

098-1

國立臺北科技大學九十六學年度碩士班招生考試

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第二節 生物化學 (選考) 試題

第一頁 共四頁

注意事項：

1. 本試題共 40 題，每題 2.5 分，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. A major component of RNA but not of DNA is:

- A) adenine. B) cytosine. C) guanine. D) thymine. E) uracil.

2. The difference between a ribonucleotide and a deoxyribonucleotide is:

- A) a deoxyribonucleotide has an —H instead of an —OH at C-2.
 B) a deoxyribonucleotide has α configuration; ribonucleotide has the β configuration at C-1.
 C) a ribonucleotide has an extra —OH at C-4.
 D) a ribonucleotide has more structural flexibility than deoxyribonucleotide.
 E) a ribonucleotide is a pyranose, deoxyribonucleotide is a furanose.

3. Which of the following is a palindromic sequence?

- A) AGGTCC
TCCAGG
 B) CCTTCC
GCAAGG
 C) GAATCC
CTTAGG
 D) GGATCC
CCTAGG
 E) GTATCC
CATAGG

4. In comparison with DNA-DNA double helices, the stability of DNA-RNA and RNA-RNA helices is:

- A) DNA-DNA > DNA-RNA > RNA-RNA.
 B) DNA-DNA > RNA-RNA > DNA-RNA.
 C) RNA-DNA > RNA-RNA > DNA-DNA.
 D) RNA-RNA > DNA-DNA > DNA-RNA.
 E) RNA-RNA > DNA-RNA > DNA-DNA.

5. Of the 20 standard amino acids, only _____ is not optically active. The reason is that its side chain _____.

- A) alanine; is a simple methyl group
 B) glycine; is a hydrogen atom
 C) glycine; is unbranched
 D) lysine; contains only nitrogen
 E) proline; forms a covalent bond with the amino group

6. Which of the following statements about aromatic amino acids is correct?

- A) All are strongly hydrophilic.
 B) Histidine's ring structure results in its being categorized as aromatic or basic, depending on pH.
 C) On a molar basis, tryptophan absorbs more ultraviolet light than tyrosine.
 D) The major contribution to the characteristic absorption of light at 280 nm by proteins is the phenylalanine R group.
 E) The presence of a ring structure in its R group determines whether or not an amino acid is aromatic.

7. The uncommon amino acid selenocysteine has an R group with the structure $-\text{CH}_2-\text{SeH}$ ($pK_a \approx 5$). In an aqueous solution, $\text{pH} = 7.0$, selenocysteine would:

- A) be a fully ionized zwitterion with no net charge.
 B) be found in proteins as D-selenocysteine.
 C) never be found in a protein.
 D) be nonionic.
 E) not be optically active.

8. By adding SDS (sodium dodecyl sulfate) during the electrophoresis of proteins, it is possible to:

- A) determine a protein's isoelectric point.
 B) determine an enzyme's specific activity.
 C) determine the amino acid composition of the protein.
 D) preserve a protein's native structure and biological activity.
 E) separate proteins exclusively on the basis of molecular weight.

注意：背面尚有試題

9. Which of the following is *not* known to be involved in the process of *assisted* folding of proteins?

- A) Chaperonins
- B) Disulfide interchange
- C) Heat shock proteins
- D) Peptide bond hydrolysis
- E) Peptide bond isomerization

10. A monoclonal antibody differs from a polyclonal antibody in that monoclonal antibodies:

- A) are labeled with chemicals that can be visualized.
- B) are produced by cells from the same organism that produced the antigen.
- C) are synthesized by a population of identical, or "cloned," cells.
- D) are synthesized only in living organisms.
- E) have only a single polypeptide chain that can recognize an antigen.

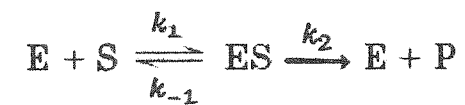
11. Which of the following parts of the IgG molecule are *not* involved in binding to an antigen?

- A) Fab. B) Fc. C) Heavy chain. D) Light chain. E) Variable domain.

12. One of the enzymes involved in glycolysis, aldolase, requires Zn^{2+} for catalysis. Under conditions of zinc deficiency, when the enzyme may lack zinc, it would be referred to as the:

- A) apoenzyme. B) coenzyme. C) holoenzyme. D) prosthetic group. E) substrate.

13. Michaelis and Menten assumed that the overall reaction for an enzyme-catalyzed reaction could be written as



Using this reaction, the rate of breakdown of the enzyme-substrate complex can be described by the expression:

- A) $k_1 ([E_t] - [ES])$. B) $k_1 ([E_t] - [ES])[S]$. C) $k_2 [ES]$. D) $k_1 [ES] + k_2 [ES]$. E) $k_1 [ES]$.

14. In glycoproteins, the carbohydrate moiety is always attached through the amino acid residues:

- A) asparagine, serine, or threonine.
- B) aspartate or glutamate.
- C) glutamine or arginine.
- D) glycine, alanine, or aspartate.
- E) tryptophan, aspartate, or cysteine.

15. The biochemical property of lectins that is the basis for most of their biological effects is their ability to bind to:

- A) amphipathic molecules.
- B) hydrophobic molecules.
- C) specific lipids.
- D) specific oligosaccharides.
- E) specific peptides.

16. The biological role of restriction enzymes is to:

- A) aid recombinant DNA research.
- B) degrade foreign DNA that enters a bacterium.
- C) make bacteria resistant to antibiotics.
- D) restrict the damage to DNA by ultraviolet light.
- E) restrict the size of DNA in certain bacteria.

17. In the laboratory, recombinant plasmids are commonly introduced into bacterial cells by:

- A) electrophoresis – a gentle low-voltage gradient draws the DNA into the cell.
- B) infection with a bacteriophage that carries the plasmid.
- C) microinjection.
- D) mixing plasmids with an extract of broken cells.
- E) transformation – heat shock of the cells incubated with plasmid DNA in the presence of $CaCl_2$.

18. The PCR reaction mixture does *not* include:

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

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

- A) acetyl triphosphate.
- B) adenosine monophosphate.
- C) adenosine triphosphate.
- D) cytosine tetraphosphate.
- E) uridine diphosphate

20. Proteins often have regions that show specific, coherent patterns of folding or function. These regions are called:

- A) domains. B) oligomers. C) peptides. D) sites. E) subunits.

21. Which vitamin is derived from cholesterol?
A) A B) B₁₂ C) D D) E E) K
22. Ubiquitin is a:
A) component of the electron transport system.
B) protease.
C) protein kinase.
D) protein phosphorylase.
E) protein that tags another protein for proteolysis.
23. Oncogenes are known that encode all of the following *except*:
A) cytoplasmic G proteins and protein kinases.
B) DNA-dependent RNA polymerases.
C) growth factors.
D) secreted proteins.
E) transmembrane protein receptors.
24. The structure of NAD⁺ does *not* include:
A) a flavin nucleotide.
B) a pyrophosphate bond.
C) an adenine nucleotide.
D) nicotinamide.
E) two ribose residues.
25. Glycolysis is the name given to a metabolic pathway occurring in many different cell types. It consists of 11 enzymatic steps that convert glucose to lactic acid. Glycolysis is an example of:
A) aerobic metabolism.
B) anabolic metabolism.
C) a net reductive process.
D) fermentation.
E) oxidative phosphorylation.
26. Glycogen is converted to monosaccharide units by:
A) glucokinase.
B) glucose-6-phosphatase
C) glycogen phosphorylase.
D) glycogen synthase.
E) glycogenase.
27. Which of the below is *not* required for the oxidative decarboxylation of pyruvate to form acetyl-CoA?
A) ATP B) CoA-SH C) FAD D) Lipoic acid E) NAD⁺
28. The two moles of CO₂ produced in the first turn of the citric acid cycle have their origin in the:
A) carboxyl and methylene carbons of oxaloacetate
B) carboxyl group of acetate and a carboxyl group of oxaloacetate.
C) carboxyl group of acetate and the keto group of oxaloacetate.
D) two carbon atoms of acetate.
E) two carboxyl groups derived from oxaloacetate
29. Free fatty acids in the bloodstream are:
A) bound to hemoglobin.
B) carried by the protein serum albumin.
C) freely soluble in the aqueous phase of the blood.
D) nonexistent; the blood does not contain free fatty acids.
E) present at levels that are independent of epinephrine.
30. Which of these is able to cross the inner mitochondrial membrane?
A) Acetyl-CoA
B) Fatty acyl-carnitine
C) Fatty acyl-CoA
D) Malonyl-CoA
E) None of the above can cross.
31. In amino acid catabolism, the first reaction for many amino acids is a(n):
A) decarboxylation requiring thiamine pyrophosphate (TPP).
B) hydroxylation requiring NADPH and O₂.
C) oxidative deamination requiring NAD⁺.
D) reduction requiring pyridoxal phosphate (PLP).
E) transamination requiring pyridoxal phosphate (PLP).
32. Which of these *directly* donates a nitrogen atom for the formation of urea during the urea cycle?
A) Adenine. B) Aspartate. C) Creatine. D) Glutamate. E) Ornithine.
33. Oxidative phosphorylation and photophosphorylation share all of the following *except*:
A) chlorophyll.
B) involvement of cytochromes.
C) participation of quinones.

098-5

098-6

- D) proton pumping across a membrane to create electrochemical potential.
- E) use of iron-sulfur proteins.

34. The synthesis of glycogen, starch, and sucrose all:

- A) involve addition of a sugar residue at the reducing end of the growing polymer.
- B) take place in liver and muscle of mammals.
- C) use a sugar nucleotide as substrate.
- D) use glucose 1-phosphate as the only substrate.
- E) use glucose-6-phosphate as substrate.

35. Transketolase requires the coenzyme:

- A) cobalamin (vitamin B₁₂).
- B) lipoic acid
- C) pyridoxal phosphate.
- D) tetrahydrofolic acid.
- E) thiamine pyrophosphate.

36. Which of the following is *not* required in the synthesis of fatty acids?

- A) Acetyl-CoA
- B) Biotin
- C) HCO₃⁻ (CO₂)
- D) Malonyl-CoA
- E) NADH

37. Which of these can be synthesized by plants but *not* by humans?

- A) Linoleate [18:2(Δ^{9,12})]
- B) Palmitate (16:0)
- C) Phosphatidylcholine
- D) Pyruvate
- E) Stearate (18:0)

38. Glutathione is a(n):

- A) enzyme essential in the synthesis of glutamate.
- B) isomer of oxidized glutamic acid.
- C) methyl-group donor in many biosynthetic pathways.
- D) product of glutamate and methionine.
- E) tripeptide of glycine, glutamate, and cysteine.

39. Bile pigments are:

- A) formed in the degradation of heme.
- B) generated by oxidation of sterols.
- C) responsible for light reception in the vertebrate eye.
- D) secreted from the pancreas
- E) the products of purine degradation.

40. An important intermediate in the biosynthetic pathway to aromatic amino acids is:

- A) benzoic acid.
- B) lactate.
- C) orotate.
- D) shikimate.
- E) α-ketoglutarate.