

國立中央大學94學年度碩士班考試入學試題卷 共 2 頁 第 1 頁  
所別：光電科學研究所碩士班 一般生 科目：生物學

一、單選題：(每題四分)

1. When an RNA virus invades a cell, it typically first  
A. causes the cell to make many copies of virus RNA    B. causes the host cell to start dividing    C. closes the channels in the membrane  
D. inserts the RNA into a host chromosome    E. makes a DNA copy of the viral RNA
2. The codons that serve as "stop" signals for the protein synthesis are called  
A. anticodons    B. release codons    C. nonsense codons    D. amino acid codons    E. tRNA codons
3. Cell membranes are composed  
A. mostly of phospholipid molecules with a few protein pumps.    B. mostly of protein with a few phospholipid molecules  
C. DNA and RNA molecules interspersed with RNA molecules    D. entirely of protein molecules    E. none of the above.
4. Proteins possess all of the following functions except  
A. structure    B. metabolism    C. encode genetic information    D. membrane transport    E. cell recognition
5. The polymerase chain reaction, more popularly known as PCR, includes which of the following steps?  
A. denaturation of primers and the DNA fragment to be amplified    B. annealing of primers to the complementary sequences on the DNA  
C. primer extension with DNA polymerase    D. repeating steps 1-3 in many cycles    E. all of the above
6. Humans who have lost even one copy of an autosome are called  
A. tetrasomics    B. trisomics    C. bisomics    D. monosomics    E. nullisomics
7. A person with type A blood might be either heterozygous or homozygous. One way to find out is to  
A. count the type A red blood cells    B. test for type A sugars on red blood cells    C. test the offspring after the person mates with a B type  
D. test the offspring after the person mates with an O type    E. test the offspring after the person mates with a homozygous type A
8. Cell migration is dependent on all of the following except  
A. cadherins    B.  $Ca^{+2}$  binding sites    C. changing patterns of adhesion    D. auxins    E. integrins
9. Which one of the following is not one of the theories advanced for the aging of animals?  
A. accumulated mutation, telomere depletion    B. wear and tear    C. gene clock    D. microbial infection    E. immunological exhaustion
10. The bond connecting one nucleotide with the next one along the chain is called a  
A. C=C bond    B. hydrogen bond    C. hydrophobic bond    D. phosphodiester bond    E. peptide bond
11. The two strands in the DNA molecule contain nitrogen bases which are  
A. identical    B. parallel    C. complimentary    D. the same in all species    E. exact copies of the protein they make
12. Gene expression includes which two of the following processes?  
A. transcription and replication    B. replication and repression    C. protein synthesis and replication    D. mutation and cell division  
E. transcription and translation

注意：背面有試題

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13. Which of the following statements about photosynthesis and respiration is true?  
A) Respiration occurs in plants as well as animals, and for the same reason (ATP production).  
B) Respiration occurs only in animals and photosynthesis occurs only in plants.  
C) Respiration occurs in plants, but no ATP is produced by plant respiration.  
D) Respiration occurs in plants as well as in animals, but the cellular details of the process are very different in plants and animals.
14. Cells cannot increase in size beyond a theoretical maximum because  
A) the surface area of a larger cell is insufficient for nutrient and waste exchange.  
B) the number of mitochondria would be insufficient for adequate energy production.  
C) larger cells would need more structural support.  
D) the nucleus would contain inadequate amounts of DNA in a larger cell.
15. The most basic reason why animals need a continuous supply of oxygen is because  
A. it is needed to make carbon dioxide B. without it, animals cannot synthesize protein C. without it, animals cannot dispose of carbon dioxide D. it is needed to carry out glycolysis E. without it, animals cannot obtain enough energy from their food
16. Structure in the living world is organized at hierarchical levels. Which of the following choices lists several of these from least inclusive to most inclusive?  
A. cell, molecule, organ, organ system, tissue, organism B. molecule, cell, tissue, organ, organ system, organism C. molecule, cell, organ, organ system, tissue, organism D. cell, molecule, tissue, organ, organ system, organism E. molecule, cell, tissue, organ system, organ, organism
17. When body temperature is too high, which of the following does not occur?  
A. the thermostatic control center of the brain is activated. B. blood vessels in the skin contract. C. evaporative cooling occurs  
D. heat radiates from the skin. E. blood vessels at the body surface fill with warm blood
18. Humans are unable to get metabolic energy from cellulose because  
A. cellulose contains very little chemical energy B. cellulose is not part of a normal diet C. cellulose digesting enzymes are absent D. cellulose does not taste good E. cellulose is present in large quantities in the gut
19. Plant physiologists often incubate plant tissue in an extract of termite gut to dissolve the cell wall. After this incubation treatment, the structure left is called  
A. the parenchyma B. a guard cell C. a companion cell D. the endodermis E. a protoplast
20. You are conducting research on nerve cells. During an experiment, you administer an electrical stimulation to the cells. The probable result of this stimulation will be  
A. start the membrane water pump B. open gated channels C. cause increased saturation of phospholipid tails D. result in increased membrane fluidity and asymmetry

二、問答題 (10 points/each)

1. How do you think the impact of recombinant DNA technology on both the basic research in life sciences and biotechnology?
2. Please describe the potential application of optical technology in life science research?