The hospital you work as a molecular pathologist has a rash of infections that are resistant to the normal antibiotics. You have isolated a piece of DNA newly captured in a plasmid by bacteria that may confer resistance to antibiotics. You have just sequenced this short segment of DNA (only one strand given for the double stranded DNA).  You need to determine if this DNA sequence could encode a whole protein in order to determine treatment for those that are infected.

5'  TCAATGTAACGCGCTACCCGGAGCTCTGGGCCCAAATTTCATCCACT 3'

1.  What amino acid will you find at the beginning of a protein? \_\_\_\_\_\_\_\_ At the end? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. How many possible open reading frames are there in ds DNA? \_\_\_\_\_\_\_

3. Find the open reading frame (ORF) that codes for a whole protein.  Remember, there are six possibilities.

4.  Label which strand on the DNA will be the sense strand, and which will be antisense when this DNA is transcribed.

5.  Transcribe this ORF into mRNA, indicating the 5' and 3' ends.

6.  Translate this mRNA into amino acids, indicating the amino (N) and carboxy (C) termini.

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Answer Key

To encode a whole protein, this piece must have a start and stop codon. First write the complementary strand of DNA.  Next look for the longest possible ORF in both strands, reading each in a 5´ to 3´ direction.  In this instance the longest open reading frame is in the reverse orientation (strand 2).  Strand 2 will be the sense strand and Strand 1 the antisense strand

Strand 1     5'  TCAATGTAACGCGCTACCCGGAGCTCTGGGCCCAAATTTCATCCACT  3'

Strand 2     3´ AGTTACATTGCGCGATGGGCCTCGAGACCCGGGTTTAAAGTAGGTGA   5´

1         S  M  \*  R  A  T  R  S  S  G  P  K  F  H  P

2          Q  C  N  A  L  P  G  A  L  G  P  N  F  I  H

3           N  V  T  R  Y  P  E  L  W  A  Q  I  S  S  T

4           \*  H  L  A  S  G  P  A  R  P  G  F  K  M  W

5          E  I  Y  R  A  V  R  L  E  P  G  L  N  \*  G

6         K  L  T  V  R  \*  G  S  S  Q  A  W  I  E  D

mRNA

5´ AGUGGAUGAAAUUUGGGCCCAGAGCUCCGGGUAGCGCGUUACAUUGA 3´

Protein    N- Met Lys Phe Gly Pro Arg Ala Pro Gly Ser Ala Leu His -C