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Program Support Notes

Junior - **M**iddle **H**igh

23mins

Methods of Heat Transfer

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For Teachers:

Introduction

This program is aimed at years 8 to 10, but would be also useful for any senior students who meet the concepts of heat, heat flow and temperature in biology, chemistry or physics.
The program looks at the concept of heat energy and its properties. How different types of energy can be converted is outlined. There are many examples of how heat is used in every day life and the kinetic theory is used to help understand the movement of heat energy. Conduction, convection and radiation heat are discussed and illustrated in depth. The important concept of heat capacity is investigated. The differences between heat, energy and temperature are clearly explained.

One sequence that could be used is:

- check what students know before they view the program,
- alert them to key words/terms
- watch program, making notes on key terms
- discuss what is seen
- give out questions
- answer as many questions as possible
- watch program again, filling in missing answers/correcting
- go over student responses, correcting and filling in missed items.

Program Timeline

00:00:00 Introduction
00:01:55 Chapter 1 – Heat energy, and temperature
00:06:53 Summary – Heat energy, and temperature
00:07:19 Chapter 2 – Conduction
00:11:53 Summary – Conduction
00:12:00 Chapter 3 – Convection
00:14:41 Chapter 4 – Radiation
00:19:04 Chapter 5 – Specific heat
00:21:25 Conclusion
00:22:16 Credits
00:23:10 End program

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Student Worksheet:

Before Viewing the Program

Spend a few moments thinking about your knowledge of heat and temperature. Then answer the following questions

1. What is referred to when we use the term “thermal”?

   _____

2. Give three uses of heat

   _____

   _____

   _____

3. Give a definition for energy.

   _____

4. Name three types of energy.

   _____

   _____

   _____

5. Name the scale we use to measure temperature

   _____

While Viewing the Program

Have a pen/pencil and paper ready. Consider the following terms.
Energy, work, potential, kinetic, gravitational, infrared, joules, thermometer, Celsius, Kelvin, conduction, convection, radiation, insulator, circulation, absorb, emit, reflect, vacuum, capacity.
As the program plays, as these terms occur, jot down a quick thought about them.

1. Energy

2. Work

3. Potential

4. Kinetic

5. Gravitational

6. Infrared

7. Joules

8. Thermometer

9. Celsius

10. Kelvin

11. Conduction

12. Convection

13. Insulator

14. Circulation

_____

15. Absorb

_____

16. Emit

_____

17. Reflect

_____

18. Vacuum

_____

19. Capacity

_____

After Viewing the Program

1. After the program has been viewed, fill in the missing words in the following sentences. Choose from the list.
   absorb, conduction, convection, energy, fuel, heating, infrared, insulator, joule, kinetic, lowest, metals, radiation, temperature, *thermal*

   a) Many common domestic appliances are used for _____ and cooling.

   b) Burning _____ can be used to generate heat and power engines.

   c) Heat is a form of_____

   d) Moving energy is also known as _____ energy

   e) Heat is transferred between two objects when they have a difference in _____

   f) We use thermometers to measure _____

   g) The _____ possible temperature ("absolute zero") is -273.15^{o}C.

   h) The unit of energy is the _____

   i) Heat can be transferred by _____ , convection and radiation.

   j) _____ tend to be good conductors of heat.

   k) A substance that doesn't conduct heat well is an_____

   l) Heat travels in fluids mainly by _____

   m) Heat can travel through a vacuum by_____

   n) _____ .radiation is a form of heat energy.

   o) Black surfaces _____ heat well.

   p) _____ capacity refers to how much heat is needed to raise the temperature of a substance.

2. Decide whether the following statements are True or False. Circle the correct answer.

   a) Power stations use heat to generate electricity.

      TRUE or **FALSE**

   b) Heat, energy and temperature are all different names for the same thing.

      TRUE or **FALSE**

   c) Potential energy is stored energy.

      TRUE or **FALSE**

d) Energy cannot be changed into different forms.

TRUE or **FALSE**

e) Heat travels from warmer to colder places.

TRUE or **FALSE**

f) Conduction of heat only occurs in liquids.

TRUE or **FALSE**

g) When an object is heated, the particles present move more slowly.

TRUE or **FALSE**

h) All materials conduct heat as well as each other.

TRUE or **FALSE**

i) Materials containing air are usually good insulators.

TRUE or **FALSE**

j) Convection occurs in fluids due to movement of these fluids.

TRUE or **FALSE**

k) The Sun is a major source of infrared radiation.

TRUE or **FALSE**

l) Silver and shiny surface are good absorbers of heat radiation.

TRUE or **FALSE**

m) Heat transfer occurs only with solids.

TRUE or **FALSE**

n) Heat can occur as a result of physical and chemical changes.

TRUE or **FALSE**

o) Infrared rays travel at the speed of light.

TRUE or **FALSE**

p) Only objects that feel warm to the touch have heat energy.

TRUE or **FALSE**

Suggested Student Responses:

Before the Program

1 What is referred to when we use the term “thermal”?
To do with heat.

2 Give three uses of heat
Cooking, keeping us warm, hot drinks, welding etc.

3 Give definition for energy.
Ability to cause change or make things happen.

4 Name three types of energy.
Heat, kinetic, potential, light etc.

5 Name the scale we use to measure temperature.
Degrees Celsius

Suggested Student Responses

After Viewing the Program

1. After the program has been viewed, fill in the missing words in the following sentences. Choose from the list.
   absorb, conduction, convection, difference, energy, fuel, heating, Infrared, insulator. joule, kinetic, lowest, metals, radiation, temperature, *thermal*

   a) Many common domestic appliances are used for **heating** and cooling

   b) Burning **fuel** can be used to generate heat and power engines.

   c) Heat is a form of **energy**

   d) Moving energy is also known as **kineti***c* energy

   e) Heat is transferred between two objects when they have a difference in **difference**

   f) We use thermometers to measure **temperature**

   g) The **lowest** possible temperature ("absolute zero") is -273.15^{o}C.

   h) The unit of energy is the **Joule**

   i) Heat can be transferred by **conduction**, convection and radiation.

   j) **Metals** tend to be good conductors of heat.

   k) A substance that doesn't conduct heat well is an **insulator**

   l) Heat travels in fluids mainly by **convection**

   m) Heat can travel through a vacuum by **radiation**

   n) **Infrared** radiation is a form of heat energy.

   o) Black surfaces **absorb** heat well.

   p) **Thermal**. capacity refers to how much heat is needed to raise the temperature of a substance.

2. Decide whether the following statements are True or False.

   a) Power stations use heat to generate electricity.
   True

   b) Heat, energy and temperature are all different names for the same thing.
   False

   c) Potential energy is stored energy.
   True

   d) Energy cannot be changed into different forms.
   False

   e) Heat travels from warmer to colder places.
   True

   f) Conduction of heat only occurs in liquids.
   False

   g) When an object is heated, the particles present move more slowly.
   False

   h) All materials conduct heat as well as each other.
   False

   i) Materials containing air are usually good insulators.
   True

   j) Convection occurs in fluids due to movement of these fluids.
   True

   k) The Sun is a major source of infrared radiation.
   True

   l) Silver and shiny surface are good absorbers of heat radiation.
   False

   m) Heat transfer occurs only with solids.
   False

   n) Heat can occur as a result of physical and chemical changes.
   True

   o) Infrared rays travel at the speed of light.
   True

   p) Only objects that feel warm to the touch have heat energy.
   False