Help David Caruso solve a murder mystery by using your knowledge of transcription and translation. David needs your knowledge to identify the victim and the suspect.

Help him quickly, or he will be forced to repeatedly look up before talking, or constantly remove his sunglasses. You know the look.

1. Fill in the complementary DNA strand using the base-pairing rules for making DNA.

   DNA: GTG CAC CTG ACT CCT GAG GCG

   DNA: CAC GTG GAC TGA GGA CTC CGC

2. Now make the messenger RNA from the new, complementary strand of DNA that you just wrote down. Use the RNA base-pairing rules.

   mRNA: GUG CAC CUG ACU CCU GAG GCG

3. You are a detective at a crime scene. You have several problems. You do not know who your victim is. You have only his burned body and most of his flesh is gone. The only cell structures to survive were a few strands of mRNA. What information might the mRNA contain that would be useful?

   mRNA could be used to sequence one of the victim’s genes for a protein

4. You purify a sample of the victim’s mRNA. The order of bases is below. You do not have a sample of mRNA from any of the missing persons you think may be the victim, but you do have a sample of their normal DNA. Which person was the victim?

   mRNA: AUU GCG CCU UAG

   DNA: Mary Johnson: TTG GCG CTA TTC   Jack Flash: GTA TTC ATC CGT

   Sycamore Sam: TAA CGC GGA ATC
5. You have no fingerprints from the crime scene, but you were able to obtain some of the killer’s DNA from cheek cells in saliva left at the crime scene. Unfortunately, the DNA is badly degraded and you need to decide if what is left can be used as evidence. Fill in the gaps in the DNA so that you can match it to a killer.

GGT  CAA  GCT  AGG  CTA   AGG  TCA  GGT   CCG  GAT  
CCA  GTT  CGA  TCC   GAT   TCC  AGT   CCA   GGC  CTA

6. Explain to the jury why it is okay that you filled in the missing information. Is there any chance that you are wrong?

We are 100% certain that we have the complete DNA sequence for the killer due to the complimentary base-pairing of DNA – A to T and C to G.
7. The only samples you have to match with the newly repaired DNA sample for the killer are cytoplasm samples. Each cytoplasm sample was collected from the 3 suspects you have for this murder.

    tRNA Suspect 1:  GGC CUA UUA GTT
    tRNA Suspect 2:  CGA UCC GAU UCC
    tRNA Suspect 3:  UUU AAG CCG GAC

Based on the tRNA anti-codon sequences you collected from each murder suspect, which suspect is the killer? Try aligning the strand with different parts of the DNA. How sure are you?

    KILLER: It was suspect #2, of course.

Number 2 in his usual, villainous pose.

    tRNA Suspect 2:  CGA UCC GAU UCC

    CCA GTT CGA TCC GAT TCC AGT CCA GGC CTA
8. Explain the evidence to a jury. Who was the victim and who was the murderer? Remember to tell the whole story or the defense will nail you on cross-examination.

Sycamore Sam was murdered by #2. We were able to trace the mRNA sequence back to a gene unique to Sycamore Sam’s DNA among our suspects. The cytoplasm extracted from cheek cells at the crime scene came from our second suspect - #2. Based on sequences of tRNA, we used the complimentary base-pairing rules for RNA and DNA to conclude that, amongst our suspects, #2 is the murderer. Number 2’s DNA is the only match to the tRNA sequence.