

Thermal Energy

Use the resources found on Mr. Hanna’s website to help you respond to the following items.

VOCABULARY:

- 1) TEMPERATURE
- 2) THERMAL ENERGY
- 3) HEAT
- 4) CONDUCTION
- 5) CONDUCTOR
- 6) INSULATOR
- 7) CONVECTION
- 8) RADIATION

SHORT ANSWER:

- 9) Explain the relationship between “thermal energy,” “temperature,” and “heat.”

- 10) Compare the three common temperature scales in the table below.

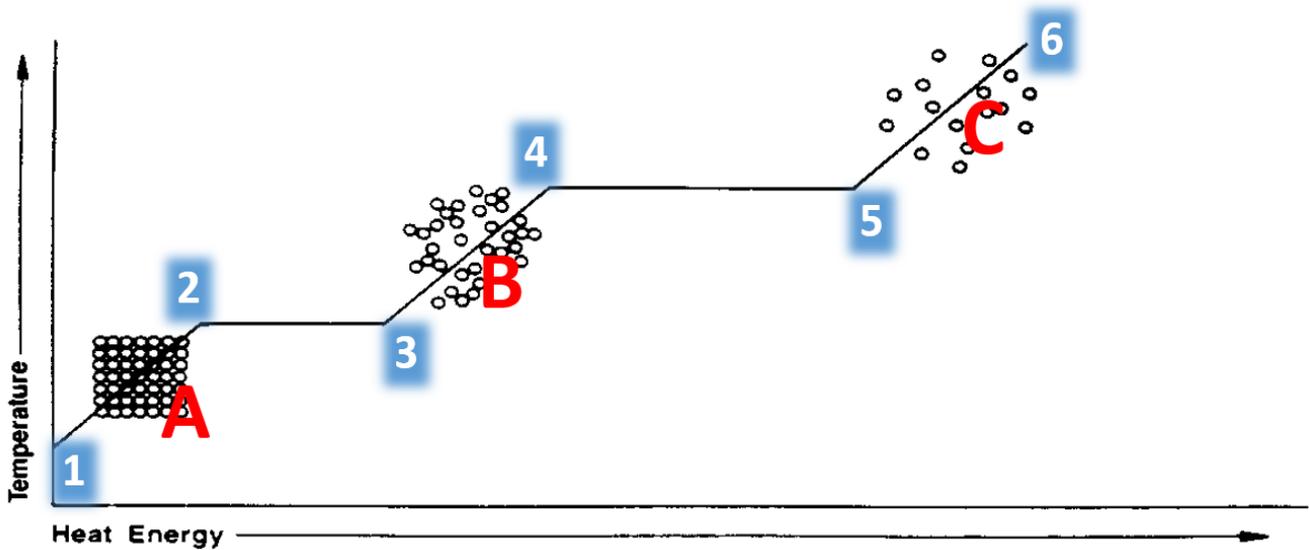
| Temp. Scale | <u>FAHRENHEIT</u> | <u>CELSIUS</u> | <u>KELVIN</u> |
|--------------------------------|--------------------------|-----------------------|----------------------|
| Metric System? (Y or N) | | | |
| Freezing Point of Water | | | |
| Boiling Point of Water | | | |

- 11) How does the kinetic energy of the molecules in a substance relate to the temperature/phases?

- 12) Describe possible effects of adding thermal energy to a substance (*or removing it from the substance*)?

- 13) How is the energy required to raise the temperature of a substance related to the specific heat of the substance?
- 14) The specific heat of water is $4.18 \text{ J/g}^\circ\text{C}$. If you are heating 500g of water from a temperature of 20°C to a temperature of 100°C , how many Joules of thermal energy will be required? (*show your work*)
- 15) Compare the three types of heat, convection, conduction, and radiation (*how they are similar/different*).
- 16) Differentiate conductors and insulators (*how they are different*). (*note – your answer should address density*)
- 17) What causes a convection current? (*note – your answer should address density*)
- 18) What evidence do we have that radiation can transfer thermal energy through empty space?
- 19) If I hand you a can of soda that I got from the refrigerator, explain why your hand would feel cold when you touch the can.
- 20) Explain the expression, "There's no such thing as cold."

INTERPRETING A GRAPH: Use the phase change graph below to answer the following questions.



21) Label the state of matter present at each position below:

- A)
- B)
- C)

22) What is happening to the substance during each interval below?

- A) Between positions 1 and 2 –
- B) Between positions 2 and 3 –
- C) Between positions 3 and 4 –
- D) Between positions 4 and 5 –
- E) Between positions 5 and 6 –

23) Is thermal energy being added to this substance or removed from this substance between positions 1 and 6?
What evidence do you have?

24) Which positions on this graph would you use the equation " $Q=mc\Delta T$ " to determine how much thermal energy transfer is required?

25) Which positions on this graph would you use the equations " $Q=mL_f$ " or " $Q=mL_v$ " to determine how much thermal energy transfer is required?