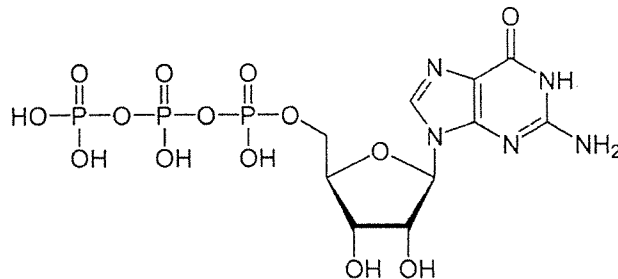


1. What is the net charge of this peptide "V-M-Y-F-E-N" at pH7.0 (4%)? What is the net charge if this peptide chain was phosphorylated by a tyrosine kinase at pH7.0 (3%)? What is the likely source of phosphate utilized by the kinase for this reaction (3%)?
2. Name the compound below (3%). Is this nucleotide a component of DNA, RNA, or both (3%)? Name one other function of this compound (4%)?



3. Calculate the pH of 1L of pure water at equilibrium (4%). How will the pH change after 0.008 moles of the strong base NaOH are dissolved in the water (4%)? Now, calculate the pH of a 50 mM aqueous solution of the weak acid 3-(N-morpholino) propane-1-sulfonic acid (MOPS) in which 61% of the solute is in its weak acid form and 39% is in the form of MOPS conjugate base (the pKa for MOPS is 7.2) (7%).
4. Describe how radioisotopes and autoradiography can be used for labeling and detecting proteins (8%). How does Western blotting detect proteins (7%)?
5. What is ubiquitin (4%), and what role does it play in tagging proteins for degradation (6%)?
6. (A) Which of the following DNA strands, the top or bottom, would serve as a template for RNA transcription if the DNA molecule were to unwind in the indicated direction (2.5%)?

5' ACGGACTGTACCGCTGAAGTCATGGACGCTCGA 3'
3' TGCCTGACATGGCGACTTCAGTACCTGCGAGCT 5'

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[Direction of DNA unwinding]

(B) What would be the resulting RNA sequence (written 5' to 3') (2.5%)
7. Compare prokaryotic and eukaryotic gene characteristics (10%).

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8. What is the difference between hnRNAs, snRNAs, miRNAs, siRNAs, and snoRNAs (10%)?
9. Give two examples of how gene expression may be repressed without altering the gene-coding sequence (10%).
10. Which of the following can diffuse into mitochondria? (A) Acetyl-CoA (B) Fatty acyl-CoA (C) Malonyl-CoA (D) Fatty acyl-carnitine (2.5%)
11. Which method can reveal primary structure of a protein? (A) Edman degradation (B) NMR (C) MRI (D) 2D gel electrophoresis (E) None of above (2.5%)

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