

系所組別：生物資訊與訊息傳遞研究所甲、乙組

考試科目：生命科學概論

考試日期：0307，節次：3

※ 考生請注意：本試題  可  不可 使用計算機

請勿在本試題紙上作答，否則不予計分

## 一、單選題 (40 分，每題 2 分)

(Single-choice questions; 2 points each)

1. Unlike eukaryotic cells, prokaryotic cells \_\_\_.
  - a. lack a plasma membrane
  - b. have RNA, not DNA
  - c. have no nucleus
  - d. all of the above
  
2. Alleles are \_\_\_.
  - a. different molecular forms of the same gene
  - b. different phenotypes
  - c. self-fertilizing, true-breeding homozygotes
  - d. all chromosomes aligned at spindle equator
  
3. A difference between the meiotic and mitotic cell cycles in mammals is that in the meiotic cycle \_\_\_.
  - a. G1 and S phases occur in the interphase
  - b. cycling occurs only in the germ cells
  - c. spindle fibers are attached to kinetochores
  - d. the spindle forms during prometaphase
  
4. Meiosis \_\_ the parental chromosome number.
  - a. doubles
  - b. reduces
  - c. maintains
  - d. corrupts
  
5. Nondisjunction at meiosis can result in \_\_\_.
  - a. an inversion
  - b. a translocation
  - c. crossing-over
  - d. aneuploidy

(背面仍有題目,請繼續作答)

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6. The \_\_\_ are major decomposers
- fungi
  - viruses
  - ciliates
  - insect
7. \_\_\_ are molecules released from a signaling cell that have effects on target cells.
- Hormones
  - Pheromones
  - Neurotransmitters
  - Local signaling molecules
  - Both a and b
  - a through d
8. \_\_\_ are targets of effector cytotoxic T cells.
- Extracellular virus particles in blood
  - Virus-infected body cells or tumor cells
  - Parasitic flukes in the liver
  - Pollen grains in nasal mucus
  - Bacterial cells in pus
9. Water transport from roots to leaves occurs by \_\_\_
- pressure flow
  - active transport
  - the pumping force of xylem vessels
  - cohesion-tension among water molecules
10. The reason that a mutation carried on human mitochondrial DNA is inherited through the mother only is that \_\_\_
- sperm cells do not contain mitochondrial DNA
  - maternal mitochondrial DNA is degraded in the zygote
  - paternal mitochondrial DNA does not enter the egg
  - egg cell mitochondria lack DNA

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11. Which of the enzymes listed below is involved in repair of *both* thymine dimers and deaminate cytosine in *E. coli*? \_\_
- DNA polymerase III
  - Uracil N-glycosylase
  - DNA polymerase I
  - AP endonuclease
12. The “nucleosome” \_\_
- contains only DNA and nonhistone proteins
  - has a core of histones with DNA wound around it
  - is fully responsible for DNA packaging into chromosomes
  - surrounds nuclear pores
13. The major events of mitotic prophase include all of the following except \_\_
- chromosome coiling
  - DNA replication
  - nuclear envelope breakdown
  - nucleolar disaggregation
14. Plants with both sexes on the same organism prevent self-fertilization by \_\_
- forming glycoproteins on pollen and not the stigma
  - forming pollen and eggs in different flowers
  - having identical CAM's on the cell surfaces of reproductive tissues
  - not coding for callose, which normally enhances fertilization
15. The molecular biology of protein synthesis in nucleus-cytoplasm and mitochondrial systems use the same \_\_
- genetic code
  - linearity of DNA
  - size of ribosomes
  - structures of amino acids

(背面仍有題目,請繼續作答)

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16. Modifications of proteins as they pass through the Golgi include all of the following except \_\_
- glycosylation
  - proteolysis
  - signal sequence removal
  - sulfation
17. Which of the following bacteria is the pathogen of gastric ulcer ? \_\_
- Salmonella typhi
  - Helicobacter pylori
  - E coli
  - Vibro Cholerae
  - Mycobacterium tuberculosis
18. Which of the following characteristics is a characteristic of a G protein in membranes ? \_\_
- can bind to both a receptor and an effector
  - act as tyrosine protein kinases
  - bind only to GTP but not to GDP
  - cannot act at a gated channel
19. A "niche"\_\_.
- is the sum of activities and relationships in a community by which individuals of a species secure and use resources
  - is unvarying for a given species
  - shifts in large and small ways
  - both a and c
20. Natural selection may occur when there are \_\_
- differences in the adaptiveness of forms of traits to prevailing environmental conditions
  - differences in survival and reproduction among individuals that differ in one or more traits
  - both a and b

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## 二、名詞解釋 (24 分，每題 3 分)

(Please briefly describe the following terms; 3 points each)

1. Central Dogma
2. Transposons
3. Tumor suppressor genes
4. Second messengers
5. Proteasome degradation
6. small interfering RNA (siRNA)
7. Chromatin immunoprecipitation (ChIP)
8. Replicative senescence

## 三、簡答題 (總共佔 36 分)

(Answer the following questions; total score =36 points)

1. Please briefly describe how Oswald Avery was able to show that DNA is the genetic material in cells. (5 points)
2. Explain how a DNA sequence (enhancer sequence) located 5,000 base pairs from a gene transcription start site can stimulate transcription even if its orientation is reversed. (6 points)
3. What functional sites and domains are present on steroid hormone receptors? (3 points) Outline the molecular mechanism by which steroid hormones regulate genes. (5 points)
4. Please list two methods you know to identify novel protein-protein interactions, and give a brief description. (6 points)
5. The Nobel Prize in Physiology or Medicine 2009 is awarded to Elizabeth H. Blackburn, Carol W. Greider and Jack W. Szostak for the discovery of how chromosomes are protected by telomeres and the enzyme telomerase. What are telomeres? (3 points) What special problems occur at the telomere in replication of the leading chain? (4 points) How are these problems apparently solved in eukaryotes? (4 points)