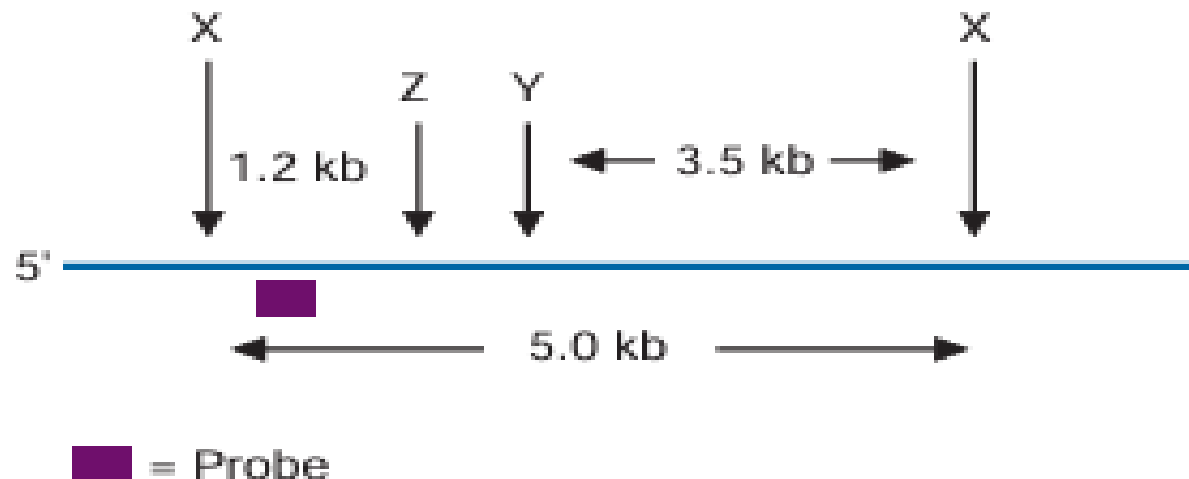


❖ Consider the following map of a genomic region of DNA, showing restriction endonuclease sites for enzymes X and Y. You have a probe to this region (as indicated on the figure). A certain disease maps to this region of DNA, and creates a new restriction site, Z, which is cut with restriction enzyme Z. As a diagnostic tool, a **carrier** would exhibit which bands when DNA that has been completely restricted **with enzyme X** is run through a gel and a Southern blot is performed utilizing the indicated probe?

- (A) 5.0 kb
- (B) 1.0 and 5.0 kb
- (C) 1.5 and 5.0 kb
- (D) 1.5 and 3.5 kb
- (E) 0.5 and 1.0 kb



The answer is A: 5.0 kb. **This would be a noninformative result.** Enzyme X would not cut at site Z, so there would be no difference between the normal and disease gene when the DNA is cut with enzyme X, so both genes would give rise to a 5 kb piece of DNA. **In order to distinguish between the normal and the disease gene, one needs to cut with two enzymes, X and Z; using the probe indicated in a Southern blot,** the disease gene would then show a piece of DNA that is **1.2 kb** in size, while the normal gene would show a piece of DNA that is **5.0 kb** in size.