4.9

Batteries: 1/(1.04)^4=85% of batteries share of supply could come from returned batteries, but only 80% of battery lead is recovered. Thus only 68% of batteries share is available for recovery. Batteries are 38% of lead consumption, so roughly 26% of lead production comes from recycled batteries.

Architectural: 1/(1.04)^70=6% of architectural share of supply could come from returned architectural elements, and 95% is recovered. Still, roughly 6% of the architectural share is available for recovery. Architectural elements are 16% of lead consumption, so roughly 1% of lead production comes from recycled architectural elements.

Paint: 0%

4.10

Assuming that nothing else changes (material intensity of products doesn't change, etc), the amount of material currently required to produce the products is $m_0$. In five years, these products will reach end of life, and thus $m_0$ of material $M$ will be available for recycling. At that point, the demand for the material will have increased to $m_0 (1+r_c)^5$. If we wish for the import demand to not increase above the original level, which was $m_0$ in the current year, we need to recover $m_0(1+r_c)^5-m_0$ or $m_0((1+r_c)^5-1)$ of the material from recycled sources to meet the additional demand. Since the original quantity of material available is $m_0$, we divide the additional demand, $m_0((1+r_c)^5-1)$ by $m_0$ to find that the required recycling rate to meet this new demand is $(1+r_c)^5-1$.