A. Single choice (50%, 2 points/question)

1. What is another name for programmed cell death?
   a. necrosis
   b. oxidative burst
   c. diapedesis
   d. apoptosis

2. What role(s) does the cytoskeleton play in a living cell?
   a. maintaining cell shape
   b. movement
   c. contraction
   d. all of these

3. Where are ribosomes produced in a eukaryotic cell?
   a. endoplasmic reticulum
   b. vacuole
   c. centriole
   d. nucleolus

4. The process by which messenger RNA is synthesized by complementary base pairing of ribonucleotides with deoxyribonucleotides to match a section of DNA (a gene) is called
   a. Translation
   b. Replication
   c. Transcription
   d. Termination

5. In Eukaryotes, the splicing process of pre-mRNA can lead to different mature mRNA molecules and therefore to different proteins. This phenomenon is called
   a. alternative splicing
   b. exonic splicing
   c. gene splicing
   d. intronic splicing

6. Proteins that bind between the promoter region and the section of the gene which is transcribed thus blocking transcription (preventing gene expression) are called
   a. inducer
   b. activators
   c. repressors
   d. operator

7. DNA Polymerase III is actually a complex containing several different protein subunits. So it is often called a
   a. Holoenzyme
   b. Primeosome
   c. Replisome
   d. None of the above

8. The enzyme responsible for initiating the unwinding of double-stranded DNA (eliminating supercoiling) by nicking a single strand of the DNA molecule is:
   a. Topoisomerase
   b. Helicase
   c. Gyrase
   d. Ligase

9. A repeating DNA sequence at the end of chromosomes that prevents them from losing base pair sequences at their ends and from fusing together is called:
   a. A Telomere
b. A Telomerase
   c. A replicon
   d. None of the above

10. Which of the following is not a stop codon?
   a. UAG
   b. GUA
   c. UAA
   d. UGA

11. Every polypeptide chain formed in translation starts with the amino acid
   a. methionine
   b. serine
   c. alanine
   d. lysine

12. The number of hydrogen bonds that hold the Adenine - Thymine base pair together is
   a. 4
   b. 3
   c. 5
   d. 2

13. The DNA molecule is a polymer. Its monomer units are:
   a. nucleosides
   b. nucleic acids
   c. amino acids
   d. nucleotide

14. The difference between DNA and RNA is:
   a. The RNA sugar phosphate backbone contains ribose rather than deoxyribose.
   b. DNA molecules are double stranded while RNA molecules are single stranded for the most part.
   c. Thymine in DNA is replaced by Uracil in RNA.
   d. All of the above

15. The three pyrimidine bases in DNA are:
   a. Cytosine, Thymine and Uracil
   b. Thymine, Guanine and Cytosine
   c. Adenine, Thymine and Guanine
   d. Adenine, Uracil and Guanine

16. PKA (protein kinase A) can exert what kind of effect on protein
   a. Lys acetylation
   b. Arg methylation
   c. Ser phosphorylation
   d. Tyr phosphorylation

17. Which one of the following factors whose receptor is not on the cell surface membrane
   a. estrogen
   b. epidermal growth factor
   c. insulin
   d. tumor necrosis factor

18. Which one of the following is not the intracellular signaling molecule
   a. cAMP / cGMP
   b. acetylcholine
   c. Ca\(^{2+}\)
   d. NO

19. Which one of the following is less likely to occur in cancer cells
   a. Transformation
b. telomere elongation

c. chromosome translocation

d. Senescence

20. Which one of the following is not included in PCR reaction mixture
   a. oligonucleotide primers
   b. DNA containing the sequence to be amplified
   c. DNA ligase
   d. All four deoxynucleoside triphosphates

21. In eukaryotic cells, transcription factors can bind to____
   a. RNA polymerase II
   b. promoter DNA
   c. other transcription factor
   d. all of the above

22. The operator of Operon usually associates with____
   a. repressors
   b. suppressor tRNA
   c. mRNA
   d. all of the above

23. About the Okazaki fragments, which one of the following statements is not truth? Okazaki fragments
   a. appear in DNA replication
   b. occur in the leading strand
   c. are in a direction opposite to the direction of replication
   d. occur in the lagging strand

24. Which one of the following is most sensitive to the inhibition of the α-amanitin
   a. DNA polymerase
   b. RNA polymerase I
   c. RNA polymerase II
   d. RNA polymerase III

25. Who proposed DNA double helix hypothesis
   a. Obama
   b. Warburg
   c. Watson
   d. Weinberg

Questions and Answers (50%)
1. Please describe the molecular mechanisms by which human proto-oncogenes can be converted into oncogenes (15%).
2. Please prepare a 500 ml of 0.5M EDTA pH 8.0. (EDTA: C\textsubscript{10}H\textsubscript{14}N\textsubscript{2}Na\textsubscript{2}O\textsubscript{8}\cdot2H\textsubscript{2}O and molecular weight: 372.24 g/mol) Note: using 10N NaOH solution to adjust pH. (5%)
3. Please prepare a solution with 1x TBST (1x TBS solution with 0.5% Tween 20) in 1 liter final volume. Stock solution: 10x TBST and 100% Tween 20. (5%)
4. DNA-repair systems are responsible for maintaining genomic fidelity in normal cells despite the high frequency with mutational events occur. Please describe the system responsible for repairing each types of mutation in mammalian cells (10%)
5. Please describe the common process of converting extracellular signals into intracellular responses. (15%)