

Name: _____

Collisions Username: _____

Class: _____

Phase Change Quest

Now that you have completed the Phase Change Challenges, you are ready to conduct this Phase Change Quest.

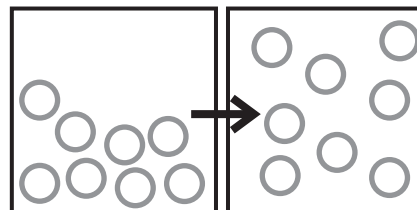
MISSION 1. GATHER YOUR INTEL

Use your Collisions gameplay experience to gather the following intel:

1. Label the particle used for this target.
2. Draw the particles in the initial phase and label the phase.
3. Draw the particles in the ending phase and label the phase.
4. List the temperature at phase change.

Sample Target

Particle: HCN



Initial Phase:

Ending Phase:

liquid

gas

26 °C
at phase change

MISSION 2. EXPOSE THE DETAILS

Use your expertise to expose the following information for each target phase change.

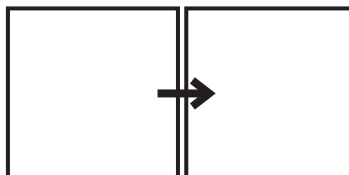
	Sample Target
Substance used	Hydrogen Cyanide
Phase Change(s) that occurred	Boiling
Exothermic or endothermic	Exothermic
$\Delta H > 0$ or $\Delta H < 0$	$\Delta H < 0$
Does entropy increase or decrease?	Increases
Type of IMF	Dipole-Dipole
Were these IMFs broken or formed?	Broken
Formula mass of substance	27.026 g/mol
100. g = _____ moles?	3.7 moles
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.	2627 kJ (liquid)

Phase Change - Challenge Level 1

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____



Initial Phase: _____

Ending Phase: _____

_____ °C
at phase change

MISSION 2. EXPOSE THE DETAILS

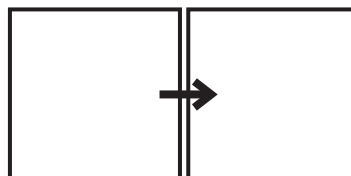
Target 1	
Substance used	
Phase Change(s) that occurred	
Exothermic or endothermic	
$\Delta H > 0$ or $\Delta H < 0$	
Does entropy increase or decrease?	
Type of IMF	
Were these IMFs broken or formed?	
Formula mass of substance	
100. g = _____ moles?	
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.	

Phase Change - Challenge Level 2

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____



Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

MISSION 2. EXPOSE THE DETAILS

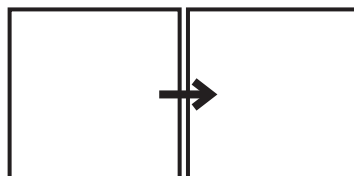
Target 1	
Substance used	
Phase Change(s) that occurred	
Exothermic or endothermic	
$\Delta H > 0$ or $\Delta H < 0$	
Does entropy increase or decrease?	
Type of IMF	
Were these IMFs broken or formed?	
Formula mass of substance	
100. g = _____ moles?	
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.	

Phase Change - Challenge Level 3

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

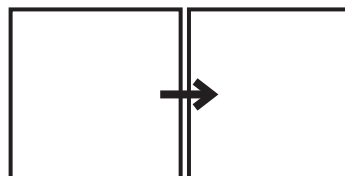


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 2

Particle: _____



Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

MISSION 2. EXPOSE THE DETAILS

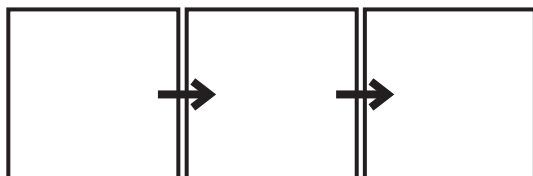
	Target 1	Target 2
Substance used		
Phase Change(s) that occurred		
Exothermic or endothermic		
$\Delta H > 0$ or $\Delta H < 0$		
Does entropy increase or decrease?		
Type of IMF		
Were these IMFs broken or formed?		
Formula mass of substance		
100. g = _____ moles?		
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.		

Phase Change - Challenge Level 4

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

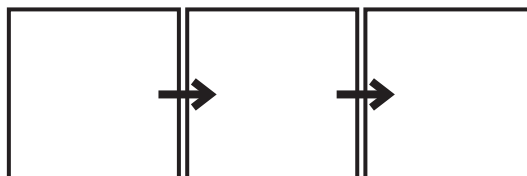


Initial Phase: Phase 2: Ending Phase:

_____ °C _____ °C
at phase change at phase change

Target 2

Particle: _____

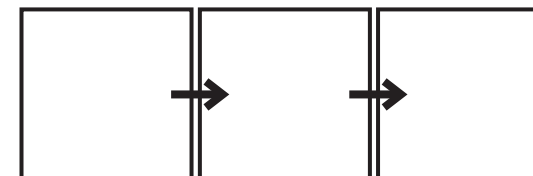


Initial Phase: Phase 2: Ending Phase:

_____ °C _____ °C
at phase change at phase change

Target 3

Particle: _____



Initial Phase: Phase 2: Ending Phase:

_____ °C _____ °C
at phase change at phase change

MISSION 2. EXPOSE THE DETAILS

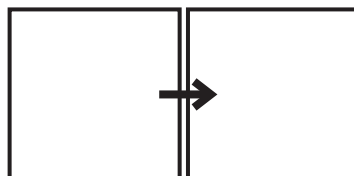
	Target 1	Target 2	Target 3
Substance used			
Phase Change(s) that occurred			
Exothermic or endothermic			
$\Delta H > 0$ or $\Delta H < 0$			
Does entropy increase or decrease?			
Type of IMF			
Were these IMFs broken or formed?			
Formula mass of substance			
100. g = _____ moles?			
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.			

Phase Change - Challenge Level 5

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

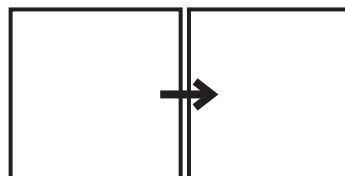


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 2

Particle: _____



Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

MISSION 2. EXPOSE THE DETAILS

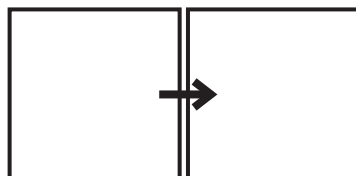
	Target 1	Target 2
Substance used		
Phase Change(s) that occurred		
Exothermic or endothermic		
$\Delta H > 0$ or $\Delta H < 0$		
Does entropy increase or decrease?		
Type of IMF		
Were these IMFs broken or formed?		
Formula mass of substance		
100. g = _____ moles?		
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.		

Phase Change - Challenge Level 6

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

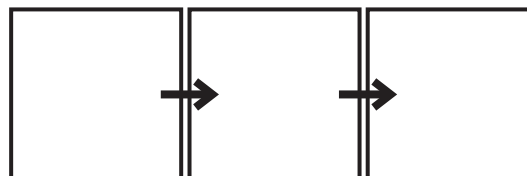


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 2

Particle: _____



Initial Phase: _____ Phase 2: _____ Ending Phase: _____

_____ °C
at phase change

_____ °C
at phase change

MISSION 2. EXPOSE THE DETAILS

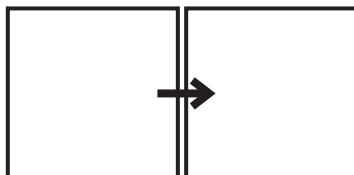
	Target 1	Target 2
Substance used		
Phase Change(s) that occurred		
Exothermic or endothermic		
$\Delta H > 0$ or $\Delta H < 0$		
Does entropy increase or decrease?		
Type of IMF		
Were these IMFs broken or formed?		
Formula mass of substance		
100. g = _____ moles?		
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.		

Phase Change - Challenge Level 7

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

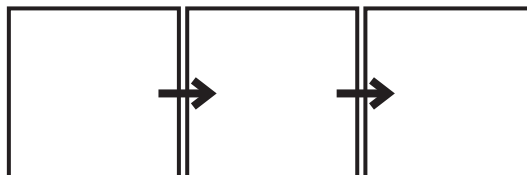


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 2

Particle: _____



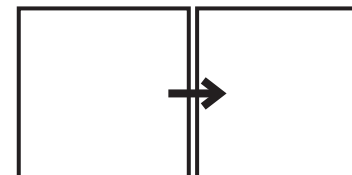
Initial Phase: _____ Phase 2: _____ Ending Phase: _____

_____ °C
at phase change

_____ °C
at phase change

Target 3

Particle: _____



Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

MISSION 2. EXPOSE THE DETAILS

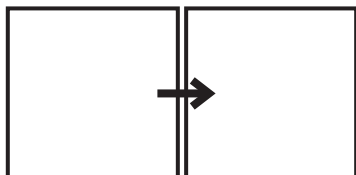
	Target 1	Target 2	Target 3
Substance used			
Phase Change(s) that occurred			
Exothermic or endothermic			
$\Delta H > 0$ or $\Delta H < 0$			
Does entropy increase or decrease?			
Type of IMF			
Were these IMFs broken or formed?			
Formula mass of substance			
100. g = _____ moles?			
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.			

Phase Change - Challenge Level 8

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

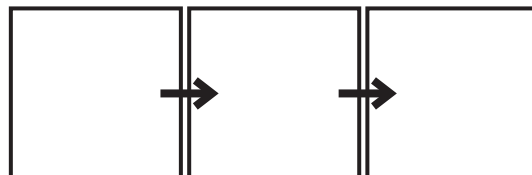


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 2

Particle: _____

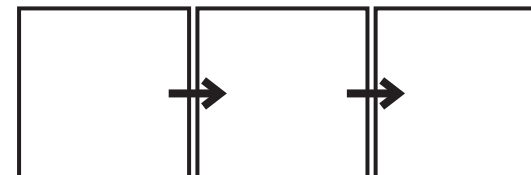


Initial Phase: _____ Phase 2: _____ Ending Phase: _____

_____ °C _____ °C
at phase change at phase change

Target 3

Particle: _____



Initial Phase: _____ Phase 2: _____ Ending Phase: _____

_____ °C _____ °C
at phase change at phase change

MISSION 2. EXPOSE THE DETAILS

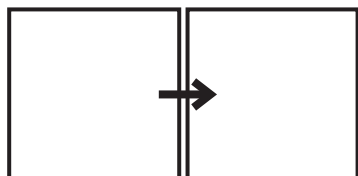
	Target 1	Target 2	Target 3
Substance used			
Phase Change(s) that occurred			
Exothermic or endothermic			
$\Delta H > 0$ or $\Delta H < 0$			
Does entropy increase or decrease?			
Type of IMF			
Were these IMFs broken or formed?			
Formula mass of substance			
100. g = _____ moles?			
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.			

Phase Change - Challenge Level 9

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

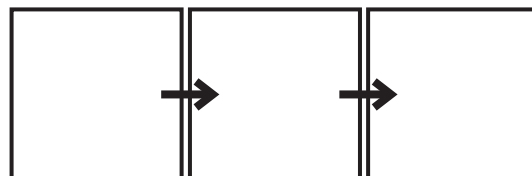


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 2

Particle: _____

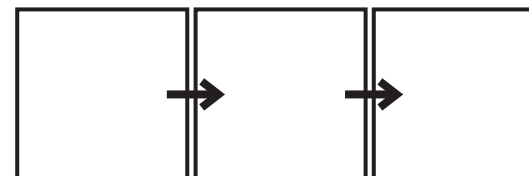


Initial Phase: _____ Phase 2: _____ Ending Phase: _____

_____ °C _____ °C
at phase change at phase change

Target 3

Particle: _____



Initial Phase: _____ Phase 2: _____ Ending Phase: _____

_____ °C _____ °C
at phase change at phase change

MISSION 2. EXPOSE THE DETAILS

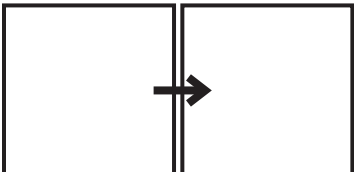
	Target 1	Target 2	Target 3
Substance used			
Phase Change(s) that occurred			
Exothermic or endothermic			
$\Delta H > 0$ or $\Delta H < 0$			
Does entropy increase or decrease?			
Type of IMF			
Were these IMFs broken or formed?			
Formula mass of substance			
100. g = _____ moles?			
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.			

Phase Change - Challenge Level 10

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

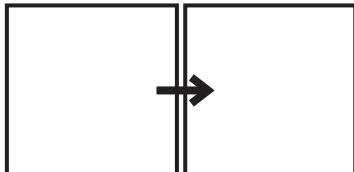


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 2

Particle: _____

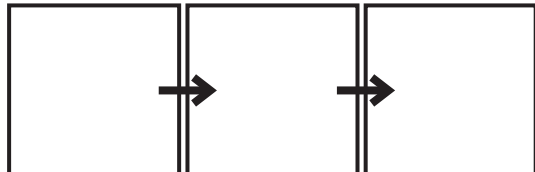


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 3

Particle: _____

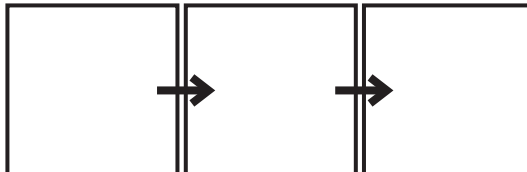


Initial Phase: _____ Phase 2: _____ Ending Phase: _____

_____ °C _____ °C
at phase change at phase change

Target 4

Particle: _____



Initial Phase: _____ Phase 2: _____ Ending Phase: _____

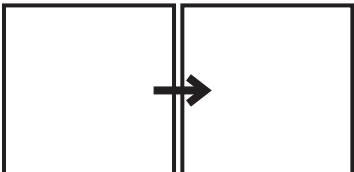
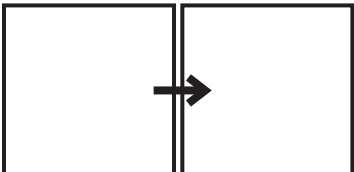
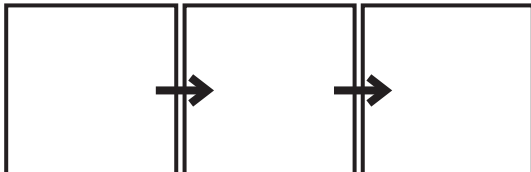
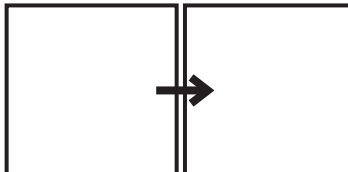
_____ °C _____ °C
at phase change at phase change

MISSION 2. EXPOSE THE DETAILS

	Target 1	Target 2	Target 3	Target 4
Substance used				
Phase Change(s) that occurred				
Exothermic or endothermic				
$\Delta H > 0$ or $\Delta H < 0$				
Does entropy increase or decrease?				
Type of IMF				
Were these IMFs broken or formed?				
Formula mass of substance				
100. g = _____ moles?				
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.				

Phase Change - Challenge Level 11

MISSION 1. GATHER YOUR INTEL

Target 1	Target 2	Target 3	Target 4
Particle: _____	Particle: _____	Particle: _____	Particle: _____
			
Initial Phase: _____ Ending Phase: _____	Initial Phase: _____ Ending Phase: _____	Initial Phase: _____ Phase 2: _____ Ending Phase: _____	Initial Phase: _____ Ending Phase: _____
_____ °C at phase change	_____ °C at phase change	_____ °C at phase change _____ °C at phase change	_____ °C at phase change

MISSION 2. EXPOSE THE DETAILS

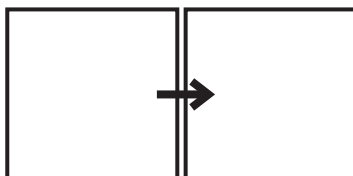
	Target 1	Target 2	Target 3	Target 4
Substance used				
Phase Change(s) that occurred				
Exothermic or endothermic				
$\Delta H > 0$ or $\Delta H < 0$				
Does entropy increase or decrease?				
Type of IMF				
Were these IMFs broken or formed?				
Formula mass of substance				
100. g = _____ moles?				
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.				

Phase Change - IMFs Connected Level 1

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

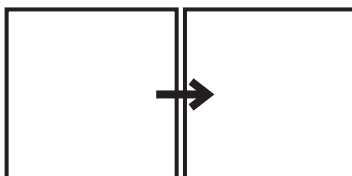


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 2

Particle: _____

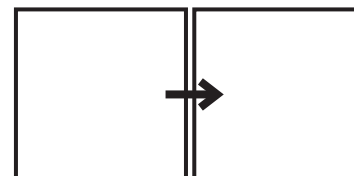


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 3

Particle: _____



Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

MISSION 2. EXPOSE THE DETAILS

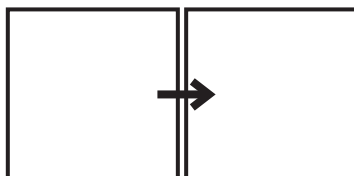
	Target 1	Target 2	Target 3
Substance used			
Phase Change(s) that occurred			
Exothermic or endothermic			
$\Delta H > 0$ or $\Delta H < 0$			
Does entropy increase or decrease?			
Type of IMF			
Were these IMFs broken or formed?			
Formula mass of substance			
100. g = _____ moles?			
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.			

Phase Change - IMFs Connected Level 2

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

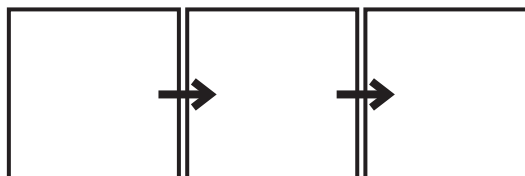


Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 2

Particle: _____



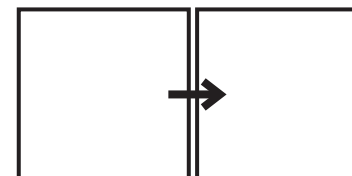
Initial Phase: _____ Phase 2: _____ Ending Phase: _____

_____ °C
at phase change

_____ °C
at phase change

Target 3

Particle: _____



Initial Phase: _____ Ending Phase: _____

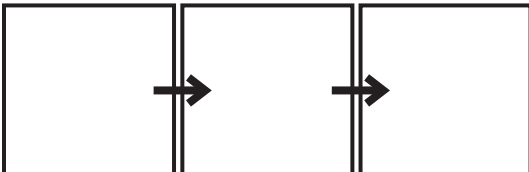
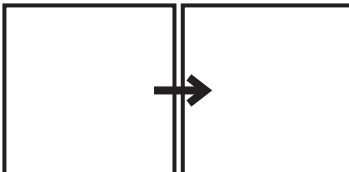
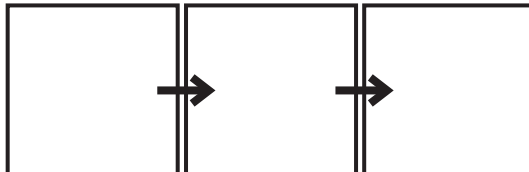
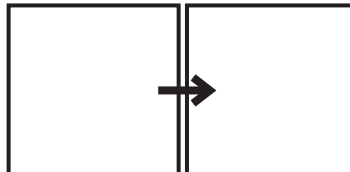
_____ °C
at phase change

MISSION 2. EXPOSE THE DETAILS

	Target 1	Target 2	Target 3
Substance used			
Phase Change(s) that occurred			
Exothermic or endothermic			
$\Delta H > 0$ or $\Delta H < 0$			
Does entropy increase or decrease?			
Type of IMF			
Were these IMFs broken or formed?			
Formula mass of substance			
100. g = _____ moles?			
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.			

Phase Change - IMFs Connected Level 3

MISSION 1. GATHER YOUR INTEL

Target 1	Target 2	Target 3	Target 4
Particle: _____	Particle: _____	Particle: _____	Particle: _____
			
_____ _____ °C at phase change	_____ _____ °C at phase change	_____ _____ °C at phase change	_____ _____ °C at phase change

MISSION 2. EXPOSE THE DETAILS

	Target 1	Target 2	Target 3	Target 4
Substance used				
Phase Change(s) that occurred				
Exothermic or endothermic				
$\Delta H > 0$ or $\Delta H < 0$				
Does entropy increase or decrease?				
Type of IMF				
Were these IMFs broken or formed?				
Formula mass of substance				
100. g = _____ moles?				
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.				

Phase Change - Ionic Bonding Connected Level 1

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

Initial Phase: Phase 2: Ending Phase:

_____ °C _____ °C

at phase change at phase change

Target 2

Particle: _____

Initial Phase: Ending Phase:

_____ °C

at phase change

MISSION 2. EXPOSE THE DETAILS

	Target 1	Target 2
Substance used		
Phase Change(s) that occurred		
Exothermic or endothermic		
$\Delta H > 0$ or $\Delta H < 0$		
Does entropy increase or decrease?		
Type of IMF		
Were these IMFs broken or formed?		
Formula mass of substance		
100. g = _____ moles?		
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.		

Phase Change - Ionic Bonding Connected Level 2

MISSION 1. GATHER YOUR INTEL

Target 1

Particle: _____

→

Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 3

Particle: _____

→

→

Initial Phase: _____ Phase 2: _____ Ending Phase: _____

_____ °C _____ °C
at phase change at phase change

Target 2

Particle: _____

→

Initial Phase: _____ Ending Phase: _____

_____ °C
at phase change

Target 4

Particle: _____

→

Initial Phase: _____ Ending Phase: _____

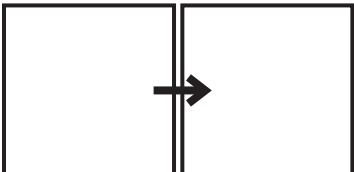
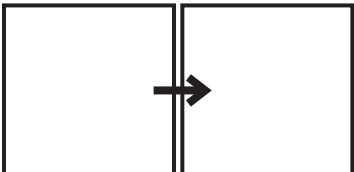
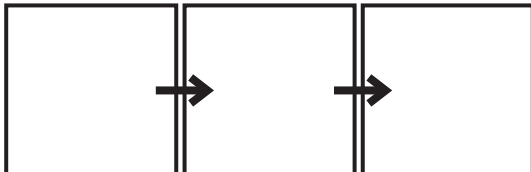
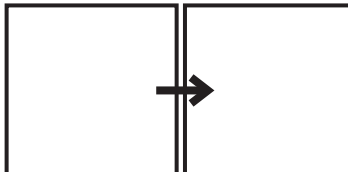
_____ °C
at phase change

MISSION 2. EXPOSE THE DETAILS

	Target 1	Target 2	Target 3	Target 4
Substance used				
Phase Change(s) that occurred				
Exothermic or endothermic				
$\Delta H > 0$ or $\Delta H < 0$				
Does entropy increase or decrease?				
Type of IMF				
Were these IMFs broken or formed?				
Formula mass of substance				
100. g = _____ moles?				
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.				

Phase Change - Ionic Bonding Connected Level 3

MISSION 1. GATHER YOUR INTEL

Target 1	Target 2	Target 3	Target 4
Particle: _____	Particle: _____	Particle: _____	Particle: _____
			
Initial Phase: _____ Ending Phase: _____	Initial Phase: _____ Ending Phase: _____	Initial Phase: _____ Phase 2: _____ Ending Phase: _____	Initial Phase: _____ Ending Phase: _____
_____ °C at phase change	_____ °C at phase change	_____ °C at phase change _____ °C at phase change	_____ °C at phase change

MISSION 2. EXPOSE THE DETAILS

	Target 1	Target 2	Target 3	Target 4
Substance used				
Phase Change(s) that occurred				
Exothermic or endothermic				
$\Delta H > 0$ or $\Delta H < 0$				
Does entropy increase or decrease?				
Type of IMF				
Were these IMFs broken or formed?				
Formula mass of substance				
100. g = _____ moles?				
Calculate the energy needed to heat 100g of this particle by 10 degrees. Please indicate what state the particle is in.				