

Test for **Template-Based Synthesis: PCR** Activity

Name _____ Teacher _____

Date _____ Class _____

1. Suppose you have a supply of four types of molecules: A, B, C and D. When combined in a reaction chamber, these molecules can react with each other forming a chain-like linear polymer (each of them bonding to any two others). Imagine that you would like them to form the chain C-A-B-D. You friend suggests simply making a mixture of A, B, C and D in equal concentrations and allowing them to form chemical bonds with each other. Would this be an effective method to create a C-A-B-D linear chain of molecules? Why or why not?

Response includes...	
No, because they would randomly combine together and it would be very unlikely that you would get them bonded together in that particular order.	1
Other	0

2. Describe the role of random molecular motion in getting the correct nucleotide (A, T, G or C) to bond to a growing DNA strand during DNA duplication.

Response includes...	
Random molecular motion keeps nucleotides in constant motion bringing the nucleotides in close contact to the DNA, close enough for attractions (intermolecular forces) to come into play. As nucleotides are complementary, (certain nucleotides are attracted to certain other nucleotides) such as G-C and A-T, So, when a nucleotide randomly appears in the right spot on the DNA template it is added by the DNA polymerase and creates a growing DNA chain.	2
It doesn't "know" when to arrive. They just arrive randomly. If the right one comes by, it gets bonded.	1
Other	0

3. A lab technician is getting bad results from her PCR procedure. She's trying to make lots of copies from a tiny sample of DNA, but it's not working. Help her troubleshoot! Read her procedure below, find at least 3 errors and suggest a way to correct each one.

- i. Cool the sample to 30°C to denature the DNA.
- ii. Add RNA primers, two paired nucleotides in length.
- iii. Heat the sample to 90°C to anneal the primers.
- iv. Cool the sample to 20°C so that the enzyme can extend the primers

Error 1: Cooling the sample to 30°C won't denature the DNA. It needs a high temperature for the strands to separate.

Error 2: Even if the primers were single stranded, having only two bases is not specific enough to specify which part of the DNA she wants.

Error 3: Heating the sample to 90°C is too hot for annealing to occur. You want the primers to stick to the DNA, and not immediately be knocked free, as they would be at that high a temperature.

Error 4: Cooling the sample to 20°C for extending may work, but probably too slowly. In fact, at that temp, probably all the DNA will just rehybridize or anneal to any other complimentary strands.

Explanation Score

	Response includes...
Complete (3)	States at least 3 errors and suggested a way to correct each one (see above options).
Mostly complete (2)	States at 2 errors and suggested a way to correct each one (see above options).
Partial (1)	States errors, but doesn't suggest ways to correct, or states only 1 error with suggestion.
Incorrect (0)	Other