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## PASSAGE VII

The molar heat of fusion is the amount of heat necessary to melt (or freeze) 1.00 mole of a substance at its melting point at a constant pressure. The molar heat of fusion for water is 6.02 kilojoules per mole (kJ/mol).

The equation for molar heat of fusion is:

$$q = \Delta H_{\text{fus}}(\text{mass/molar mass})$$

In this equation,  $q$  is the total amount of heat involved,  $\Delta H_{\text{fus}}$  represents the molar heat of fusion (this value is a constant for a given substance), and (mass/molar mass) represents the number of moles of a given substance.

The following table lists molar heats of fusion, boiling points, and melting points for several elements.

Element	Melting point (°C)	Boiling point (°C)	$\Delta H_{\text{fus}}$ (kJ/mol)
Calcium	839.00	1,484.00	8.54
Silver	961.92	2,212.00	11.30
Iron	1,535.00	2,750.00	13.80
Nickel	1,453.00	2,732.00	17.46

Note: measured at a pressure of 1 atmosphere (atm).

35. According to the passage,  $\Delta H_{\text{fus}}$  of water:
- is less than  $\Delta H_{\text{fus}}$  of calcium.
  - is greater than  $\Delta H_{\text{fus}}$  of calcium.
  - is greater than  $\Delta H_{\text{fus}}$  of nickel.
  - cannot be determined.
36. The energy required to melt 1.00 mole of iron at 1,535°C and constant pressure of 1 atm is:
- 6.02 kJ.
  - 8.54 kJ.
  - 13.80 kJ.
  - 2,750.00 kJ.
37. According to the table, as the energy required to melt 1 mole of the given elements increases, the melting points:
- increase only.
  - decrease only.
  - increase then decrease.
  - neither increase nor decrease.
38. The boiling point of potassium is 759.90°C. If potassium follows the general pattern of the other elements in the table, its heat of fusion would be:
- below 8 kJ/mol.
  - between 8 and 11 kJ/mol.
  - between 11 and 14 kJ/mol.
  - between 14 and 18 kJ/mol.
39. Molar heat of fusion is directly related to the strength of the forces that hold molecules together; strong forces make it difficult for molecules to break away into the liquid or gaseous phase. Data in the table support the conclusion that those forces are stronger in:
- calcium than in silver.
  - silver than in nickel.
  - iron than in calcium.
  - iron than in nickel.
40. It was hypothesized that the heat of fusion will increase as the boiling point increases. Based on the data in the table, which of the following pairs of elements support(s) this hypothesis?
- Nickel and iron
  - Water and calcium
  - Silver and iron
- I only
  - II only
  - III only
  - II and III only
  - I, II, and III

END OF THE SCIENCE REASONING TEST.

STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.