We can explain these bulk properties using the particle theory.

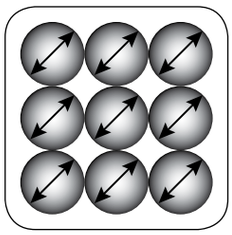
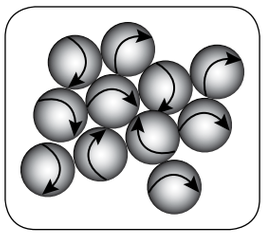
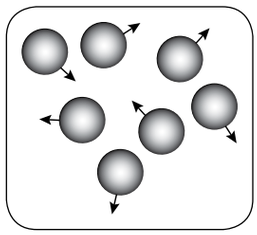
Solid	Liquid	Gas
 Figure 1.04	 Figure 1.05	 Figure 1.06
particles close together	particles close together	particles far apart
particles arranged in a regular pattern	particles arranged randomly	particles arranged randomly
particles vibrate around a fixed point	particles slide over each other randomly and slowly	particles move randomly and rapidly

Table 1.02

TIP

It is a common error to think that the particles in liquids are spaced out. They are not. They are close to each other with very little or no space between. They slide over each other and do not have free motion like gases.

Sample answer

Use the kinetic particle theory to explain why a crystal of iodine keeps its particular shape and cannot be compressed but iodine vapour can be compressed and spreads everywhere. **[4]**

The particles in solid iodine are regularly arranged **[1]** so it keeps its shape. They are packed closely together **[1]** so the crystal cannot be compressed. The particles in iodine vapour are far apart **[1]** (as there are no attractive forces between them) **[1]**. When pressure is put on the vapour, the particles can be pushed closer to each other **[1]**.

Progress check

1.01 Describe the three states of matter in terms of shape and volume. **[6]**

1.02 Describe the difference between solids and liquids in terms of closeness and motion of particles. **[4]**

1.03 At room temperature and pressure bromine molecules are close together and randomly arranged. Describe the proximity (closeness) and arrangement of bromine molecules in (a) bromine vapour **[2]** (b) solid bromine. **[2]**

1.02 Changes of state