

1. Alternate (non Watson-Crick) base pair interactions are important in the folding of RNA into 3-dimensional structures, such as the L-shaped structures formed by tRNA. These interactions are primarily:

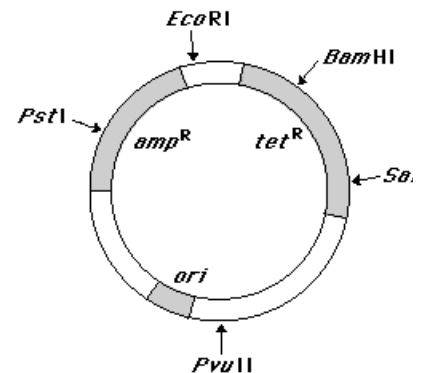
- A) covalent bonds involving ribose.
- B) covalent bonds involving the bases.
- C) hydrogen bonds involving ribose.
- D) hydrogen bonds involving the bases.
- E) ionic interactions involving the ribose

2. Suppose you have found a bacterium that makes a powerful anticancer compound X and you would like to use it to prepare large quantities of compound X. Unfortunately, cell production of this compound is variable, but production appears to increase in response to stress, such as growing the cells under low levels of an antibiotic like tetracycline. You decide to use DNA microarrays and DNA libraries to identify what proteins are important in the synthesis of compound X. You make two cDNA libraries: (1) mRNAs expressed in cells growing in the presence of tetracycline, incorporating green fluorescent NTPs; (2) mRNAs expressed in cells growing in the absence of tetracycline, incorporating red fluorescent NTPs. You probe a DNA microarray with both libraries (add the DNA from both libraries, allow complementary strands to form duplex, then wash off the unpaired strands). Explain the significance of different color spots that you will find.

Green spots =

Red spots = Yellow spots = Suppose you find that tetracycline leads to increased expression of an mRNA that encodes 3 proteins. You also discover a protein (protein Y) that binds to this mRNA and also binds tetracycline. Propose and describe a role for the 3 proteins encoded by the mRNA and for protein Y in increasing production of compound X.

3. Suppose the plasmid shown is digested with the restriction enzyme *Pst*I, and the DNA is then annealed with a *Pst*I digest of human DNA, ligated, and used to transform *E. coli* cells.



Which one of the following conditions allows you to select for ALL colonies that contain the plasmid, with or without human DNA inserted?

- (a) grow in media containing ampicillin
- (b) grow in media containing no antibiotics
- (c) grow in media containing ampicillin and tetracycline
- (d) grow in media containing tetracycline

Which one of the following properties can you use to select and/or screen for all colonies that contain the plasmid with human DNA inserted?

- (a) They will grow in media containing tetracycline but not in media containing ampicillin.
- (b) They will grow in media containing no antibiotics.
- (c) They will grow in media containing ampicillin and tetracycline.
- (d) They will grow in media containing ampicillin but not in media containing tetracycline.