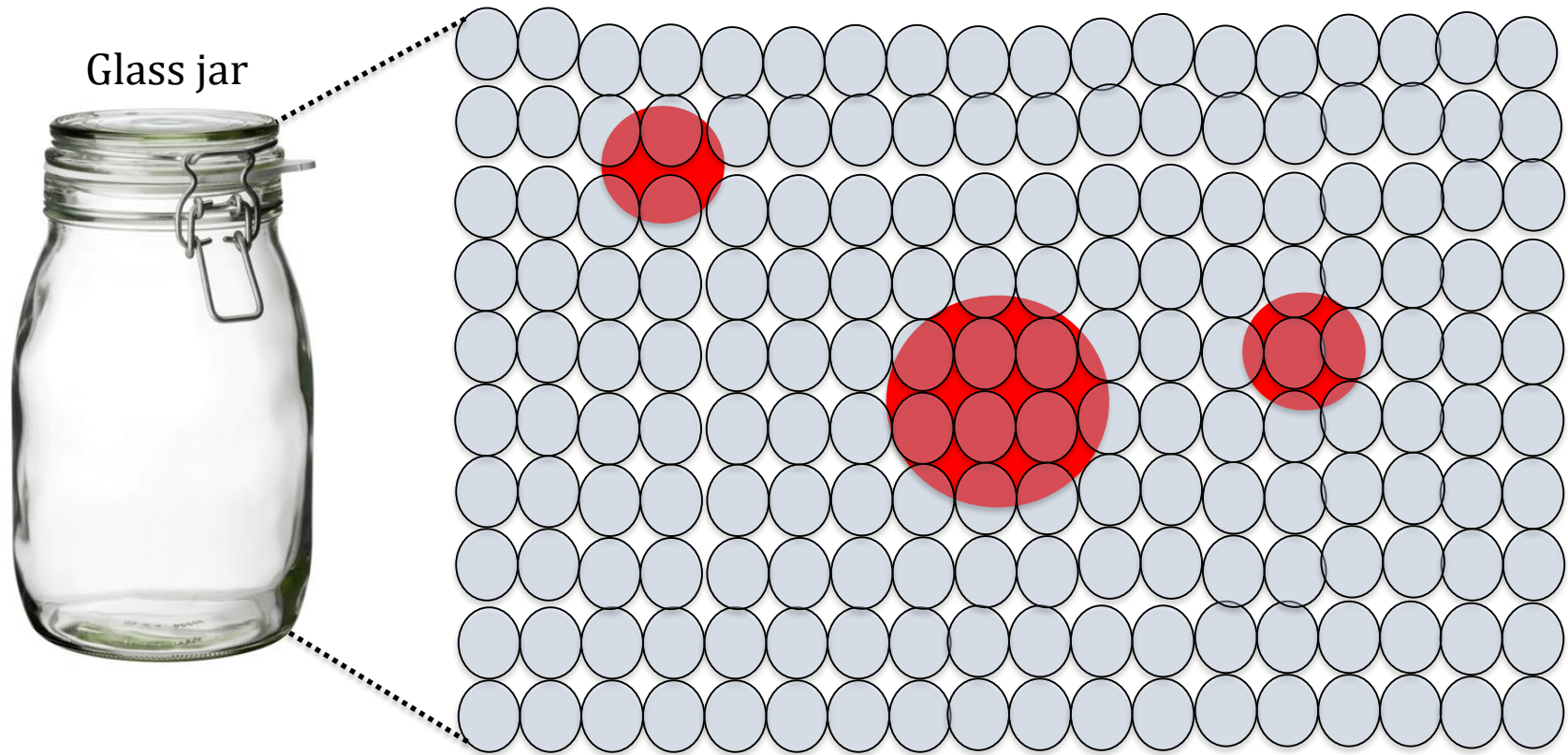


<b>Topic</b>	Particle pictures, states of matter and melting points	<b>Level</b>	Key Stage 3 (or any course for students aged 11-16)
<b>Outcomes</b>	<ol style="list-style-type: none"> <li>1. To know that a vacuum (nothing) exists between particles</li> <li>2. To understand that different substances have different melting points and this affects their state at room temperature. At room temperature a solid has the strongest forces of attraction between their particles, then liquids and then gases. Gases have negligible forces of attraction between the particles.</li> </ol>		
<b>Information for teachers</b>	<p>Students might be able to draw particle pictures but they may still have lots of misconceptions. This task hopes to diagnose the following misconceptions:</p> <ul style="list-style-type: none"> <li>- Air exists between gas particles (there is empty space between particles)</li> <li>- Gases have higher temperatures than solids and liquids (at the same room temperature, solids, liquids and gases will have the same temperature)</li> <li>- Applying macroscopic properties to particles i.e. when glass breaks particles separate (broken glass will still resemble a solid)</li> </ul>		
<b>Other resources</b>	<p>Other resources on particles are here:  <a href="http://thescienceteacher.co.uk/particle-pictures/">http://thescienceteacher.co.uk/particle-pictures/</a></p>		

**A glass jar contains air. The air particles are trapped and cannot get out.**

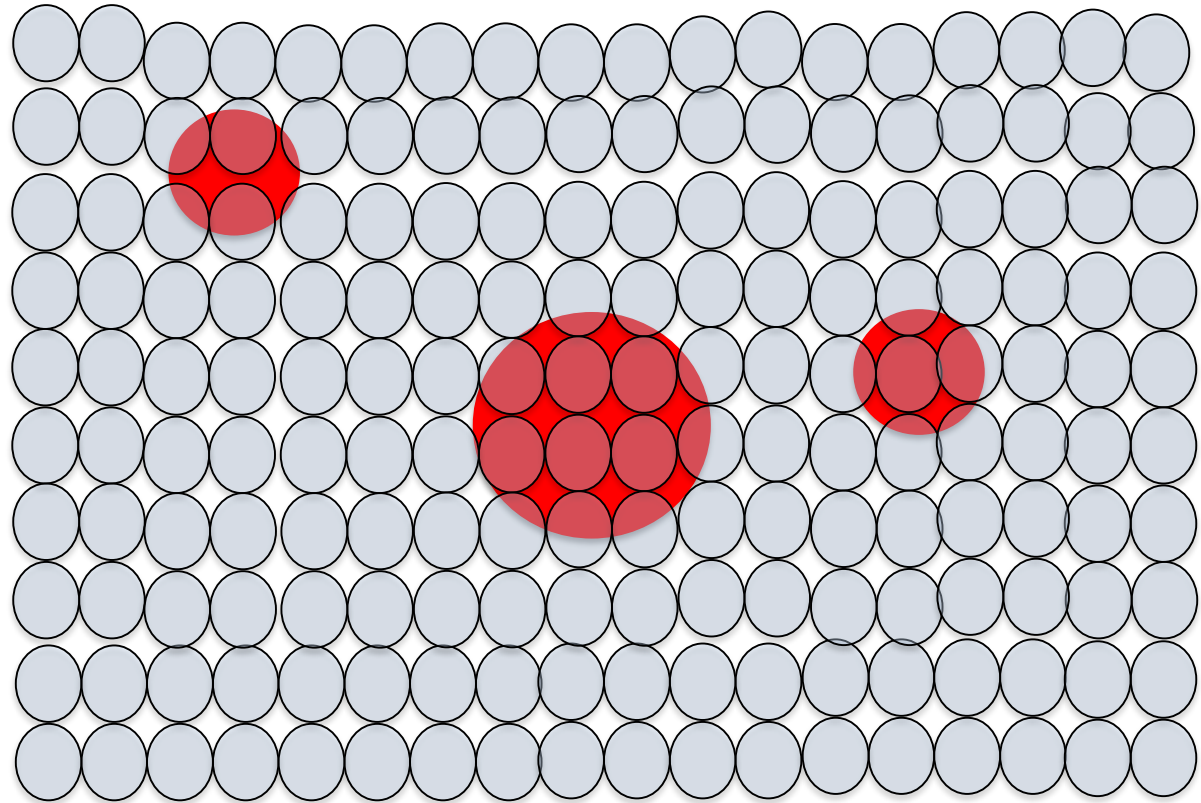
Particle model of glass jar containing air particles



1. Look at the particle picture. What is between the gas particles inside the jar?
2. The jar is at room temperature. Do the gases have a lower, higher or the same temperature as the solid glass?
3. Do the gases or the glass have a higher melting point? Explain your answer.
4. Why is glass a solid at room temperature and not a gas?
5. The jar is dropped on the floor and smashes into lots of small pieces. Draw a particle picture to show how particles would be arranged in a piece of broken glass.

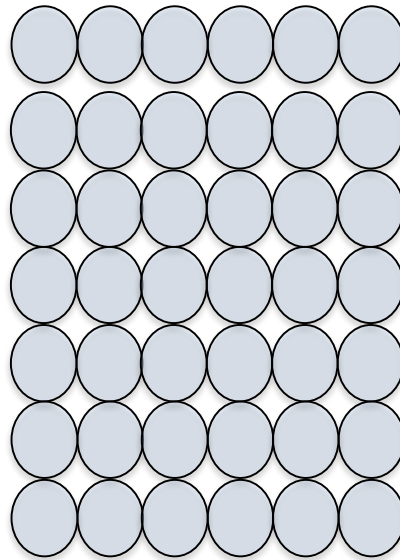
## Particle model of glass jar containing air particles

Glass jar



1. Look at the particle picture. What is between the gas particles inside the jar? **Nothing – it is a vacuum.**
2. The jar is at room temperature. Do the gases have a lower, higher or the same temperature as the solid glass? **The same.**
3. Do the gases or the glass have a higher melting point? Explain your answer. **The glass because it is a solid at room temperature.**
4. Why is glass a solid at room temperature and not a gas? **There are strong forces of attraction between the glass particles. The temperature is not high enough to pull these forces apart.**

5. The jar is dropped on the floor and smashes into lots of small pieces. Draw a particle picture to show how particles would be arranged in a piece of broken glass.



# How has your thinking changed?

Before this lesson I thought that....

but now I think that...

Particle model of glass jar (not to scale!)

