HEAT FORMULA

Name _____

Part A: Introducing the Heat Formula

$$Q = mC\Delta T \quad \text{or} \quad Q = mC(T_f - T_i)$$

Symbol	Quantity	SI Unit
Q	Heat energy transferred	Joules (J)
m	mass	kilograms (kg)
C	Specific Heat of substance	$\frac{J}{kg\ ℃}$
ΔT	Change in temperature	Kelvin (K) or Degrees Celsius (℃)
T_f	Final Temperature	K or ℃
T_i	Initial Temperature	K or ℃

Material	Specific Heat $\left(\frac{J}{kg\ ℃}\right)$
water	4,184
oil	1900
wood	1800
aluminum	900
concrete	880
glass	800
steel	470
silver	235
gold	129

A.1. I have 2 kg of *water*. I heat it from 20℃ to 30℃.
How much heat energy does the water absorb?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

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A.2. How much heat energy does it take to heat a 0.5 kg aluminum can from 20℃ to 200℃ ?

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

A.3. How much energy does it take to heat 0.5 kg water from its melting point (0℃) to its boiling point (100℃)?

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

A.4. How much energy does it take to heat 2000 kg of steel from 20℃ to 800℃ ?

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

A.5. How much energy does it take to heat 3 kg of glass up by 4 degrees?

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

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A.6. How much energy does it take to heat a 0.05 kg silver ring up by 40 degrees?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

A.7. How much energy do I need to remove to *cool* 3 kg of water from 50℃ down to 37℃?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

8. A 0.5-kilogram piece of aluminum increases its temperature 7°C when heat energy is added. How much heat energy produced this change in temperature?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

9. A volume of water has a mass of 0.5 kilogram. If the temperature of this amount of water was raised by 7°C, how much heat energy is produced?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

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10. How much heat energy is required to raise the temperature of 1 kilogram of steel by 10°C?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

11. How much heat energy is needed to raise the temperature of 100-liters of water from 10°C to 25°C? Note: One liter of water has a mass of one kilogram.

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

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Part B: Solving the Heat Formula for other pieces

B.1 When 1,500 joules of energy is lost from a 1.277-kilogram object, the temperature decreases from 45°C to 40°C. What is the specific heat of this object? Of what material is the object made?

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

B.2 What is the specific heat of a material that gains 600 joules of energy when a 0.25-kilogram object increases in temperate by 3°C? What is this material?

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

B.3 A liquid with a specific heat of 1,900 J/kg·°C has 4,750 joules of heat energy is added to it. If the temperature increases from 20°C to 30°C, what is the mass of the liquid?

B.4 What is the mass of a block of concrete that gains 52,800 joules of energy when its temperature is increased by 5°C?

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

B.5 A scientist wants to raise the temperature of a 0.10-kilogram sample of glass from – 45°C to 15°C. How much heat energy is required to produce this change in temperature?

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Looking For	Formula
Already Know	
Answer as equation *with unit*:	

B.6 A 0.25-kilogram sample of aluminum is provided with 5,000 joules of heat energy. What will be the change in temperature of this sample of aluminum?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

B.7 What is the change in temperature for a 2-kilogram mass of water that loses 8,500 joules of energy?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

B.8 I have 0.8 kg of water with a temperature of 30°C. I add 10,000 Joules of energy to the water. What will be the final temperature?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	