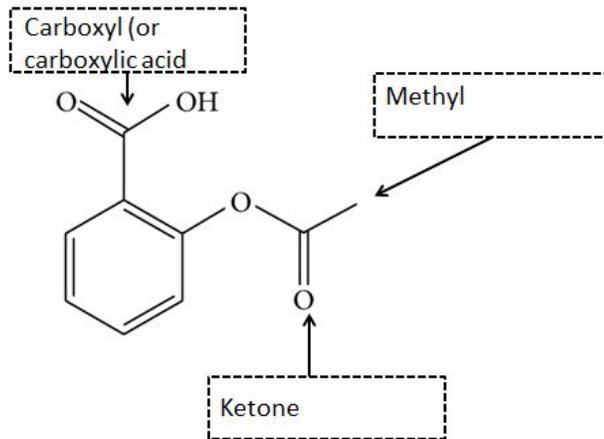


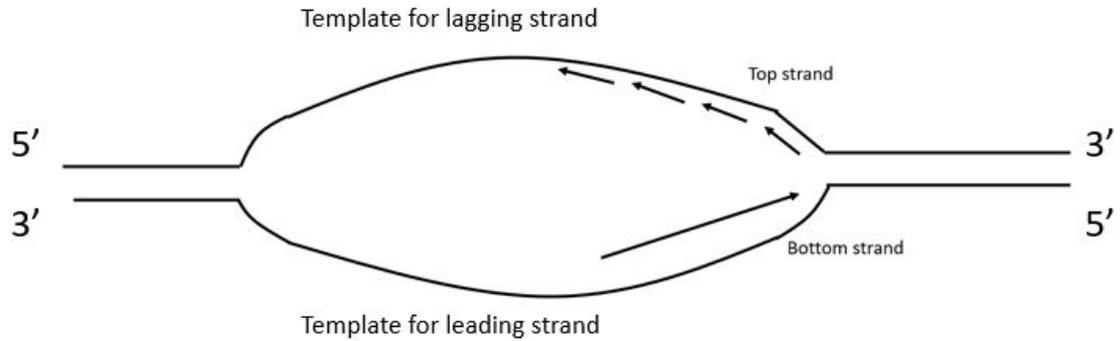
Maximum score: 50 points

1. Purines are adenine and guanine, pyrimidines are cytosine and thymine. Purines are two fused rings, pyrimidines are a single ring. **(2 points: 1 point for each part)**
2. **0.5 points per correct box**



3. **6.5 points total**
 - a. **Maximum 1.5 points for this section**
 - i. RR, rr **(0.5 points)**
 - ii. Rr **(0.5 points)**
 - iii. Incomplete dominance **(0.5 points)**
 - b. **Maximum 3 points for this section**
 - i. **0.5 points per correct answer**
 - 1 - 25%
 - 2 - 25%
 - 3 - 25%
 - 4 - 25%
 - ii. Meiosis, Prophase I **(1 point)**
 - c. 16 **(2 points)**
4. Autosomal dominant, autosomal recessive **(1 point)**
5. **Maximum 2 points for this section**
 - a. Autosomal dominant, autosomal recessive, sex-linked dominant **(1 point)**
 - b. Autosomal dominant, 0.5 OR autosomal recessive, 0.5 OR sex-linked dominant, 0.5 **(1 point)**
6. A - 3' end, 5' end **(1 point)**

7. C - "Intron trapping" describes the process that exploits the existence of the intron-exon splicing to find new genes (1 point)
8. **Maximum 3 points for this section**
- a. **2 points for this section**



- b. iii (1 point)
9. **Maximum 5 points for this section**
- a. The top strand (1 point)
- b. 5' UCGAACUACA 3' (1 point)
- c. Before the transcription start site (1 point)
- d. It affects both the mRNA transcript and the protein. The transcript has a different sequence so the protein transcribed will be different. (1 point)
- e. It is a frameshift mutation (1 point - give 0.5 points for insertion)
10. **Maximum 3 points for this section**
- a. ddNTPs (dideoxynucleotide triphosphates) (1 point)
- b. ddNTPs are missing a 3' OH in addition to the already missing 2' OH (1 point)
- c. The chain being produced when sequencing terminates early because the concentration of ddNTPs is too high. This results in an incomplete sequence. (1 point)
11. C, E, B, A, D (1 point)
12. **Maximum 5 points for this section**
- a. The promoter (1 point)
- b. TATA box (1 point)
- c. Bacteria: sigma factors. Eukaryotes: transcription factors (2 points)
- d. i, iii, iv (1 point)
13. Klinefelter's Syndrome (XXY) (1 point)
14. **Maximum 3 points for this section**
- a. Chain elongation and codon recognition and translation termination (1 point)

- b. Bonding of tRNA to amino acid (**1 point**)
 - c. Transcription would never initiate (**1 point**)
15. **Maximum 4 points for this section**
- a. Operator, promoter, and genes (**1.5 points**)
 - b. Gene expression decreases as tryptophan binds the repressor (**1 point**)
 - i. Repressible (**0.5 points**)
 - c. **0.5 points for each correct answer:**
 - i. Yes
 - ii. Yes
16. Cas9 binds to the guide RNA and to the target DNA sequence and also cuts the strands of the DNA. (**1 point: 0.5 points per part—binding is one part, cutting is the other part**)
17. **Maximum 3 points for this section**
- a. Forgot ampicillin resistance gene (**1 point**)
 - b. Forgot an origin of replication (**1 point**)
 - c. Forgot restriction enzyme sites (**1 point**)
18. B (**1 point**)
19. A (**1 point**)
20. C (**1 point**)
21. Height, weight, neural tube defects, spina bifida, anencephaly, hip dysplasia, etc (**1 point for each correct answer up to maximum 3 points**)