

國立中興大學107學年度碩士班招生考試試題

科目：生物化學

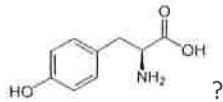
系所：生物科技學研究所

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本科目試題共 **6** 頁

選擇題，每題答對得 1.5 分。答錯倒扣 0.5 分。

1. Which microorganism is frequently used to mediate the gene transformation of plant?
 - a) *Agrobacteria tumefaciens*
 - b) *Bacillus amyloliquefaciens*
 - c) *Streptococcus aeruginosa*
 - d) *Xanthomonas campestris*
2. Which microorganism is the original source for the restriction endonuclease *HindIII*?
 - a) *Bacillus amyloliquefacien*
 - b) *Escherichia coli*
 - c) *Haemophilus influenza*
 - d) *Klebsiella pneumonia*
3. Which cofactor is required for the reaction catalyzed by T4 DNA ligase?
 - a) ATP
 - b) Biotin
 - c) NADH
 - d) NADPH
4. Which amino acid does contribute most to the 280 nm absorbance of a protein?
 - a) Methionine
 - b) Phenylalanine
 - c) Proline
 - d) Tryptophan
5. Which amino acid does have the structure depicted below.



 - a) Histidine
 - b) Phenylalanine
 - c) Tryptophan
 - d) Tyrosine
6. What is the complementary sequence of the oligonucleotide 5'-GAATCTTAGTACC-3' ?
 - a) 5'-CCATGATTCTTAAG-3'
 - b) 5'-CTTAAGAATCATGG-3'
 - c) 5'-GGTACTAAGAATTC-3'
 - d) 5'-GAAUUCUUAGUACC-3'
7. A double-helix B-DNA region has the sequence 5'-TTCTTAGTAC-3' in one of its strand. What is the length of this DNA region?
 - a) 3.4 nm
 - b) 5.4 nm
 - c) 0.20 μm
 - d) 0.20 mm
8. Dissolving 80 mg sodium hydroxide into 200 ml water will give you a solution with pH value of?
 - a) 13
 - b) 12
 - c) 11
 - d) 10
9. Which dye is frequently used to detect DNA fragments in DNA electrophoresis?
 - a) Bromophenol blue
 - b) Coomassie blue
 - c) Ethidium bromide
 - d) Mthylene blue
10. Which dye is considered a carcinogen?
 - a) Bromophenol blue
 - b) Coomassie blue
 - c) Ethidium bromide
 - d) Mthyl blue
11. Saline solution contains NaCl 0.86% (w/v). What is the molarity of saline? (MW of NaCl is 58)
 - a) 49 mM
 - b) 68 mM
 - c) 148 mM
 - d) 210 mM

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12. Which is NOT a radio-active isotope?

- a) ^3H
- b) ^{12}C
- c) ^{32}P
- d) ^{35}S

13. Which is NOT a stop codon in protein translation?

- a) UAG
- b) UAA
- c) UGG
- d) UGA

14. Which RNA species is related to plant defense mechanism?

- a) miRNA
- b) siRNA
- c) soRNA
- d) trcRNA

15. What is the basis for the separation of proteins by gel filtration chromatography?

- a) Hydrophobic patch on protein surface
- b) Net charges on protein surface
- c) Molecular sizes
- d) Specific interaction between protein and resin

16. What is the purpose of doing Western blotting?

- a) Protein detection
- b) DNA detection
- c) RNA detection
- d) DNA amplification

17. Chitin is a polymer of?

- a) Arabinose
- b) Glucose
- c) N-acetyl glucosamine
- d) Neuraminic acid

18. What is the substrate that can be hydrolyzed by amylase?

- a) Cellulose

b) Chitin

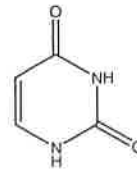
c) Hemicellulose

d) Starch

19. Cellulose is a polymer composed of glucose. What is the chemical linkage between each glucose unit in cellulose?

- a) β -1,3-linkage
- b) α -1,3-linkage
- c) β -1,4-linkage
- d) α -1,6-linkage

20. Which base does have the structure indicated below?



- a) Adenine
- b) Cytosine
- c) Guanine
- d) Uracil

21. What is the average size of the proteins encoded by a 1-kb open reading frame?

- a) 13,000 Dalton
- b) 25,000 Dalton
- c) 37,000 Dalton
- d) 56,000 Dalton

22. What is the average molecular weight of a 1-kb mRNAs?

- a) 35,000 Dalton
- b) 70,000 Dalton
- c) 150,000 Dalton
- d) 350,000 Dalton

23. Which organism does not have a nucleus?

- a) Bacteria
- b) Yeast

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本科目試題共6頁

- c) Nematode
d) Plant
24. Which intracellular organelle does NOT contain genetic materials?
a) Endoplasmic reticulum
b) Mitochondria
c) Nucleus
d) Chloroplast
25. What fold is the proton concentration of a buffer solution with pH 5.0 to that with pH 7.0?
a) 2
b) 10
c) 100
d) 500
26. What can be the range of size of a bacterial coccus?
a) 0.5 ~ 2 mm
b) 0.5 ~ 2 μm
c) 0.5 ~ 2 nm
d) 0.5 ~ 2 \AA
27. Which amino acid does only have one cognate translational codon?
a) Met
b) Ser
c) Tyr
d) Val
28. What is the type of genome of influenza viruses?
a) Double-stranded DNA
b) Single-stranded DNA
c) Positive-sense RNAs
d) Negative-sense RNAs
29. If a solution has a pH of 2, a nonpolar amino acid in solution will contain which of the following?
a) A deprotonated carboxylic acid and an overall charge of -1
b) A deprotonated carboxylic acid and an overall charge of +1
c) A protonated amine and an overall charge of +1
d) A deprotonated amine and an overall charge of +1
30. What is the molecular mass (Dalton) of a molecule with the molecular formula of $\text{C}_6\text{H}_{12}\text{O}_6$?
a) 96
b) 154
c) 180
d) 192
31. How much does the radioactivity of a solution of $[\alpha\text{-}^{32}\text{P}]\text{ATP}$ remain after a 42-day storage? (the half-life of ^{32}P is about 14 days)
a) 1/3
b) 1/6
c) 1/8
d) 1/9
32. Which of the following intermolecular interactions is ready to break by adding reducing agents?
a) covalent bond
b) disulfide bond
c) hydrogen bond
d) van der Waals bond
33. Linda is studying the metabolism of proteins in yeast cells to follow the formation of proteins from its earliest point. In her experiment, she will feed the yeast radioactive nutrients and follow the fate of the radioactivity in the cells. Which of the following radioactive atoms will allow her to exclusively follow proteins in the cell?
a) Carbon
b) Nitrogen
c) Phosphorus
d) Sulfur
34. RNA instability in alkaline solutions is due to

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本科目試題共 6 頁

- a) Adenine
b) Ribose
c) Uracil
d) Single strand nature
35. A strand of mRNA is composed of 28% guanine bases. What is the percentage of cytosine in that mRNA?
a) 22
b) 28
c) 32
d) More information is needed to answer this question
36. Which is TRUE about transcription and translation?
a) Transcription and translation may occur simultaneously in prokaryotic cells
b) Transcription and translation may occur simultaneously in eukaryotic cells
c) Transcription and translation occur within the same cellular compartments in eukaryotic cells
d) Spliceosomes remove exon from the pre-mRNA and splice together the introns in eukaryotic cells
37. Which of the following statements regarding enzyme-catalyzed reactions is FALSE?
a) Enzymes form complexes with their substrates
b) Enzymes lower the activation energy for chemical reactions
c) Enzymes change the K_{eq} for chemical reactions
d) Reactions occur at the "active site" of enzymes, where a precise 3D orientation of amino acids is an important feature of catalysis
38. Which of the structure within cells does contain the digestive enzymes to eliminate waste and debris?
a) Golgi body
b) Lysosome
c) Peroxisome
d) Rough endoplasmic reticulum
39. Which of these is an example of disease caused by prion?
a) HIV
b) Parkinson's disease
c) Alzheimer's disease
d) Mad cow disease
40. Which phase of the cell cycle involves DNA replication?
a) G1
b) S
c) G2
d) M
41. What is the normal role of restriction endonucleases in bacterial cells?
a) To degrade the bacterial chromosome into small pieces during replication
b) To degrade invading phage DNA
c) To produce RNA primers for replication
d) All of the above
42. A genomic library is
a) a database where the sequence of an organism's genome is stored
b) a collection of many clones possessing different DNA fragments from the same organisms bound to vectors
c) a book that describes how to isolate DNA from a particular organism
d) a place where the information of the genetic organization of organisms are kept
43. A very common mutualistic, symbiotic relationship between a fungus and the roots of a plant is
a) Lichen
b) Mycorrhizal
c) Ascomycete

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本科目試題共 5 頁

- d) Basidiomycete
44. The volume of O_2 liberated in photosynthesis has which of the following ratio to CO_2 ?
- a) 1:1
b) 2:1
c) 1:2
d) 3:1
45. Gene silencing is one of the defense mechanism which can be induced by several events. Which of the following phenomenon may involve in gene silencing?
- a) Virus infection
b) Overexpression of a gene
c) Transposon
d) All of the above
46. Which of the following sequences (in double strand) contains a six- cutter restriction enzyme site?
- a) CATCTAGAGG
b) GCACTTGCTA
c) TATAGGGTAG
d) GGCCAGATG
47. Northern blotting is a technique used for RNA detection. Which of the following description cannot be performed by Northern blotting?
- a) The relative levels of an mRNA species isolated from different tissues.
b) The size of an mRNA species.
c) The amino acid sequence coded by an mRNA species.
d) The half-life of an mRNA species.
48. Which enzyme is used to make high fructose syrup from glucose solution?
- a) Glucose dehydrogenase
b) Glucose isomerase
c) Glucose oxidase
- d) Glucose permease
49. Which enzyme is used to make bio-diesel from triacylglycerol?
- a) Amylase
b) Glucoamylase
c) Lipase
d) Pectinase
50. Aspartame is an artificial non-saccharide sweetener. What is it?
- a) A dipeptide derivative containing aspartate and phenylalanine
b) A dipeptide derivative containing aspartate and glutamate
c) A dinucleotide derivative containing AMP and GMP
d) A dinucleotide derivative containing CMP and GMP
51. Lovastatin is a drug used to lower serum cholesterol in those with hypercholesterolemia. Which organism may contain lovastatin in nature?
- a) *Aspergillus terreus* (mold)
b) *Arabidopsis thaliana* (plant)
c) *Candida albicans* (yeast)
d) *Saccharomyces cerevisiae* (yeast)
52. Artemisinin (青蒿素) is isolated from the plant *Artemisia annua* to treat what disease?
- a) Alzheimer disease
b) Hepatitis B virus infection
c) Liver cancer
d) Malaria
53. Herceptin (賀治平) is a target drug used to treat breast cancer. What is its nature?
- a) compound isolated from plant
b) compound isolated from fungus
c) monoclonal antibody

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- d) nucleotide analog
54. Where can you find pluripotent hematopoietic stem cells?
- Blood
 - Bone marrow
 - Spleen
 - Thymus
55. Which program is used to protein databases using a translated nucleotide query?
- Blastn
 - Blastp
 - Blastx
 - tBlastn
56. The CRISPR/Cas system, originally found in bacteria, has been developed into a very powerful tool for editing the genomes of plant and animal. What is its function in bacteria?
- Invade it plant host
 - Invade its animal host
 - Kill other bacteria
 - Prevent infection from bacteriophage
57. The crystal protein produced by *Bacillus thuringiensis* (BT) is widely used in agriculture. What is its function?
- Kill pathogenic fungi
 - Kill insect
 - Kill nematode
 - Kill weed
58. The dividing number of primary mammalian cells is limited (40-60 times). This phenomenon is called "Hayflick limit". What is the reason for the limitation?
- Shortening of telomere after cell dividing
 - Instability of centromere during cell dividing
 - Loss of mitochondria during cell dividing
 - All above are true
59. What is the mean of (DE3) in *E. coli* BL21 (DE3) strain?
- The cell carries a lysogenic T7 polymerase gene
 - The cell carries a prophage P1
 - The cell carries a prophage λ
 - The cell carries a transposon Tn3
60. Phenylmethylsulfonyl fluoride (PMSF) is frequently included in the cell lysis buffer. What is its function?
- Increasing protein solubility
 - Keeping pH in constant
 - Inhibiting RNase and DNase activities
 - Inhibiting protease activity

闡述題 (10分)

闡述你對台灣生技產業的現狀和展望，並說明你為何要就讀生技碩士班。