**Week 6 discussion quiz**

1. A culture of yeast cells with 3 pairs of homologous chromosomes is transferred to a growth medium with radioactive thymine just prior to DNA synthesis, and then transferred back to normal medium when the S phase is complete. Then the yeast cells immediately undergo either mitosis or meiosis in the normal media.

During metaphase of mitosis, what percentage of DNA will be radioactively labeled? **50%**

After DNA replication, there are 2X the amount of DNA—half from the original DNA and half from the newly replicated DNA. Only newly synthesized DNA has radioactive labeling.

What percentage of daughter cells will have radioactively labeled DNA after completion of meiosis I? **100%**. After Meiosis I, only homologous chromosomes are separated. Each chromosome has radioactively labeled sister chromatid. So all the daughters cells after meiosis I will have chromosomes with radioactively labeled sister chromatid.

![After replication:](image1)

![After meiosis I:](image2)

If blue rectangle is paternal chromosome and red is maternal and shaded chromatid is radioactively labeled, you can see that after meiosis I, both resulting 2 daughter cells have radioactively labeled chromatid.

If you were to collect and pool DNA from all daughter cells shortly after completion of meiosis, what percentage of DNA will be radioactively labeled? **50%**

This is because there is no additional DNA replication between meiosis I and II.

2. Below is a short stretch of replicating DNA. The top strand is the template. Assume the ****** are the RNA primers.

![DNA replication fork](image3)

**Top: template strand**
**Bottom: Lagging strand made in 5’-> 3’ direction (to the right). That means replication fork is proceeding in the opposite direction to the left.
Out of the 3 Okazaki fragments, which one was synthesized first? _______ 3 _______

Which direction is the replication fork going? To the left or to the right? _______ to left _______

Which RNA primers would be removed first? _______ C _______

Which enzyme removes the primer? _______ DNA Pol I _______

Which enzyme joins the fragments? _______ ligase _______

Where is the final connection made? At short arrow or long arrow? _______ long _______

This is because DNA Pol I replaces RNA primer with DNA in 5’ to 3’ direction.

3. The figure at the right shows hybridization between an mRNA that was exported out of nucleus and its corresponding genomic DNA. Label the DNA, the mRNA, and the intron(s).

![Diagram of hybridization between DNA and mRNA]

4. Possible transcription start sites are indicated with arrows. If the resulting RNA after transcription is 5’-UGAGCC-3’, circle the correct approximate location of the transcription start site.

![Diagram of transcription start site]

First identify the template strand.
RNA: 5’-UGAGCC-3’
DNA: 5’-GGCTCA-3’ -> tells us that the bottom strand is the template strand.
Then choose which direction transcription will proceed. Since RNA is added in 5’ to 3’ direction and since the start site should be downstream of the TATA box/promoter, it should be the bottom left arrow. The one on the right is wrong because RNA is synthesized in 5’← 3’ (to the left) direction but the arrow is pointing to the right.