

八十六學年度 生命科學 系(所) 分生組甲、乙  
生醫組甲、乙 組碩士班研究生入學考試

科目 生物學 科號 0902、1003  
L202、L303 共 8 頁第 / 頁 \*請在試卷【答案卷】內作答

(一)選擇題(單選，不倒扣，每題1.5分，共66分，請將答案寫在選擇題答案格內)

1. Restriction fragments of DNA are separated from one another by which process?
  - a. filtering
  - b. centrifugation
  - c. gel electrophoresis
  - d. chromatography
  - e. electron microscopy
  
2. Which of the following technologies would you use when trying to determine the evolutionary relationship between horses and zebras?
  - a. All of the techniques below might prove useful
  - b. DNA-DNA hybridization
  - c. analysis of cytochrome c differences
  - d. restriction mapping of DNA
  - e. analysis of fossil DNA
  
3. Eukaryotic sexual life cycles show tremendous variation. Of the following elements, which do all sexual life cycles have in common?
 

I. copulation	a. I, IV, and V
II. meiosis	b. I, II, and IV
III. fertilization	c. II, III, and IV
IV. gametes	d. II, IV, and V
V. spores	e. all of the above
  
4. A Barr body is normally found in the nucleus of which kind of human cell?
  - a. unfertilized egg cells only
  - b. sperm cells only
  - c. somatic cells of a female only
  - d. somatic cells of a male only
  - e. both male and female somatic cells
  
5. Ichthyosaur was an aquatic dinosaur. Fossils show us that it had a dorsal fin and a tail just as fish do, even though its closest relatives were terrestrial reptiles that had neither dorsal fins nor aquatic tails. The dorsal fins and tails of ichthyosaurs and fish are
  - a. homologous.
  - b. analogous.
  - c. adaptations to a common environment
  - d. Both a and c are correct.
  - e. Both b and c are correct

八十六學年度 生命科學 系(所) 分生組甲、乙  
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科目 生物學 科號 C902 · 1003  
L202 · 1303 共 8 頁第 2 頁 \*請在試卷【答案卷】內作答

6. Which of the following represents an order of increasingly higher levels of organization?
- nucleosome, 30-nanometer chromatin fiber, looped domain
  - looped domain, 30-nanometer chromatin fiber, nucleosome
  - looped domain, nucleosome, 30-nanometer chromatin fiber
  - nucleosome, looped domain, 30-nanometer chromatin fiber
  - 30-nanometer chromatin fiber, nucleosome, looped domain
7. Human fertility drugs increase the chance of multiple births, probably because they
- enhance implantation.
  - stimulate follicles.
  - mimic progesterone.
  - stimulate sperm.
  - prevent parturition.
8. Two strains of Hfr cells were allowed to conjugate. The conjugation was interrupted at 5-minute intervals and the following fragments were obtained: ZDKJ, LYMG, AZDK, KPVQ, QLYM. What is the correct sequence for these genes in the chromosome?
- DKPLYMQVPGA
  - AZDKPVQLYMG
  - YLQVMGAZDKJ
  - GMLYQZVPKDA
  - GVMQYLAZDKJ
9. Which of the following statements about succession is correct?
- Secondary succession occurs where no soil has previously existed.
  - Primary succession occurs in areas where soil remains after a disturbance.
  - Disturbances can stabilize community structure or initiate, or alter, succession, depending on the severity and the duration of the disturbance.
  - Some cases of succession involve facilitation, a phenomenon in which species inhibit the growth of newcomers.
  - Through successional dynamics, most communities will eventually reach a stable climax with maximum diversity.
10. What do both mitochondria and chloroplasts have in common?
- ATP is produced.
  - DNA is present.
  - Ribosomes are present.
  - Only b and c are correct.
  - a, b, and c are correct.
11. Which kind of metabolic poison would most directly interfere with glycolysis?
- an agent that reacts with oxygen and depletes its concentration in the cell
  - an agent that binds to pyruvate and inactivates it
  - an agent that closely mimics the structure of glucose but is nonmetabolic
  - an agent that reacts with NADH and oxidizes it to NAD<sup>+</sup>
  - an agent that inhibits the formation of acetyl coenzyme A

八十六學年度 生命科學 系(所) 分生組甲、乙  
主審組甲、乙 組碩士班研究生入學考試

科目 生物學 科號 1002、1003  
1202、1303 共 8 頁第 3 頁 \*請在試卷【答案卷】內作答

12. Which term best describes a change in allelic frequencies due to an influx of new members into a population?
- gene flow
  - genetic drift
  - founder effect
  - selection
  - convergent evolution
13. The globin pseudogenes lack introns. This supports which of the following hypotheses?
- Some pseudogenes are transposons involving reverse transcription.
  - Some pseudogenes arose from mutations in duplicated genes.
  - Some pseudogenes arose from RNA introduced into the cell by a virus.
  - Some pseudogenes arose from mistakes in DNA replication and recombination.
  - Some pseudogenes arose from mistakes in transcription of functional genes.
14. Neurotransmitters are released from presynaptic axon terminals into the synaptic cleft by which of the following mechanisms?
- osmosis
  - active transport
  - diffusion
  - endocytosis
  - exocytosis
15. Which ecological unit incorporates abiotic factors?
- community
  - ecosystem
  - population
  - species
  - symbiosis
16. Which of the following statements about the light reactions of photosynthesis is FALSE?
- The splitting of water molecules provides a source of electrons.
  - Chlorophyll (and other pigments) absorb light energy which excites electrons.
  - An electron transport chain is used to create a proton gradient.
  - The proton gradient is used to reduce NADP.
  - Some electrons are recycled and some are not.
17. The clonal selection theory is an explanation for
- how a single type of stem cell can produce both red blood cells and white blood cells
  - how antibody proteins can be molded to fit antigens after the antigen interacts with an antibody-producing type of cell
  - how an antigen can provoke development of very few cells to result in production of high levels of specific antibodies
  - how HIV can disrupt the immune system
  - how macrophages can recognize specific T cells and B cells.

八十六學年度 生命科學 系(所) 分生組甲、乙 組碩士班研究生入學考試  
 生醫組甲、乙

科目 生物學 科號 0902、1005 共 8 頁 第 4 頁 \*請在試卷【答案卷】內作答  
 1702、1303

18. Which of the following disciplines has contributed LEAST to the body of evidence for evolution?
- biogeography
  - mycology
  - molecular biology
  - taxonomy
  - paleontology
19. The endoplasmic reticulum and Golgi apparatus are very similar among the groups of alga-like protists, but chloroplasts differ significantly and appear to be related in different prokaryotes. What do these facts imply about the evolution of the endomembrane organelle system of eukaryotic cells?
- The Golgi apparatus evolved before the endomembrane system.
  - Endomembrane systems evolved before chloroplasts.
  - Endomembrane systems evolved from symbiotic prokaryotes.
  - Endomembrane systems evolved after chloroplasts.
  - Chloroplasts evolved before the endoplasmic reticulum.
20. All of the following statements about adenylyl cyclase are correct EXCEPT.
- ATP is its substrate.
  - It is the second messenger within cells.
  - It mediates cellular responses to some hormones.
  - It is found in the plasma membrane.
  - It is an enzyme.
21. In vertebrates, urea and uric acid are made in:
- the liver.
  - the kidneys.
  - the bladder.
  - the pancreas.
  - all of the organism's cells.
22. If a population of plants is transplanted to a higher latitude, which of the following processes is the most likely to be modified by natural selection?
- circadian rhythm
  - photoperiodic response
  - phototropic response
  - biological clock
  - triglyceridogenesis
23. One of the functions of cholesterol in animal cell membranes is to:
- facilitate transport of ions.
  - store energy.
  - maintain membrane fluidity.
  - speed diffusion.
  - phosphorylate ADP.

八十六學年度 生命科學 系(所) 分生組甲、乙  
主醫組甲、乙 組碩士班研究生入學考試

科目 生物學 科號 0902 : 1063  
1202 : 1301 共 8 頁第 5 頁 \*請在試卷【答案卷】內作答

24. Which is NOT characteristic of all mammals?
- a four-chambered heart that prevents mixing of oxygenated and deoxygenated blood
  - give birth to live young (viviparous)
  - have hair during at least some period of their life
  - have glands to produce milk to nourish their offspring
  - have a diaphragm to assist in ventilating the lungs
25. Which of the following is a function of the acrosome during fertilization?
- to block polyspermy
  - to help propel the sperm
  - to digest the exterior coats of the egg
  - to nourish the mitochondria of the sperm
  - to trigger the completion of meiosis by the sperm cell
26. A rapid method of speciation that has been important in the history of flowering plants is
- genetic drift
  - parapatric speciation
  - a mutation in the gene controlling the timing of flowering
  - behavioral isolation
  - polyploidy
27. Phylogeny is the
- life-history of an organism.
  - evolutionary history of a species.
  - theory of evolution by natural selection
  - branch of biology concerned with the diversity of life.
  - branch of biology concerned with the relations between plants and the earth's surface
28. Which of the following is the antibiotic mechanism of tetracycline?
- It oxidizes the chemical bonds of organic macromolecules
  - It uncouples the rotary motor of prokaryotic flagella.
  - It plasmolyzes the plasma membrane.
  - It binds to prokaryotic ribosomes.
  - It disrupts the cell wall.
29. What do fungi and arthropods have in common?
- Both groups are commonly coenocytic
  - The haploid state is dominant in both groups
  - Both groups are predominantly saprobes in nutrition
  - Both groups use chitin for the construction of protective coats
  - Both groups have cell walls
30. If inheritance of a human trait is sex-linked (on the X chromosome) and recessive, any of the following could result EXCEPT that
- expression of the trait might "skip" a generation
  - the trait could be more common in females than males
  - all females might become homozygous for the trait
  - the gene for the trait might mutate to a dominant allele
  - females could be a mosaic of two cell types.

八十六學年度 生命科學 系(所) 分生組甲、乙  
生醫組甲、乙 組碩士班研究生入學考試

科目

生物學

科號 0902 : 1302  
1202 : 1301

共 8 頁第 6 頁 \*請在試卷【答案卷】內作答

31. A couple who are both carriers for the gene for cystic fibrosis have two children who have cystic fibrosis. What is the probability that their next child will have cystic fibrosis?
- 0%
  - 25%
  - 50%
  - 75%
  - 100%
32. Accuracy in the translation of mRNA into the primary structure of a protein depends on specificity in the
- binding of ribosomes to mRNA
  - shape of the A and P sites of ribosomes
  - bonding of the anticodon to the codon
  - attachment of amino acids to tRNAs
  - Both c and d are correct
33. If there were no mycorrhizae, which of the following would be true?
- There would be fewer infectious diseases
  - We wouldn't have antibiotics like penicillin
  - There would be no mushrooms for pizza.
  - A lot of trees would not grow well
  - Cheeses like blue cheese or Roquefort could not exist
34. One of the major distinctions between plants and the algal protists is that
- only algal protists have flagellated, swimming sperm.
  - embryos are not retained within parental tissues in protists.
  - meiosis proceeds at a faster pace in protists than in plants
  - chlorophyll pigments in algal protists are different from those in plants.
  - only plants form a cell plate during cytokinesis
35. The process of intracellular digestion is usually preceded by
- hydrolysis
  - endocytosis.
  - absorption
  - elimination.
  - secretion
36. A 1:2:1 phenotypic ratio in the F<sub>2</sub> generation of a monohybrid cross is a sign of
- complete dominance
  - multiple alleles
  - intermediate inheritance.
  - polygenic inheritance.
  - pleiotropy.
37. Which of the following is a true statement about nitrogen fixation in root nodules?
- The plant contributes the nitrogenase enzyme.
  - The process is relatively inexpensive in terms of ATP costs
  - Leghemoglobin helps maintain a low O<sub>2</sub> concentration within the nodule
  - The process tends to deplete nitrogen compounds in the soil.
  - The bacteria of the nodule are autotrophic.

八十六學年度 生命科學 系(所) 分生組甲、乙  
生醫組甲、乙 組碩士班研究生入學考試

科目 生物學 科號 10902、1003  
1202、1303 共 8 頁第 7 頁 \*請在試卷【答案卷】內作答

38. Phloem transport of sucrose can be described as going from "source to sink". Which of the following would not normally function as a sink?
- a. growing leaf
  - b. growing root
  - c. storage organ in summer
  - d. mature leaf
  - e. shoot tip
39. Where is eukaryotic ribosomal RNA transcribed?
- a. the Golgi apparatus
  - b. ribosomes
  - c. nucleoli
  - d. X-chromosomes
  - e. prokaryotic cells only
40. In a hospital, a bacterium is isolated that is resistant to an antibiotic previously used against other kinds of bacteria. This is most likely the result of
- a. transposition
  - b. reverse transcription
  - c. transduction
  - d. transformation
  - e. insertion
41. Breathing is usually regulated by
- a. erythropoietin levels in the blood
  - b. the concentration of red blood cells
  - c. hemoglobin levels in the blood
  - d. CO<sub>2</sub> and O<sub>2</sub> concentration and pH-level sensors
  - e. the lungs and the larynx
42. What is one characteristic that separates chordates from all other animals?
- a. true coelom
  - b. hollow dorsal nerve cord
  - c. blastopore, which becomes the anus
  - d. bilateral symmetry
  - e. segmentation
43. In comparing myoglobin to adult hemoglobin, it would be correct to say that myoglobin
- a. has approximately the same molecular mass
  - b. has a greater affinity for oxygen
  - c. contains magnesium instead of iron
  - d. contains a greater amount of iron
  - e. Both a and d are correct
44. Which functional plant cells lack a nucleus?
- a. xylem only
  - b. sieve tube cells only
  - c. companion cells only
  - d. both companion and parenchyma cells
  - e. both xylem and sieve tube cells

八十六學年度 生命科學 系(所) 分生組甲、乙  
生書組甲、乙 組碩士班研究生入學考試

科目 生物學 科號 0X12 : 1301  
1302 : 1303 共 5 頁第 8 頁 \*請在試卷【答案卷】內作答

(二)問答題

1. 請說明狂牛病的可能病源、傳播方式以及致病機制。(8分)
2. 去年科學家找到了那些證據而推論火星上曾經有生命存在?(6分)
3. 請畫個簡圖描述 HIV 病毒感染人體細胞及繁殖的過程。由感染到發病通常有數年時間,在這期間免疫系統可能經歷了那些變化?目前採用那些醫療方式?(12分)
4. 請描述深海熱泉(Hydrothermal vents)的地理位置以及生態系統中的成員、能量來源與能量轉移的情形。(8分)