Specific Latent Heat Questions (ANSWERS) for GCSE Physics

1. A 1 kg block of ice melts at 0°C. If the specific latent heat of fusion of ice is 334,000 J/kg, how much energy is required to melt the block?

$\Delta E = m\ l_f$

$= 1 \times 334{,}000$

= **334,000 J**

2. How much energy is required to boil 2 kg of water at 100°C, given that the specific latent heat of vaporization of water is 2,260,000 J/kg?

$\Delta E = m\ l_v$

$= 2 \times 2{,}260{,}000$

= **4,520,000 J**

3. What is the specific latent heat of fusion if 50,000 J of energy is required to melt 0.2 kg of a substance at its melting point?

$\Delta E = m\ l_f$

$50{,}000 = 0.2 \times l_f$

$50{,}000 / 0.2 = l_f$ = **250,000 J/kg**

4. If 670,000 J of energy is used to evaporate 0.25 kg of water at 100°C, what is the specific latent heat of vaporization of water?

$\Delta E = m\ l_v$

$670{,}000 = 0.25 \times l_v$

$670{,}000 / 0.25 = l_v$ = **2680,000 J/kg**

5. A 3 kg block of a material requires 6,690,000 J to completely vaporize. What is the specific latent heat of vaporization of the material?

$\Delta E = m\ l_v$

$6{,}690{,}000 = 3 \times l_v$

$6{,}690{,}000 / 3 = l_v$ = **2,230,000 J/kg**

6. Calculate the energy needed to melt 0.75 kg of lead at its melting point, if the specific latent heat of fusion of lead is 24,500 J/kg.

$\Delta E = m\, l_f$

$= 0.75 \times 24{,}500$

= **18,375 J**

7. A 0.6 kg block of ice is melted, and the temperature remains constant at 0°C. How much energy is required, given the specific latent heat of fusion of ice is 334,000 J/kg?

$\Delta E = m\, l_f$

$= 0.6 \times 334{,}000$

= **200,400 J**

8. A 2.5 kg sample of steam condenses into water at 100°C. How much energy is released during this process, given that the specific latent heat of vaporization of water is 2,260,000 J/kg?

$\Delta E = m\, l_\upsilon$

$= 2.5 \times 2{,}260{,}000$

= **5650,000 J** **(or 5.65 MJ)**

9. A 0.3 kg block of an unknown substance requires 27,000 J to melt at its melting point. Calculate the specific latent heat of fusion of the substance.

$\Delta E = m\, l_f$

$27{,}000 = 0.3 \times l_f$

$27{,}000 / 0.3 = l_f$ = **90,000 J/kg**

10. If 4 kg of water at 100°C absorbs 9,040,000 J of energy, how much of the water will evaporate? The specific latent heat of vaporization of water is 2,260,000 J/kg..

$\Delta E = m\, l_\upsilon$

$9{,}040{,}000 = m \times 2{,}260{,}000$

$9{,}040{,}000 / 2{,}260{,}000 = m$

= **4kg (all of it)**

11. How much energy is needed to vaporize 0.85 kg of ethanol, if the specific latent heat of vaporization of ethanol is 850,000 J/kg?

$\Delta E = m\ l_v$

$= 0.85 \times 850,000$

= **722,500 J**

12. A 5 kg block of water is cooled and freezes completely at 0°C. How much energy is released during this phase change, given the specific latent heat of fusion of water is 334,000 J/kg?

$\Delta E = m\ l_f$

$= 5 \times 334,000$

= **1670,000 J** **(or 1.67 MJ)**

13. A 250 g sample of a substance with a specific latent heat of fusion of 210,000 J/kg is completely melted. How much energy is absorbed in this process?

$\Delta E = m\ l_f$ *[250g = 0.250kg]*

$= 0.250 \times 210,000$

= **52,500 J**

14. A 5.0 kg block of ice at 0°C absorbs 1,169,000 J of energy to partially melt. How much of the ice melts, given that the specific latent heat of fusion of ice is 334,000 J/kg?

$\Delta E = m\ l_f$

$1,169,000 = m \times 334,000$

$1,169,000 / 334,000 = m$ = **3.5 kg** **(or 70% of it)**

15. A 4 kg sample of a substance is heated, and its temperature rises to its boiling point. It then requires 4,800,000 J of energy to completely vaporize. If the specific latent heat of vaporization is 1,600,000 J/kg, how much of the substance has vaporized?

$\Delta E = m\ l_v$

$4,800,000 = m \times 1600,000$

$4,800,000 / 1600,000 = m$

= **3kg** **(or 75% of it)**