Radiation Investigation

Do some materials absorb radiation better than others? Black sand and white sand will be exposed to the same amount of radiation and the increase in temperature of each will be measured.

Materials:

Black sand (45 ml)
White sand (45 ml)
2 beakers
Clock with a second hand
Heat lamp
2 Celsius thermometers

Procedure:

1. Use a spoon to scoop 45 ml of the **black** sand from it's container into a graduated cylinder. Gently shake or tap the cylinder with your finger to level the sand for a more accurate measurement. **DO NOT TAP THE CYLINDER ON A HARD SURFACE!**

2. Pour the sand into a beaker. Gently tap the beaker to level the sand.

3. Use a spoon to scoop 45 ml of the **White** sand from it's container into a graduated cylinder. Gently shake or tap the cylinder with your finger to level the sand for a more accurate measurement. **DO NOT TAP THE CYLINDER ON A HARD SURFACE!**

4. Pour the sand into a beaker. Gently tap the beaker to level the sand.

5. Place the two beakers on a paper plate close together, but not touching.

6. Gently place a thermometer in each beaker. **BE CAREFUL NOT TO BREAK IT!** Measure the initial temperature of the sand in each beaker. Record these values on your data sheet.

6. Place the beakers under the lamp. Turn the lamp on and note the time.

7. Measure the temperature of each sand every minute for 9 minutes. Record the values on your data sheet.

8. Turn off the lamp.

9. Carefully remove the thermometers. Clean your work area.

10. Pour the sand back into the correct container.

11. Answer the questions on your data sheet.

Station 4: Radiation

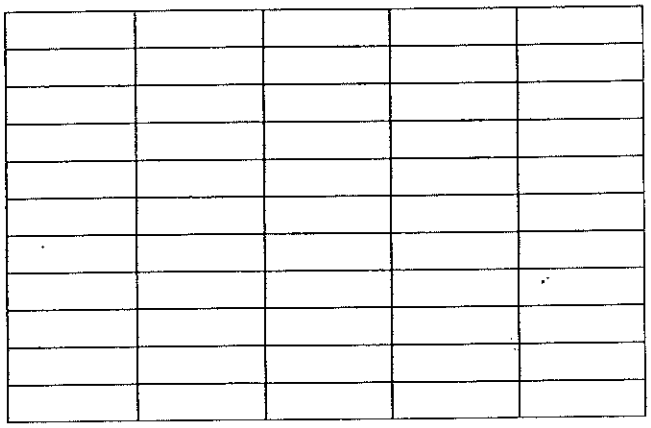
Data Table 4

Time (minutes)	Temperature (°C)	
	Black Sand	White Sand
0		
1		
2		
3		
4		
Total change in temperature		

Time (minutes)	Temperature (°C)	
	Black Sand	White Sand
5		
6		
7		
8		
9		

Graphing the Data

Plot the time and temperature data for each substance on the following graph. Each temperature recorded will be represented by one point. Use different shape data points or a different color pencil for each substance. Use the horizontal (x) axis for the time and the vertical (y) axis for the temperature. Label each axis, including units and make sure the scale is clearly marked. Draw a "best-fit" line that includes, or comes close to, as many data points as possible for each substance.



18. Calculate the total change in temperature over time by subtracting the final temperature (9 minutes) from the initial temperature (0 minutes). Record the values in Data Table 4.
19. How did the temperature in each substance vary over time? Explain the variation.
20. Explain how you can infer that the sand was heated by radiation and not by conduction or convection.
21. On a sunny summer day what color shirt—black or white—might be cooler? Why?