1. a. melting

$Ti_{(s)} \longrightarrow Ti_{(\ell)}$

$\Delta H_{fus} = 18.8 \frac{KJ}{mol}$

$\frac{55.8g\ Ti}{1} \times \frac{1 mol\ Ti}{47.88g} \times \frac{18.8\ KJ}{1 mol\ Ti} = 21.9\ KJ$

b. condensing

$H_2O_{(\ell)} \longrightarrow H_2O_{(s)}$

$\Delta H_{vap} = -\Delta H_{cond} : \Delta H_{cond} = -40.7 \frac{KJ}{mol}$

$\frac{14.2g\ H_2O}{1} \times \frac{1 mol\ H_2O}{18.02g} \times \frac{-40.7\ KJ}{1 mol\ H_2O} = -32.1\ KJ$

c. boiling

$C_6H_{6(\ell)} \longrightarrow C_6H_{6(g)}$

$\Delta H_{vap} = 30.8 \frac{KJ}{mol}$

$\frac{53.5g\ C_6H_6}{1} \times \frac{1 mol\ C_6H_6}{78g} \times \frac{30.8 KJ}{1 mol\ C_6H_6} = 21.1\ KJ$

d. freezing

$Al_{(\ell)} \longrightarrow Al_{(s)}$

$\Delta H_{fus} = -\Delta H_{solid} : \Delta H_{solid} = -10.8 \frac{KJ}{mol}$

$\frac{27.3g\ Al}{1} \times \frac{1 mol\ Al}{27g} \times \frac{10.8\ KJ}{1 mol\ Al} = -10.9\ KJ$

e. melting

$Au_{(s)} \longrightarrow Au_{(\ell)}$

$\Delta H_{fus} = 12.4 \frac{KJ}{mol}$

$\frac{76.4g\ Au}{1} \times \frac{1 mol\ Au}{197g} \times \frac{12.4\ KJ}{1 mol\ Au} = 4.8\ KJ$

(2.) a. acetic acid, $HC_2H_3O_2$

$m = 49.2\,g$

$\Delta T = 43.2\,^\circ C$

$c = 2.05\ \frac{J}{g\,^\circ C}$

$q = (49.2\,g)(2.05\ \frac{J}{g\,^\circ C})(43.2\,^\circ C) = 4357\ J$

b. toluene

$m = 9.61\,g$

$\Delta T = 55.4\,^\circ C$

$c = 1.615\ \frac{J}{g\,^\circ C}$

$q = (9.61\,g)(1.615\ \frac{J}{g\,^\circ C})(55.4\,^\circ C) = 860\ J$

c. Kerosene

$m = 2.47\,g$

$\Delta T = 29.6\,^\circ C$

$c = 2.09\ \frac{J}{g\,^\circ C}$

$q = (2.47\,g)(2.09\ \frac{J}{g\,^\circ C})(29.6\,^\circ C) = 153\ J$

d. chalk

$m = 31.9\,g$

$\Delta T = -27.7\,^\circ C$

$c = 0.920\ \frac{J}{g\,^\circ C}$

$q = (31.9\,g)(0.920\ \frac{J}{g\,^\circ C})(-27.7\,^\circ C) = -813\ J$

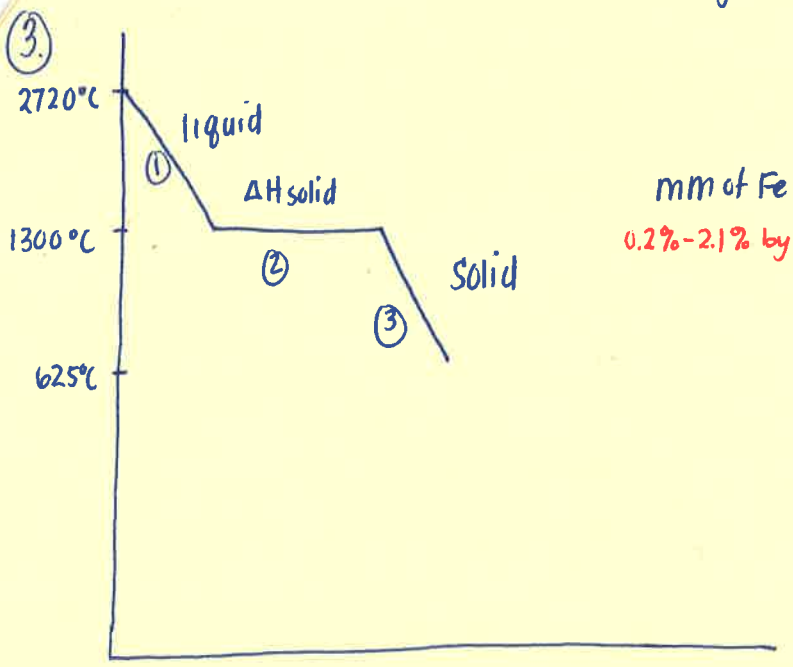
e. glass

$m = 63.6\,g$

$\Delta T = -53.2\,^\circ C$

$c = 0.753\ \frac{J}{g\,^\circ C}$

$q = (63.6\,g)(0.753\ \frac{J}{g\,^\circ C})(-53.2\,^\circ C) = -2548\ J$



6.81 Kg → 6810g ① $q = (6810g)(0.719 \frac{J}{g°C})(-1420°C) = -6952878J$

$q = -6953$ KJ

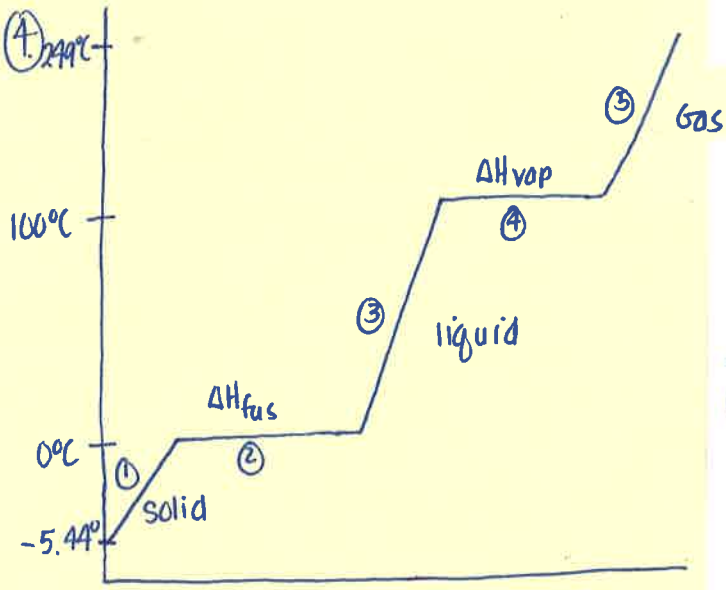
mm of Fe? 0.2%–2.1% by weight carbon ② $6810g \times \frac{1 mol\ Fe}{55.85g} \times \frac{-15.4 KJ}{1 mol} = -1878$ KJ

③ $q = (6810g)(0.450 \frac{J}{g°C})(-675°C) =$

$q = -2069$ KJ

Total heat lost = -6953 KJ + -1878 KJ + -2069 KJ

$= -10900$ KJ



$m = \frac{34.4 Kg}{1} \mid \frac{1000g}{1 Kg} = 34,400g\ H_2O$

moles ⇒ $\frac{34,400g\ H_2O}{1} \mid \frac{1 mol\ H_2O}{18.02g\ H_2O} = 1909\ mol\ H_2O$

$\Delta H_{Total} = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H4 + \Delta H5$

$= 385,500J + 11,492,000J + 14,379,200J + 77,696,000J + 10,353,712J$

$\Delta H_{Total} = 114,306,412$ J OR 114,306.4 KJ

① Temperature Change

$\Delta H_1 = m c_p \Delta T_1$

$\Delta H_1 = 34,400g \cdot 2.06 \frac{J}{g°C} \cdot (0 + 15.44°C)$

$\Delta H_1 = 385,500$ J OR 385.5 KJ

② Phase Change

$\Delta H_2 = mol \cdot \Delta H_{fus}$

$\Delta H_2 = 1909\ mol \cdot 6.02 \frac{KJ}{mol}$

$\Delta H_2 = 11,492$ KJ OR 11,492,000J

③ Temperature Change

$\Delta H_3 = m c_p \Delta T_3$

$\Delta H_3 = 34,400g \cdot 4.18 \frac{J}{g°C} \cdot (100-0)$

$\Delta H_3 = 14,379,200$ J or 14,379.2 KJ

④ Phase Change

$\Delta H_4 = mol \cdot \Delta H_{vap}$

$\Delta H_4 = 1909\ mol \cdot 40.7 \frac{KJ}{mol}$

$\Delta H_4 = 77,696$ KJ OR 77,696,000 J

⑤ Temperature Change

$\Delta H_5 = m c_p \Delta T_5$

$\Delta H_5 = 34,400g \cdot 2.02 \frac{J}{g°C} \cdot (249-100)$

$\Delta H_5 = 10,353,712$ J OR 10,353.712 KJ