects involved. You will learn the different methods of heat transfer and determine some factors that affect these methods.



CAPTURE

Key Concepts

- ✓ **Heat** is an energy in transit
- ✓ **Heat transfer** is a discipline of thermal engineering that concerns the generation, use, conversion and exchange of thermal energy (heat) between physical systems.
- ✓ Heat transfer is classified into various mechanisms, such as **thermal conduction**, **thermal convection**, **thermal radiation** and transfer of energy by phase changes.
- ✓ Heat transfer occurs between states of matter (solid, liquid, gas) whenever a **temperature difference** exists. Heat transfer occurs only in the direction of decreasing temperature, meaning from a hot object to a cold object or from higher temperature to a lower temperature.
- ✓ Objects with **high temperature give off heat** while objects with **low temperature receive heat**.



- ✓ Temperature difference between two objects is the driving force in heat exchange principle. **The greater the difference in temperature the greater the rate of heat transfer.**
- ✓ **Thermal Energy** and not heat is transferred during heat transfer.
- ✓ **Thermal Energy**-the energy that comes from the temperature of a heated substance.

Modes of Heat Transfer

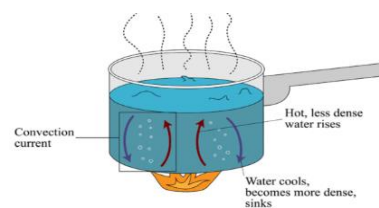
- **Conduction**- Conduction takes place between objects that are in contact with each other. The energy is transferred through particles that are close or in **direct contact** with each other.
 - The particles at a higher temperature are more energetic and thus vibrate faster than the particles at a lower temperature. When these particles collide, some of the energy from the more energetic particles are transferred to the less energetic particles, in the form of heat.
 - Heat transfer occurs not only in solids but also in fluids, but not all conduct heat equally. **Metals** are mostly good conductors of heat since they **absorbed heat faster**. Solid materials which do not absorb heat easily are good **insulators** such as **rubber and cloth**
 - **Example: heating a pan on a stove**- the heat from the burner transfers directly to the surface of the pan.



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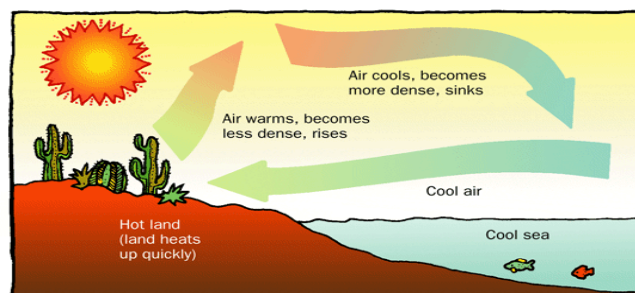
- **Convection**- movement of liquid or gases from a colder region to a warmer region, producing a current.

Example:1. Boiling water in a pot



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2. Convection in Nature



Formation of the wind

<https://geography-revision.co.uk/wp-content/uploads/2020/02/Convection.png>



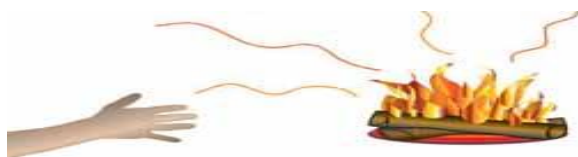
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- **Radiation-** Radiation is heat transfer in the form of electromagnetic waves that carry energy from one object to another. There is no physical medium needed for radiation to occur; it will even work in a vacuum. The most common example of radiation is **energy from the sun**.

- The **hotter an object** is, the **more infrared radiation it emits**.
- Heat transfer by radiation takes place between objects of different temperatures when the hotter object emits more energy than it absorbs from the cooler object and the cooler object receives more energy than it emits.
- Objects with dark surfaces absorbed more heat than objects with bright surfaces



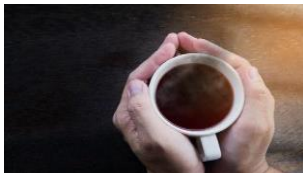


Example: getting warm from the furnace

<https://etorgerson.files.wordpress.com/2010/12/radiation.jpg>

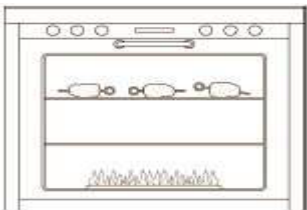



INTEGRATE

- A. Directions:** Give the modes of heat transfer in each situation and explain how is heat transferred in these processes.

| Situation | Modes of heat transfer | Explanation |
|--|------------------------|-------------|
|  https://image.freepik.com/free-photo/top-view-man-hands-holding-hot-coffee-mug_1150-6415.jpg a. Holding a cup of coffee | | |
|  https://o.quizlet.com/i/aPyxgAOE4C6EPTTP-iMxcQ.jpg b. Getting tan under the sun | | |
|  https://o.quizlet.com/1oZGV-avtkXkS5eCY3q6rw.jpg c. Rising and falling of macaroni in a pot | | |



| | | |
|--|--|--|
|  <p>d. Gas flame at the bottom of the oven to the potatoes at the top of the oven</p> | | |
|  <p>https://2.bp.blogspot.com/-wBPB9ekNFEo/ToIAPtmx8sI/AAAAAAAAAcI/T9ghaWlUMMA/s1600/thepinoywarrior+lechon+3.jpg</p> <p>e. Roasting pig (lechon)</p> | | |

B. Give situations in your home or in your community that show modes of heat transfer. Complete the table below.

| | Observe things | Which objects gives off heat? | Which objects receives heat? | What is the method of heat transfer? |
|---|-----------------------|--------------------------------------|-------------------------------------|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |



ENRICH

Written Work # 4

Directions: Read the questions carefully, choose the letter of the **BEST** answer. Write your answer on the blank provided before each number.

For items 1-5: The illustration on the right shows a man and a woman making noodle soup using a pan made of metal. Use this illustration to answer the questions below.



- How does the heat travel through the pan?
A. Radiation C. Convection
B. Dispersion D. Conduction
- How does heat travel through the soup?
A. Radiation B. Dispersion C. Conduction D. Convection
- In what direction does the heat travel through the soup?
A. From top to bottom
B. From bottom to top
C. Both A and B
D. Neither A nor B
- Which of the following explains why the lady is able to hold the handle of the pan with her bare hands?

- | |
|--|
| <ol style="list-style-type: none">The handle is made of a good insulator of heat.The handle has low thermal energy.The handle has high thermal energy. |
|--|

- | | |
|-------------------|--------------------|
| A. I and II only | C. II and III only |
| B. I and III only | D. I, II and III |
- Which of the following methods of heat transfer is **NOT** taking place in the given situation?
A. Conduction C. Radiation
B. Convection D. none of them
 - In what phase of matter do heat transfer during the convection process?
A. Only in gases C. only in solids
B. Only in liquids D. in gases and liquids
 - How does energy flow when you touch a piece of ice with your finger?
A. Energy flows from your finger to the ice
B. Energy flows from the ice to the finger
C. Energy flows in both ways.
D. Energy does not flow
 - What do you call the transfer of thermal energy from one material to another by electromagnetic radiation?
A. Conduction C. Convection
B. Radiation D. Refraction



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9. How does heat transfer from one object to another?
- A. from colder to warmer objects C. from warmer to colder objects
B. from bigger to smaller objects D. from smaller to bigger objects
10. Why are plastics, rubber, and wood used as handles of some kitchen utensils?
- A. They are used as handles of some kitchen utensils because they are insulators.
B. They are used as handles of some kitchen utensils because they are conductors.
C. They are used as handles of some kitchen utensils because they are radiators.
D. They are used as handles of some kitchen utensils because they are transformers.
11. What causes rising warm air which contributes to our weather?
- A. Conduction C. Convection
B. Radiation D. all of the above
12. How does heat transfer occur through convection?
- A. Through the movement of solid
B. By the movement of light particles from hot region to a cooler region
C. Warm liquid rises and replaced by cooler liquid which will be heated in return
D. By having close contact of particles that transfers heat energy
13. What do you call the moving particles of matter?
- A. Thermal energy C. Mechanical energy
B. Electrical energy D. Thermal energy
14. You like to play outside during summer day, which shirt would you wear in order to stay cool while playing?
- A. A black shirt because it reflects the sun's energy
B. A black shirt because it absorbed the sun's energy
C. A white shirt because it reflects the sun's energy
D. A white shirt because it absorbs the sun's energy
15. Why do you think metals like aluminum and copper are used in making pots?
- A. Metals are good conductors of heat
B. Metals are good insulators
C. Metals are good conductors of heat as well as good insulators
D. None of the above

References:

Science 7 Learner Material

<https://ecclesfield-school.com/download/165/bef343cb055554105b05e04a835f8668>