5.

10. Let $X = \mathbf{R}$, $\mathcal{S}$ be the Borel sets, and let μ be the Lesbegue measure. Let E_k be the following set:

$$E_k = \bigcup_{x \in \mathbf{Q}} \left(x - \frac{1}{k}, x + \frac{1}{k} \right).$$

Then, it follows that for any E_k, $\mu(E_k) = \infty$. Since $\bigcap_{k=1}^{\infty} E_k = \mathbf{Q}$, $\mu\left(\bigcap_{k=1}^{\infty} E_k\right) = 0$. However, $\lim_{k\to\infty} \mu(E_k) = \infty$. Thus, the hypothesis that $\mu(E_1) < \infty$ is necessary.