

**EXAMPLE 1**

Find the heat energy is needed to melt 150 g of ice at 0°C to water at the same temperature.  
(Specific latent heat of fusion of water = 336 000 J/kg)

**SOLUTION:**

$$m = 0.15 \text{ kg}$$

$$Q = m l$$

$$= \quad \times$$

$$= \quad \text{J}$$

**EXAMPLE 2**

Find the heat energy is required to change 2 kg of ice at 0°C to water at 20°C.  
(Specific latent heat of fusion of water = 336 000 J/kg  
Specific heat capacity of water = 4200 J/kg°C )

**SOLUTION:**

ice

ice

water

$$Q = m l$$

$$+ m c \theta$$

$$= ( \quad ) ( \quad ) + ( \quad ) ( \quad ) ( \quad )$$

$$= \quad \text{J}$$

@

$$= \quad \text{kJ} \times$$

### EXAMPLE 3

Starting at 20°C, calculate how much heat is required to heat 0.3 kg of aluminum to its melting point and then to convert it all to liquid

Specific heat capacity of aluminium = 900 J kg<sup>-1</sup>°C<sup>-1</sup>

Specific latent heat of aluminium = 321,000 J kg<sup>-1</sup>

Melting point of aluminium = 660°C

### SOLUTION:


$$\begin{aligned} Q &= mc\theta + ml \\ &= ( \quad )( \quad )( \quad ) + ( \quad )( \quad ) \\ &= \quad \text{J} \\ &= \quad @ \quad \text{kJ} \end{aligned}$$

### EXAMPLE 4

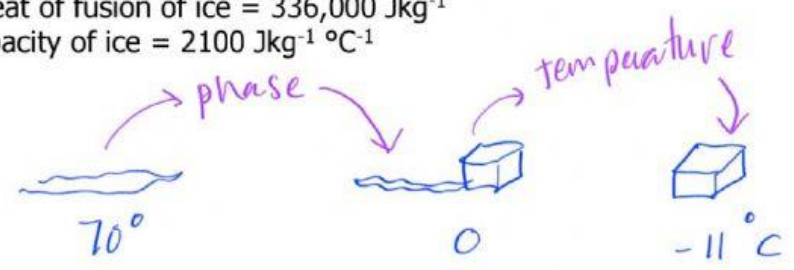
Calculate how much heat must be removed by a refrigerator from 2 kg of water at 70 °C to convert it to ice cubes at -11°C.

Specific heat capacity of water = 4200 J kg<sup>-1</sup> °C<sup>-1</sup>

Specific latent heat of fusion of ice = 336,000 J kg<sup>-1</sup>

Specific heat capacity of ice = 2100 J kg<sup>-1</sup> °C<sup>-1</sup>

### SOLUTION:


$$\begin{aligned} Q &= mc\theta + ml + mc\theta \\ &= ( \quad )( \quad )( \quad ) + ( \quad )( \quad ) + ( \quad )( \quad )( \quad ) \\ &= \quad \text{J} \end{aligned}$$