

# 國立暨南國際大學九十二學年度碩士班研究生入學考試試題

第 2 節生物化學 適用:(生醫所生醫組 522 )

(本試題共 4 頁,第 1 頁)

考生注意: 1. 依次序作答,只要標明題號,不必抄題。

2. 答案必須寫在答案卷上,否則不予計分,並限以藍黑色筆作答。

3. 試題隨卷繳回。(餘詳詳閱試場規則)

單選題: 請選擇一個最合適的答案; 每題 3 分, 共 75 分。

1. Osmosis is:

- A) movement of a polar solute molecule across a membrane
- B) movement of a water molecule across a membrane.
- C) movement of a gas molecule across a membrane.
- D) movement of a nonpolar solute molecule across a membrane.
- E) movement of a charged solute molecule (ion) across a membrane.

2. The major carrier of chemical energy in all cells is:

- A) adenosine tetrphosphate.
- B) adenosine monophosphate.
- C) adenosine diphosphate.
- D) acetyl triphosphate.
- E) adenosine triphosphate

3. The endoplasmic reticulum is:

- A) the cellular recycling center.
- B) a highly convoluted, three-dimensional network of membrane-enclosed spaces.
- C) the power plant of the cell.
- D) a collection of ribosomes.
- E) a spherical vesicle bounded by a single membrane.

4. All of the amino acids that are found in proteins (except proline) contain a(n):

- A) carboxyl group.
- B) ester group.
- C) carbonyl group.
- D) amido group.
- E) thiol group.

5. The macromolecules that serve in the storage and transmission of genetic information are:

- A) carbohydrates.
- B) lipids.
- C) nucleic acids.
- D) proteins.
- E) both A and C.

6. In an E. coli cell, the DNA is in the:

- A) nucleus.
- B) nucleoid.
- C) cell membrane.
- D) ribosomes.
- E) cell envelope.

7. When a region of DNA must be repaired by removing and replacing some of the nucleotides, what ensures that the new nucleotides are in the correct sequence?

- A) Specific enzymes bind the correct nucleotides.
- B) The newly incorporated nucleotides must be complementary to those on the other (or template) strand.

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- C) The repair enzyme recognizes the nucleotide being removed and brings in an identical one to replace it.  
D) DNA cannot be repaired and this explains why mutations occur.  
E) The three-dimensional structure determines the order of nucleotides.
8. There are proteins in the plasma membrane that can:  
A) span the width of the membrane and carry nutrients into and waste products out of the cell.  
B) be highly specific binding sites for extracellular signaling molecules.  
C) function as an ion channel.  
D) do both A and B.  
E) do A, B, and C.
9. The technique currently most widely used to determine the three-dimensional structure of biological macromolecules is:  
A) x-ray crystallography.  
B) electron microscopy.  
C) mass spectroscopy.  
D) IR spectroscopy.  
E) UV-visible spectroscopy.
10. A major change that occurred in the evolution of eukaryotic cells from prokaryotic cells was the development of:  
A) photosynthetic capability.  
B) ribosomes.  
C) DNA.  
D) a cell membrane.  
E) nuclear membranes.
11. Which of the following statements about buffers is true?  
A) When  $\text{pH} = \text{pK}_a$ , the weak acid and salt concentrations in a buffer are equal.  
B) The pH of a buffered solution remains constant no matter how much acid or base is added to the solution.  
C) A buffer composed of a weak acid of  $\text{pK}_a = 5$  is stronger at pH 4 than at pH 6.  
D) The strongest buffers are those composed of strong acids and strong bases.
12. Viruses:  
A) always cause cell lysis.  
B) are composed of nucleic acid surrounded by a protein shell and in some cases a membrane.  
C) can reproduce independently or within a cell.  
D) are composed of nucleic acid surrounded by a polysaccharide shell.  
E) can infect only mammals.
13. Energy transduction occurs in living cells primarily by \_\_\_\_\_ reactions.  
A) group transfer  
B) rearrangement  
C) cleavage  
D) oxidation-reduction  
E) condensation
14. The PCR reaction mixture does not include:

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- A) oligonucleotide primer(s).
- B) DNA containing the sequence to be amplified.
- C) heat-stable DNA polymerase.
- D) endonuclease.
- E) all four deoxynucleoside triphosphates.

15. Degradation of lipids occurs mainly in the:

- A) nucleus.
- B) lysosome.
- C) endoplasmic reticulum.
- D) cytoplasm.
- E) mitochondria.

16. Which of the following is not an intermediate of the citric acid cycle?

- A) succinyl-CoA
- B) oxaloacetate
- C) acetyl-CoA
- D)  $\alpha$ -ketoglutarate
- E) citrate

17. When blood glucose is abnormally high, the pancreas releases:

- A) epinephrine.
- B) trypsin.
- C) glucagon.
- D) glucose.
- E) insulin.

18. The functioning of ion channels can be best determined by the use of:

- A) competitive inhibitors.
- B) electrical measurements.
- C) toxins.
- D) radioactive channels.
- E) radioactive ions.

19. Enzymes differ from other catalysts in that enzymes:

- A) usually display specificity toward a single reactant.
- B) fail to influence the equilibrium point of the reaction.
- C) are not consumed in the reaction.
- D) form an activated complex with the reactants.
- E) lower the activation energy of the reaction catalyzed.

20. During muscle contraction, hydrolysis of ATP results in a change in the:

- A) conformation of actin.
- B) structure of the myofibrils.
- C) structure of the sarcoplasmic reticulum.
- D) conformation of myosin.
- E) structure of the Z disk.

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21. Most transduction systems for hormones and sensory stimuli that involve trimeric G proteins have in common all of the following except:
- A) nuclear receptors.
  - B) self-inactivation.
  - C) receptors which interact with a G protein.
  - D) receptors with multiple transmembrane segments.
  - E) cyclic nucleotides.
22. A person who cannot synthesize liver fructose 1,6-bisphosphatase would probably not be able to:
- A) resynthesize glucose from lactate produced during exercise.
  - B) convert fructose 1,6-bisphosphate into triose phosphates.
  - C) metabolize fructose.
  - D) synthesize fats when the diet contained excess carbohydrate.
  - E) None of the above is correct.
23. Almost all of the oxygen ( $O_2$ ) one consumes in breathing is converted to:
- A) water.
  - B) carbon monoxide and then to carbon dioxide.
  - C) carbon dioxide ( $CO_2$ ).
  - D) acetyl-CoA.
  - E) none of the above.
24. An intermediate of purine degradation in humans is:
- A) succinate.
  - B) urea.
  - C) glutamate.
  - D)  $NH_4^+$ .
  - E) uric acid.
25. "Footprinting" or DNase protection is a technique used to identify:
- A) *E. coli* cells that contain a desired, cloned piece of DNA.
  - B) the position of a particular gene of a chromosome.
  - C) the specific binding site of a repressor, polymerase, or other protein on the DNA.
  - D) the position of internally double-stranded regions in a single-stranded DNA molecule.

簡答題: 共 25 分 =

1. Briefly describe the role of recombination in the generation of antibody (immunoglobulin) diversity. What properties of antibodies make them useful biochemical reagents? Name two biochemical application of antibodies with just the name of the technique. (9 %)
2. What is an Okazaki fragment? Briefly describe the biochemical role of topoisomerases in DNA replication in *E. coli*. (6 %)
3. Briefly explain the difference between base-excision repair and nucleotide-excision repair. (4 %)
4. Name three general types of postsynthetic processing reactions that are observed in eukaryotic mRNA. (6 %)