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# States of Matter

## Activity 1: Who Am I?

### Question Group 1
### Question 1
I have intermolecular forces that are stronger than any state; they do a fine job holding my particles in place.
I am not even aware of my intermolecular forces.
I have intermolecular forces; they are just not strong enough to hold my particles in place.

### Question Group 2
### Question 2
Some people call me rigid. So if you hit me, it's probably going to hurt you.
I have a mild degree of rigidity. So if you hit me, I'll offer some resistance; but mainly I'll make a splash.
I'm not even close to rigid. So if you try to hit me, my particles will just move out of the way.

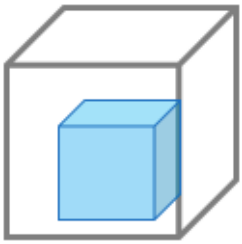
### Question Group 3
### Question 3
I have particles that are very close together and arranged in a very orderly manner.
I have particles that are close together but I make no effort to put them in any arrangement.
I have particles that are spaced far apart and they move so much they have little time to arrange themselves.

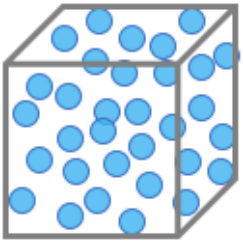
### Question Group 4
### Question 4
I have a fixed shape and volume, regardless of the container that holds me.
I have a fixed volume but my shape depends on the container that holds me.
I have a variable shape and variable volume, both of which depend on the container that holds me.

### Question Group 5
### Question 5
I have particles that vibrate about their fixed position but the forces between them prevent them from moving.
I have particles that can both vibrate and move about the container, but don't expect them to win any races.
I have particles that are constantly on the go, moving about the entire container at high speeds.

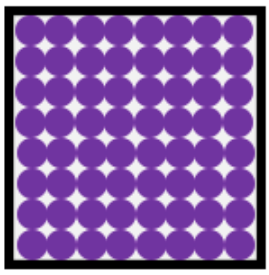
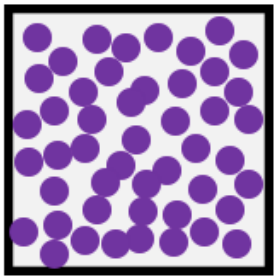
**Question Group 6**
**Question 6**
I'm not easily compressed. And forget about any hopes of me flowing.
I am not easily compressed when external forces are applied but I'm ready to flow if you tip my container.
I am quite easily compressed under the influence of an external force and flow is my middle name.

**Question Group 7**
**Question 7**
I had a caricature made of me resting in my container. It looks like this:



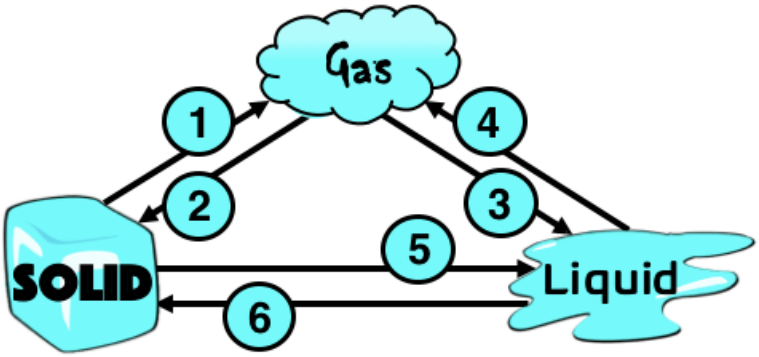


**Question Group 8**
**Question 8**
I have the following artist-drawn portrait of me hanging above my fireplace.

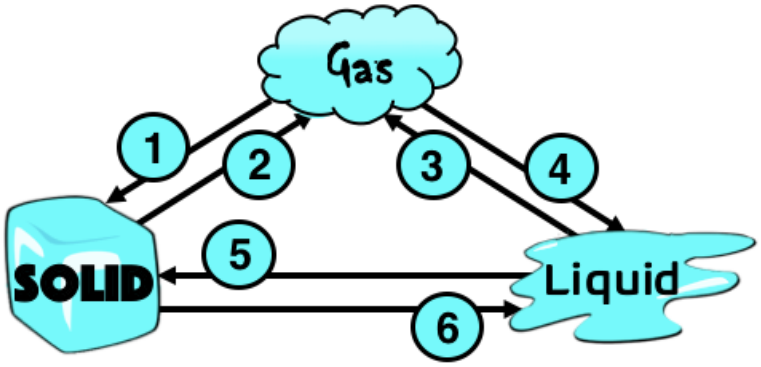




**Activity 2: State Changes**

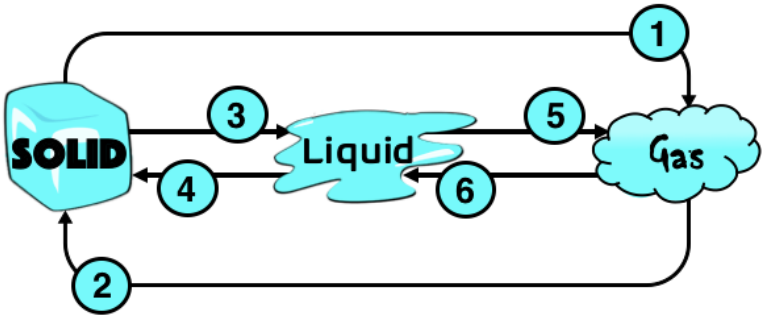
**Question Group 9**
**Question 9**
Identify the names of the state changes depicted in the diagram.



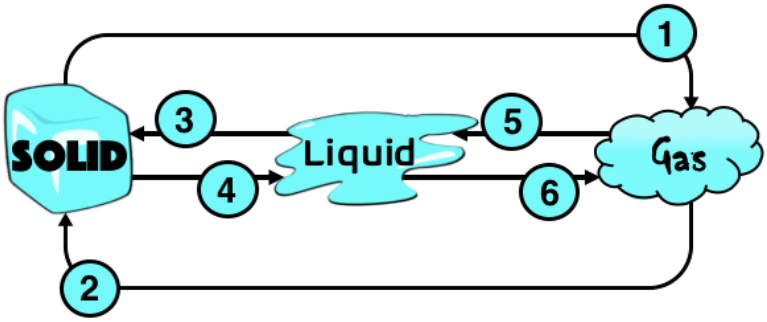

**Question 10**
Identify the names of the state changes depicted in the diagram.



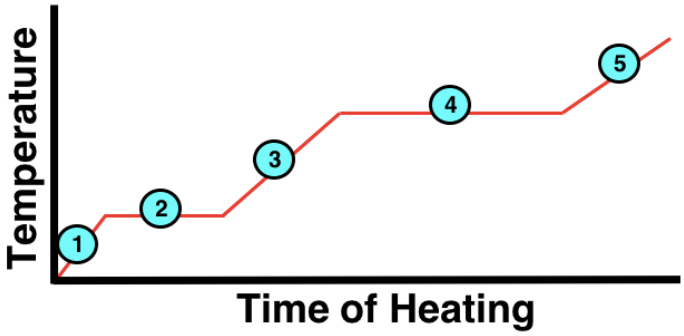

**Question 11**
Identify the names of the state changes depicted in the diagram.



**Question 12**
Identify the names of the state changes depicted in the diagram.

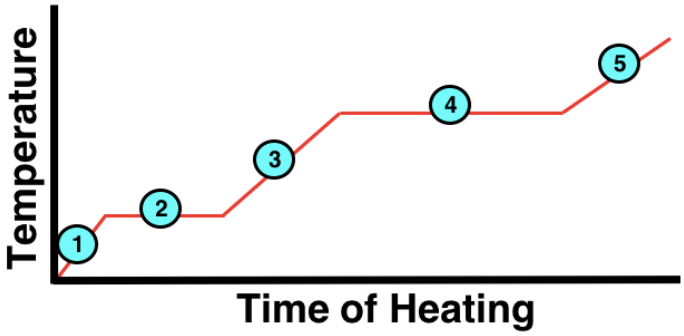


**Activity 3: Heating Curves**
**Question Group 10**
**Question 13**
A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.



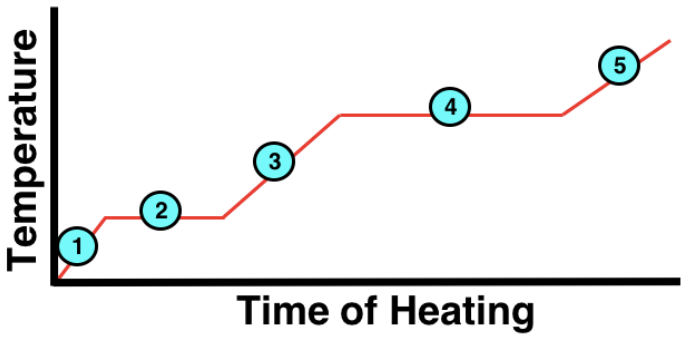

During which numbered region of the graph is there ...
... only solid present?
... only liquid present?
... only gas present?

**Question Group 11**
**Question 14**
A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.




During which numbered region of the graph is there ...
... a mixure of solid and liquid present?
... a mixure of liquid and gas present?
... a mixure of solid and gas present?

**Question Group 12**
**Question 15**
A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.

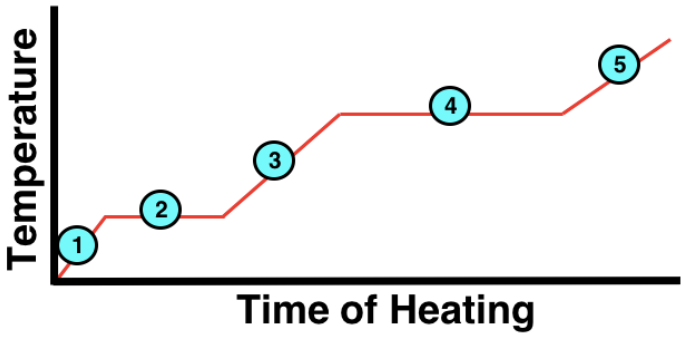



During which numbered region(s) of the graph does ...

... melting take place?
... boiling take place?
... sublimation take place?

**Question Group 13**
**Question 16**

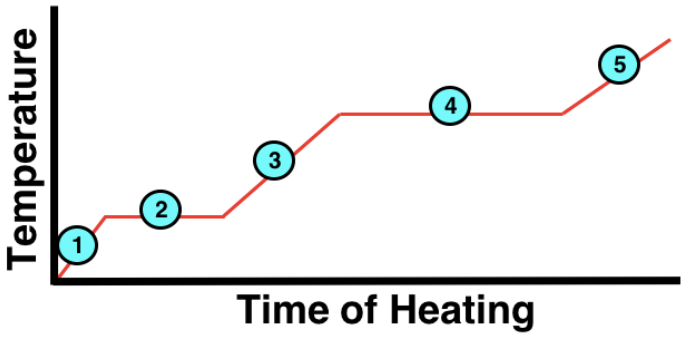
A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.




During which numbered region(s) of the graph does the addition of heat lead to a temperature change? Select all that apply.

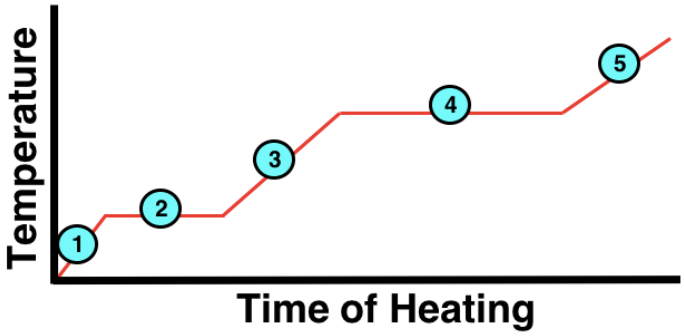
**Question Group 14**
**Question 17**

A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.

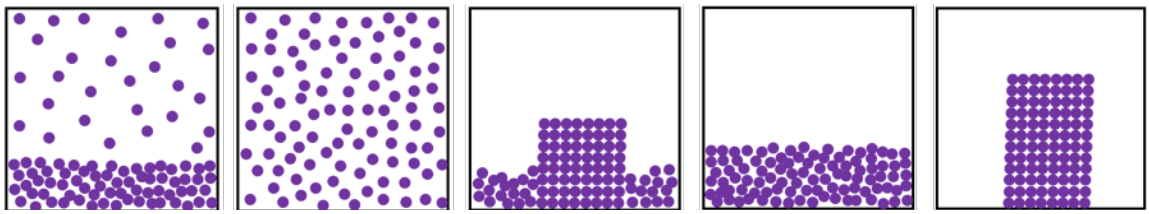



During which numbered region(s) of the graph does the addition of heat lead to a state change? Select all that apply.

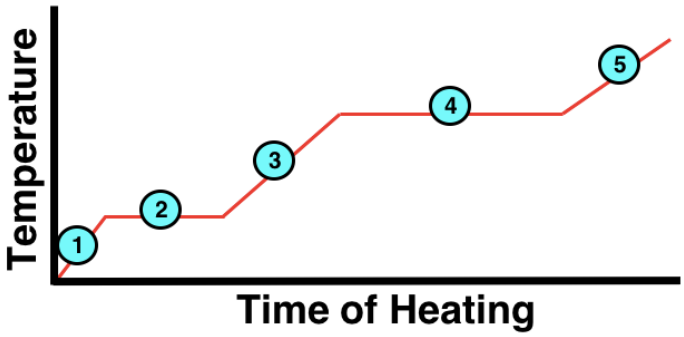
**Question Group 15**
**Question 18**
A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.



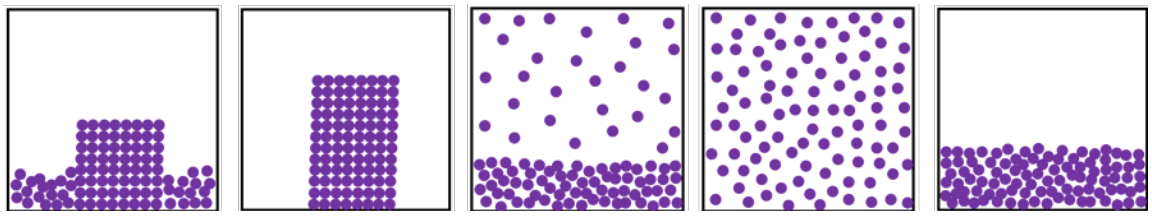

Match the particle representations shown below to a numbered region of the graph.



**Question 19**
A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.

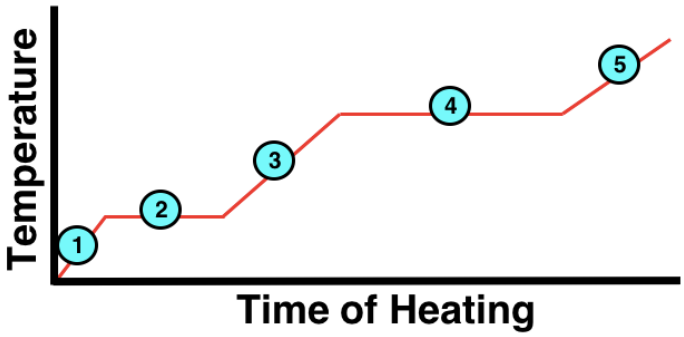



Match the particle representations shown below to a numbered region of the graph.

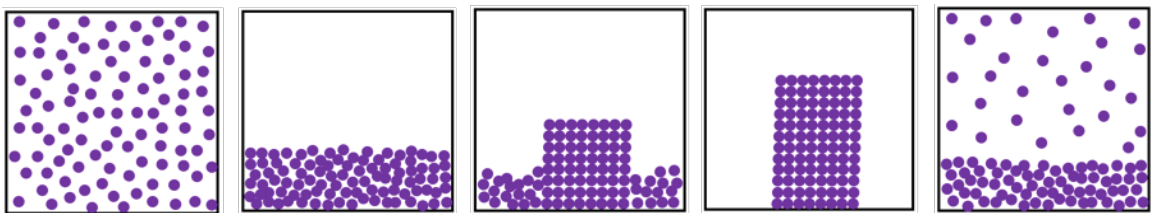


**Question 20**

A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.

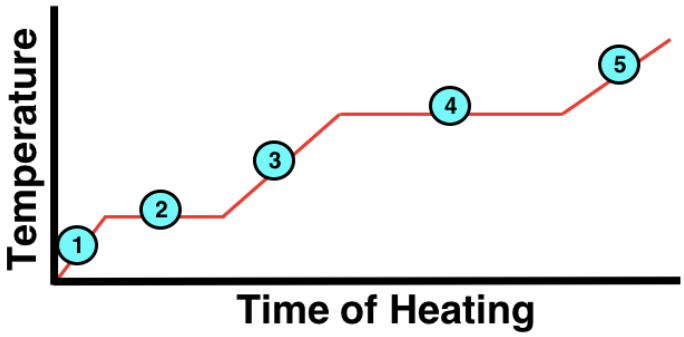



Match the particle representations shown below to a numbered region of the graph.

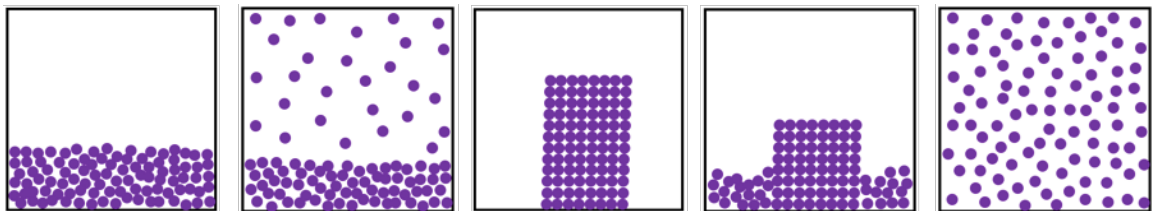


**Question 21**

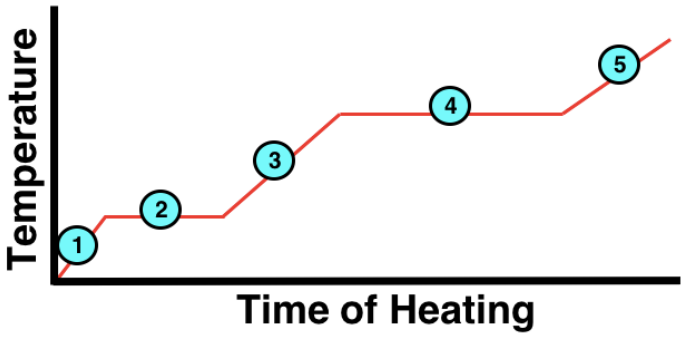
A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.




Match the particle representations shown below to a numbered region of the graph.

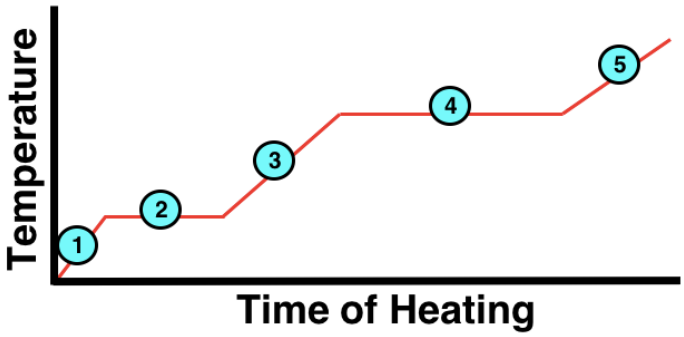


**Question Group 16**
**Question 22**
A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.




During which region of the graph does the addition of heat cause particles to vibrate more vigorously while remaining in an otherwise locked position?

**Question Group 17**
**Question 23**
A substance is placed in a closed vessel. The substance is continuously heated and its temperature monitored, leading to the *heating curve* below. Five regions of the heating curve are labeled with a number.




During which region of the graph does the addition of heat cause particles to move about the entire container at even higher speeds?