Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_ Date: \_\_\_\_\_\_

**Determining Specific Heats of Selected Materials**

**1. Write the formula for specific heat capacity, showing the units for each part.**

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| 2. The specific heat capacity of copper is 390 J/kg·C. What does this mean?  | 3. Calculate the energy transferred when 3 kg of copper is heated from 20°C to 220°C. |
| 4. Calculate this energy needed to heat 2 kg of water from 10°C to 90°C. The Specific heat capacity of water is 4200 J/kg· C.  |

**5. Complete the table by calculating the missing values.**

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| **Materials** | **Energy Transfer** | **Mass** | **Temperature Rise** | **Specific Heat Capacity** |
| A |  | 4 kg | 6°C | 4000 J/kg·C |
| B | 6,000 J | 1 kg |  | 2000 J/kg·C |
| C | 9,000 J |  | 4°C | 1000 J/kg·C |
| D |  | 12 kg | 24°C | 500 J/kg·C |
| E | 2,500 J | 2 kg | 5°C |  |

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| Answer questions 6-9 using the data table below. **Here are the specific heat capacity of four different metals.**

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| Metals | Specific Heat Capacity |
| Aluminum | 910 J/kg·C |
| Brass | 380 J/kg·C |
| Copper | 390 J/kg·C |
| Iron | 460 J/kg·C |

 | 6. How much energy must be transferred into 1 kg of copper to raise its temperature by 1°C. |
| 7. Suppose you have 1 kg of each metal. Which one will need the most energy to raise its temperature by 1 °C.  |
| 8. The same amount of energy is transferred into 1 kg of each metal. Which one has the largest temperature rise? |
| 9. How much energy must be transferred into 2 kg of iron to raise its temperature by 5 °C.  |

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| Use the Data Table below to answer the following questions.

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| Specific Heats of Selected Materials |
| Materials | **C (J/kg · K)** |
| Substance A  | 897 |
| Substance B  | 850 |
| Substance C  | 509 |
| Substance D  | 840 |
| Substance E  | 5193 |
| Substance F | 4181 |

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| 10. Which substance would release thermal energy the slowest?  | 11. Which substance would release thermal energy the quickest? |
| B. Is this substance a conductor or an insulator? | B. Is this substance a conductor or an insulator? |
| C. Which of the following materials is most likely the unknown substance from Question 10? *Circle one*Water Diamond Aluminum Helium Concrete | C. Which of the following materials is most likely the unknown substance from Question 11? *Circle one*Water Diamond Aluminum Helium Concrete |
| 12. Using the data table above, rank the substances from those that change temperatures the quickest to those that do not.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  |
| 13. Using the data table above, rank the substances from those with the highest specific heat to lowest specific heat.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  |

**Use the following 3 images to answer the questions.**



 **\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_**

14. In the lines above, label each image as being a solid, liquid or gas.

15. What image above shows molecules moving the slowest? \_\_\_\_\_\_ Why are they moving so slow?

16. What image would contain the highest amount of thermal energy?

17. If you wanted to change a substance from A to B, what would need to happen? What is this process called?

18. If you wanted to change a substance from C directly to A, what would need to happen? What is this process called?

19. What is happening to the thermal energy as you move from A to B to C? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Is this Endothermic or Exothermic

20. What is happening to the temperature as you move from A to B to C? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Is this Endothermic or Exothermic

 **Reading a phase change graph:**

21. During what time interval(s) is the thermal energy of the water increasing?

22. At what intervals is the temperature increasing?

23. What intervals show a phase change?

24. What happens from the 18th minute to the end of the data collection?

25. What state of matter is the water between interval A and B?

26. At what degree is the water melting? \_\_\_\_\_\_\_\_\_\_ At what degree is the water boiling? \_\_\_\_\_\_\_

27. What happens from the 4th minute to the 10th minute?

28. Is this graph showing an endothermic or exothermic reaction? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| 29. Is this graph showing an endothermic or exothermic reaction? \_\_\_\_\_\_\_\_\_\_\_30. Is heat being added or removed from this substance? \_\_\_\_\_\_\_\_\_\_\_\_\_\_31. What segment represents the point during which the gas is turning into a liquid? \_\_\_\_\_\_\_\_\_\_32. Which segment represents the point during which the liquid is turning into a solid? \_\_\_\_\_\_\_\_\_\_33. What process is occurring between minutes 1 and 3? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_34. What state of matter is the substance in at the end of segment b? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_35. What process is occurring between minutes 6 and 8? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_36. What state of matter is the substance in letter e? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  |