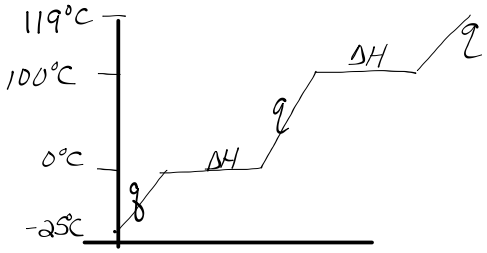
Draw the following energy diagrams

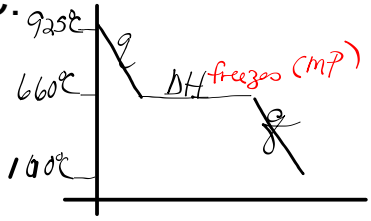
- H_2O goes from -25°C to 119°C



- Al from 925°C to 100°C.

MP = 660°C

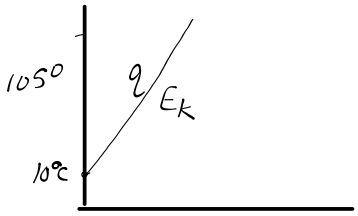
BP = 2467°C



- Sulfur is heated from 10°C to 105°C

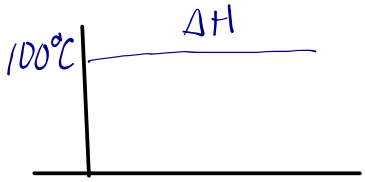
MP = 113°C

BP = 445°C

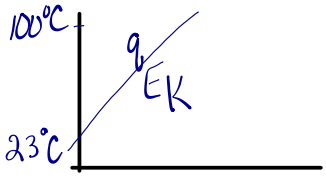


- Ice at 0°C is heated to water at 0°C

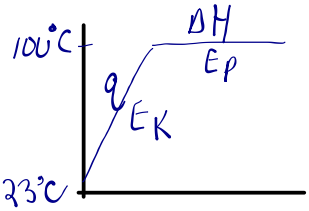
- 250g of water is vaporized



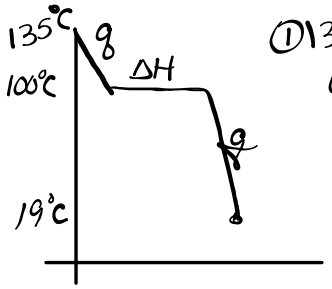
Water is heated from 23°C to water at 100°C



Water is heated from 23°C to steam at 100°C



275g of water vapor is cooled from 135°C to 19°C. Calculate the energy change



① 135°C to 100°C

$q = mc\Delta T$

$= 275g \times 1.7\frac{J}{g°C} \times 35°C$

$= 16362.5\ J$

$16.3625\ kJ$

② condense

$\Delta H = nH$

$= 275g \times \frac{1\ mol}{18.02g} \times 40.7\frac{kJ}{mol}$

$= 621.12\ kJ$

③ 100°C to 19°C

$q = mc\Delta T$

$= 275g \times 4.18\frac{J}{g°C} \times 81°C$

$= 93109.5\ J$

$93.1095\ kJ$

$=$

$16.3625kJ + 621.115kJ + 93.1095kJ$

$= 730.587\ kJ$

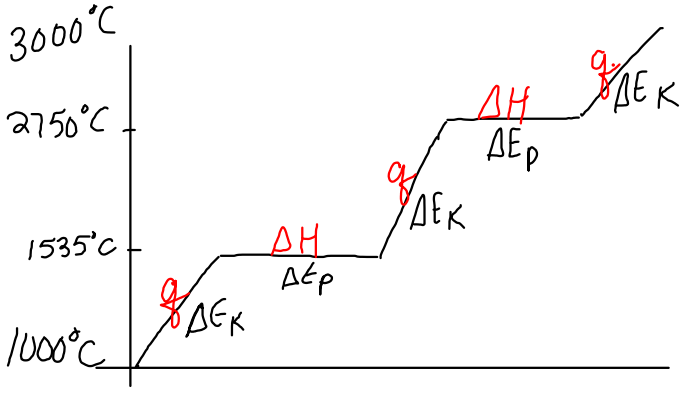
$q = 200g \times 4.18\frac{J}{g°C} \times 81°C$

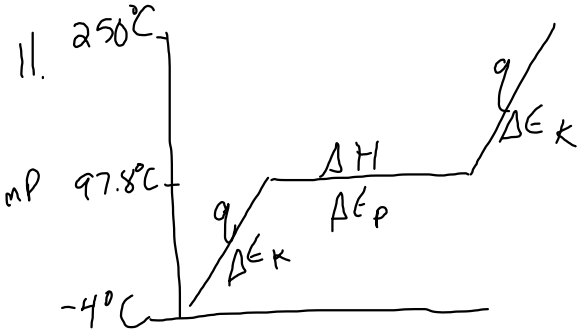
$= 67716\ J$

$67.716\ kJ$

TOTAL

$11.9\ kJ + 451.72kJ + 67.716\ kJ = 531.336\ kJ$

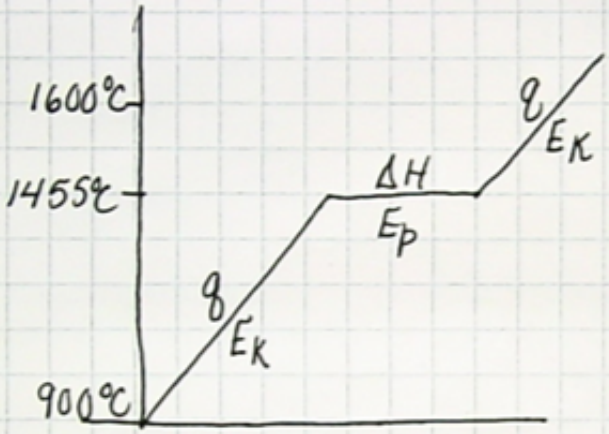




Calculate the total energy change as 500g of Nickel is heated from 900°C to 1600°C

900°C — 1455°C MP — BP 2730°

Nickel
MP 1455°C
BP 2730°C



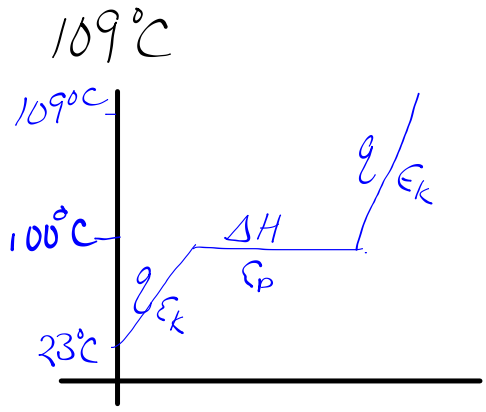
① 900-1455°C
$q = mc\Delta T$
$= 500g \times 0.44 \frac{J}{g°C} \times 555°C$
$= 122100J$
$= 122.1\ KJ$

② melts
$\Delta H = nH$
$= 500g \times \frac{1mol}{58.69g} \times 17.6 \frac{KJ}{mol}$
$= 149.94\ KJ$

③ 1455°C-1600°C
$q = mc\Delta T$
$= 500g \times 0.44 \frac{J}{g°C} \times 145°C$
$= 31900\ J$
$= 31.9\ KJ$

TOTAL: 122.1 KJ + 149.94 KJ + 31.9 KJ
= 303.94 KJ

Calculate the total energy change when 500g of H_2O is heated from 23°C to 109°C



23°C - 100°C

$q = mc\Delta T$

$= 500g \times 4.18 \frac{J}{g°C} \times 77°C$

$= 160930\ J$

$160.93\ kJ$

Boil

$\Delta H = n\Delta H$

$= 500g \times \frac{1mol}{18.02g} \times \frac{40.7\ kJ}{mol}$

$= 1129.30\ kJ$

100°C - 109°C

$q = mc\Delta T$

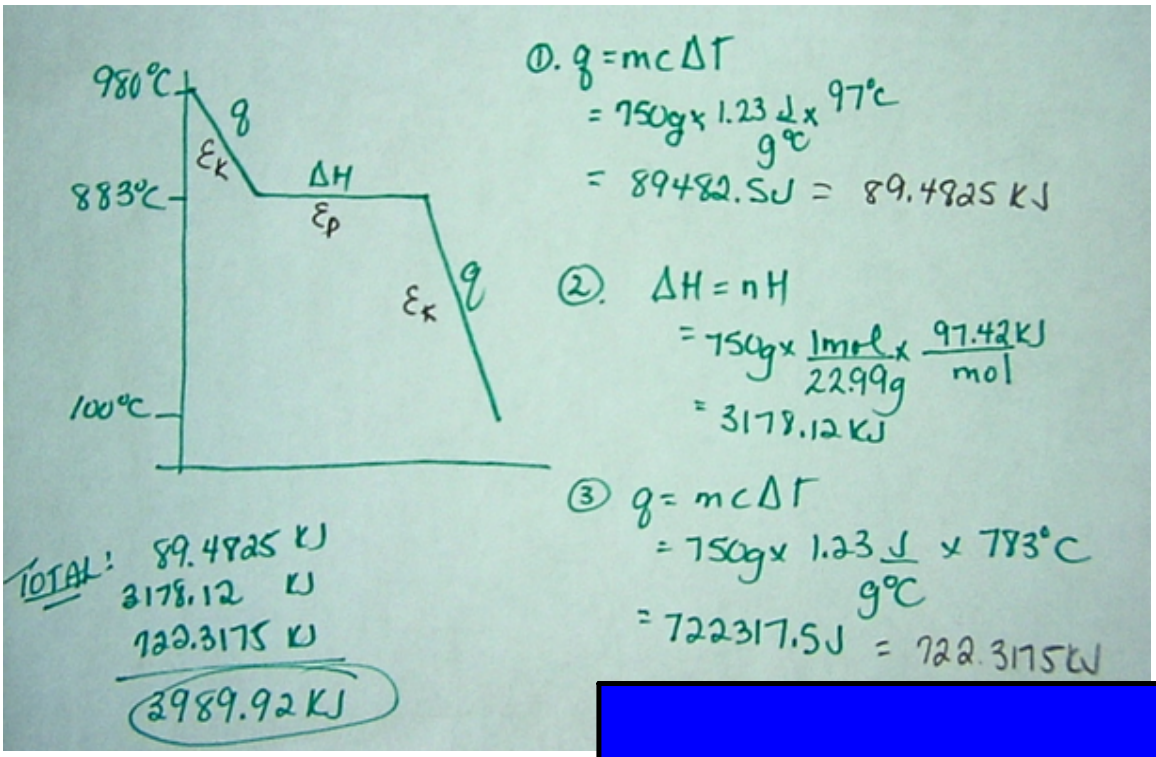
$q = 500g \times 1.7 \frac{J}{g°C} \times 9°C$

$= 7650\ J$

$7.65\ kJ$

TOTAL: 160.93 kJ
1129.30 kJ
7.65 kJ
1297.88 kJ

Calculate the total energy change when 750g of Na is cooled from 980°C to 100°C. (Sodium: MP = 97.8°C, BP = 883°C)



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Heat Change

1. Determine the amount of energy need to heat 250g of ice H_2O from -20^{O}C to -7^{O}C
2. Determine the amount of energy needed to cool 65g of Aluminum from 80^{O}C to 25^{O}C
3. Determine the amount of energy need to heat 10kg of iron from 0^{O}C to 500^{O}C

Enthalpy Change

4. Determine the energy change when 700g of ethanol is melted .
5. Determine the energy change when 3.1 kg of water is vaporized.
6. Determine the energy change when 15g of hydrogen is condensed .
7. Determine the energy change when 155 g of ammonia freezes.

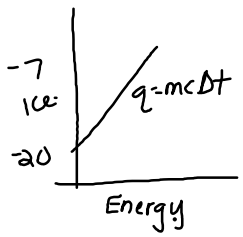
TOTAL ENERGY CHANGES

8. Determine the energy change when 550g of water is heated from 10^{O}C to 105^{O}C
9. Determine the energy change when 700g of sodium is cooled from 200^{O}C to 23^{O}C.

(NOTE: Na - melting point 97.8^{O}C
- boiling point 883^{O}C
-specific heat capacity =1.226 J/G^{O}C
- H_{vap} = 101kJ/mol H_{fus} = 2.6 kJ/mol

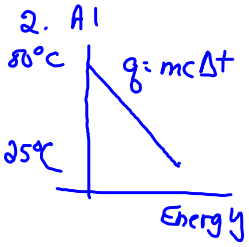
10. Determine the energy change when 2kg of ice is heated from -10^{O}C to 109^{O}C.

1. H_2O



$q = mc\Delta t$
$= 250g \times 2.1\frac{J}{g°C} \times 13°C.$
$= 6825J$ gained

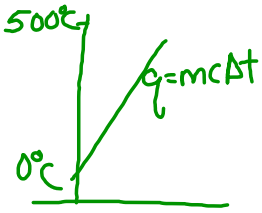
2. Al



$q = mc\Delta t$
$= 65g \times 0.90\frac{J}{g°C} \times 55°C$
$= 3217.5J$

Lost

3. Fe.



$q = mc\Delta t$
$= 10000g \times 0.46\frac{J}{g°C} \times 500°C$
$= 2300000J$ energy gained

4) CH_3-CH_2-OH

C_2H_5OH

$46.08\frac{g}{mol}$

$\Delta H = nH$ melting
$= 700g \times \frac{1mol}{46.08g} \times 4.60\frac{kJ}{mol}$
$= 69.88kJ$ ← Gained

5 H_2O vaporized
↓
$18.02g/mol$

$\Delta H = nH$
$= 3100g \times \frac{1mol}{18.02g} \times 40.7\frac{kJ}{mol}$
$= 7001.66kJ$

Gained

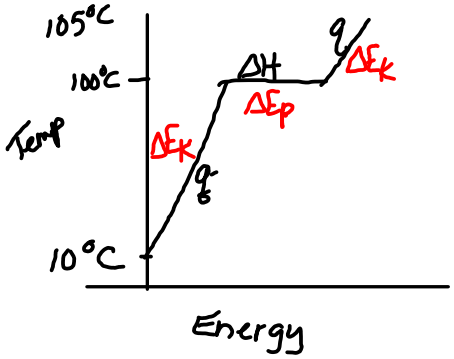
6. H_2 condensed gas → liq
↓
$2.02g/mol$

$\Delta H = nH$
$= 15g \times \frac{1mol}{2.02g} \times 0.9\frac{kJ}{mol}$
$6.68kJ$ lost

7. NH_3 freezes
↓
$17.04g/mol$

$\Delta H = nH$
$= 155g \times \frac{1mol}{17.04g} \times 5.65\frac{kJ}{mol}$
$= 51.39kJ$ lost

8.



① $10^\circ C \rightarrow 100^\circ C$

$q = mc\Delta t$

$= 550g \times 4.18\frac{J}{g^\circ C} \times 90^\circ C$

$= 206910\,J$

$= 206.91\,kJ$

② Boiling (vapor)

$\Delta H = nH$

$= 550g \times \frac{1\,mol}{18.02g} \times \frac{40.7\,kJ}{mol}$

$= 1242.23\,kJ$

③ $100^\circ C - 105^\circ C$

$q = mc\Delta t$

$= 550g \times \frac{1.7\,J}{g^\circ C} \times 5^\circ C$

$= 4675\,J$

$= 4.675\,kJ$

TOTAL: $206.91\,kJ + 1242.23\,kJ + 4.675\,kJ$

$= 1453.815\,kJ$

q 700g Na 200°C to 23°C

$200^\circ C - 97.8^\circ C$

$q = mc\Delta T$

$= 700g \times \frac{1.23\,J}{g^\circ C} \times 102.2^\circ C$

$= 87994.2\,J$

$87.9942\,kJ$

Freezes 97.8 mp

$\Delta H = nH$

$= 700g \times \frac{1\,mol}{22.99g} \times \frac{2.60\,kJ}{mol}$

$= 79.16\,kJ$

$97.8^\circ C - 23^\circ C$

$q = mc\Delta T$

$= 700g \times \frac{1.23\,J}{g^\circ C} \times 74.8^\circ C$

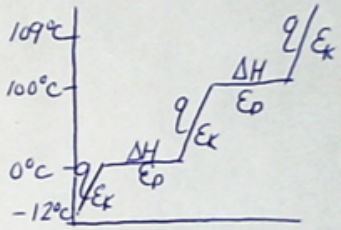
$= 64402.8\,J$

$64.402\,kJ$

TOTAL $87.99\,kJ + 79.16\,kJ + 64.402\,kJ$

$= 231.552\,kJ$

10. 2 Kg (2000g) ice -12 to 109 °C



-12°C to 0°C

$q = mc\Delta T$

$= 2000g \times 2.1 \frac{J}{g°C} \times 12°C$

50400 J

50.4 kJ

0°C melts

$\Delta H = nH$

$= 2000g \times \frac{1mol}{18.02g} \times 6.01 \frac{kJ}{mol}$

667.037 kJ

0°C - 100°C

$q = mc\Delta T$

$= 2000g \times 4.18 \frac{J}{g°C} \times 100°C$

836000 J

836.0 kJ

100°C BP

$\Delta H = nH$

$= 2000g \times \frac{1mol}{18.02g} \times \frac{40.7kJ}{mol}$

4517.20 kJ

100°C - 109°C

$q = mc\Delta T$

$= 2000g \times 1.7 \frac{J}{g°C} \times 9°C$

30600 J

30.6kJ

TOTAL:

50.4 kJ
667.04 kJ
836.000 kJ
4517.20 kJ
30.60 kJ

} 6101.24 kJ

Attachments

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