

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期： 0710 · 節次： 3

※ 考生請注意：本試題 可 不可 使用計算機**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

- 1) Which type of bond must be broken for water to vaporize?
 - A) covalent bonds
 - B) polar covalent bonds
 - C) ionic bonds
 - D) hydrogen bonds
- 2) Temperature usually increases when water condenses. Which behavior of water is most directly responsible for this phenomenon?
 - A) the release of heat by the breaking of hydrogen bonds
 - B) the change in density when it condenses to form a liquid or solid
 - C) reactions with other atmospheric compounds
 - D) the release of heat by the formation of hydrogen bonds
- 3) Research indicates that Albuterol, a drug used to relax bronchial muscles, improving airflow and thus offering relief from asthma, consists only of one enantiomer, the R-form. Why is it important for this drug to consist of only one enantiomeric form, rather than a mixture of enantiomers?
 - A) It is impossible to synthesize mixtures of enantiomers.
 - B) Albuterol is an example of a compound for which only one enantiomer exists.
 - C) It is much less expensive to synthesize one enantiomer at a time.
 - D) Different enantiomers may have different or opposite physiological effects.
- 4) Testosterone and estradiol are male and female sex hormones, respectively, in many vertebrates. In what way(s) do these molecules differ from each other?
 - A) Testosterone and estradiol are structural isomers but have the same molecular formula.
 - B) Testosterone and estradiol are enantiomers of the same organic molecule.
 - C) Testosterone and estradiol are geometric isomers but have the same molecular formula.
 - D) Testosterone and estradiol have different functional groups attached to the same carbon skeleton.
- 5) Which type of interaction stabilizes the alpha (α) helix and the beta (β) pleated sheet structures of proteins?
 - A) nonpolar covalent bonds
 - B) ionic bonds
 - C) hydrogen bonds
 - D) hydrophobic interactions
- 6) Humans can digest starch but not cellulose because
 - A) humans harbor starch-digesting bacteria in the digestive tract.
 - B) the monomer of starch is glucose, while the monomer of cellulose is galactose.
 - C) the monomer of starch is glucose, while the monomer of cellulose is maltose.
 - D) humans have enzymes that can hydrolyze the alpha (α) glycosidic linkages of starch but not the beta (β) glycosidic linkages of cellulose.
- 7) Which of the following statements about the 5' end of a polynucleotide strand of DNA is correct?
 - A) The 5' end is the fifth position on one of the nitrogenous bases.
 - B) The 5' end has thymine attached to the number 5 carbon of ribose.
 - C) The 5' end has a phosphate group attached to the number 5 carbon of ribose.
 - D) The 5' end has a carboxyl group attached to the number 5 carbon of ribose.

(背面仍有題目,請繼續作答)

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期： 0710 · 節次： 3

- 8) Quantum dots are small (15–30 nm diameter), bright particles visible using light microscopy. If the dots can be specifically bound to individual proteins on a plasma membrane of a cell, which of the following *correctly* describes the advantage of using quantum dots in examining proteins?
- A) The dots permit the position of the proteins to be determined more precisely.
 - B) The dots permit the size of the proteins to be determined more precisely.
 - C) The dots permit visualization of proteins interacting with lipids.
 - D) The dots permit the motion of the proteins to be determined more precisely.
- 9) A biologist is studying kidney tubules in small mammals. She wants specifically to examine the juxtaposition of different types of cells in these structures. The cells in question can be distinguished by external shape, size, and 3-dimensional characteristics. Which would be the optimum method for her study?
- A) light microscopy using stains specific to kidney function
 - B) scanning electron microscopy
 - C) cell fractionation
 - D) transmission electron microscopy
- 10) All of the following are part of a prokaryotic cell *except*
- A) ribosomes.
 - B) an endoplasmic reticulum.
 - C) DNA.
 - D) a plasma membrane.
- 11) Recent evidence shows that individual chromosomes occupy fairly defined territories within the nucleus. Given the structure and location of the following parts of the nucleus, which would be more probably involved in chromosome location?
- A) the nuclear lamina
 - B) the nuclear matrix
 - C) the nucleolus
 - D) nuclear pores
- 12) In animal cells, hydrolytic enzymes are packaged to prevent general destruction of cellular components. Which of the following organelles functions in this compartmentalization?
- A) chloroplast
 - B) glyoxysome
 - C) peroxisome
 - D) lysosome
- 13) Grana, thylakoids, and stroma are all components found in
- A) vacuoles.
 - B) chloroplasts.
 - C) lysosomes.
 - D) nuclei.
- 14) How does the cell multiply its peroxisomes?
- A) They are brought into the cell from the environment.
 - B) They are built *de novo* from cytosol materials.
 - C) They split in two after they are too large.
 - D) The cell synthesizes hydrogen peroxide and encloses it in a membrane.
- 15) Cells require which of the following to form cilia or flagella?
- A) centrosomes
 - B) ribosomes
 - C) actin
 - D) A and B only
- 16) Ions can travel directly from the cytoplasm of one animal cell to the cytoplasm of an adjacent cell through
- A) gap junctions.
 - B) desmosomes.
 - C) intermediate filaments.
 - D) plasmodesmata.

- 17) Of the following molecules of the ECM, which is capable of transmitting signals between the ECM and the cytoskeleton?
A) proteoglycans B) collagen C) fibronectin D) integrins
- 18) Which of the following makes it necessary for animal cells, although they have no cell walls, to have intercellular junctions?
A) Maintenance of connective tissue shape requires cells to adhere to one another.
B) Cell membranes do not distinguish the types of ions and molecules passing through them.
C) The relative shapelessness of animal cells requires a mechanism for keeping the cells aligned.
D) Large molecules, especially proteins, do not readily get through one, much less two adjacent cell membranes.
- 19) An animal cell lacking oligosaccharides on the external surface of its plasma membrane would likely be impaired in which function?
A) maintaining fluidity of the phospholipid bilayer
B) transporting ions against an electrochemical gradient
C) establishing the diffusion barrier to charged molecules
D) cell-cell recognition
- 20) A patient has had a serious accident and lost a lot of blood. In an attempt to replenish body fluids, distilled water, equal to the volume of blood lost, is transferred directly into one of his veins. What will be the most probable result of this transfusion?
A) The patient's red blood cells will shrivel up because the blood fluid is hypertonic compared to the cells.
B) The patient's red blood cells will burst because the blood fluid is hypertonic compared to the cells.
C) The patient's red blood cells will shrivel up because the blood fluid is hypotonic compared to the cells.
D) The patient's red blood cells will swell because the blood fluid is hypotonic compared to the cells.
- 21) You are working on a team that is designing a new drug. In order for this drug to work, it must enter the cytoplasm of specific target cells. Which of the following would be a factor that determines whether the molecule enters the cell?
A) similarity of the drug molecule to other molecules transported by the target cells
B) non-polarity of the drug molecule
C) lipid composition of the target cells' plasma membrane
D) blood or tissue type of the patient
- 22) If a membrane protein in an animal cell is involved in the cotransport of glucose and sodium ions into the cell, which of the following is most likely true?
A) Sodium ions can move down their electrochemical gradient through the cotransporter whether or not glucose is present outside the cell.
B) A substance that blocked sodium ions from binding to the cotransport protein would also block the transport of glucose.
C) Glucose is entering the cell along its concentration gradient.
D) The sodium ions are moving down their electrochemical gradient while glucose is moving up.

(背面仍有題目,請繼續作答)

- 23) The sodium-potassium pump in animal cells requires cytoplasmic ATP to pump ions across the plasma membrane. When the proteins of the pump are first synthesized in the rough ER, what side of the ER membrane will the ATP binding site be on?
- It will be on the side facing the interior of the ER.
 - It will be on the cytoplasmic side of the ER.
 - It doesn't matter, because the pump is not active in the ER.
 - It could be facing in either direction because the orientation of proteins is scrambled in the Golgi apparatus.
- 24) The difference between pinocytosis and receptor-mediated endocytosis is that
- pinocytosis is nonselective in the molecules it brings into the cell, whereas receptor-mediated endocytosis offers more selectivity.
 - pinocytosis brings only water into the cell, but receptor-mediated endocytosis brings in other molecules as well.
 - pinocytosis increases the surface area of the plasma membrane whereas receptor-mediated endocytosis decreases the plasma membrane surface area.
 - pinocytosis requires cellular energy, but receptor-mediated endocytosis does not.
- 25) Competitive inhibitors block the entry of substrate into the active site of an enzyme. On which of the following properties of an active site does this primarily depend?
- the enzyme providing an appropriate microenvironment conducive to a reaction's occurrence
 - the enzyme becoming too saturated because of the concentration of substrate
 - the enzyme forming covalent bonds with the reactants
 - the ability of an enzyme to form a template for holding and joining molecules

Use Figure 8.3 to answer the following questions.

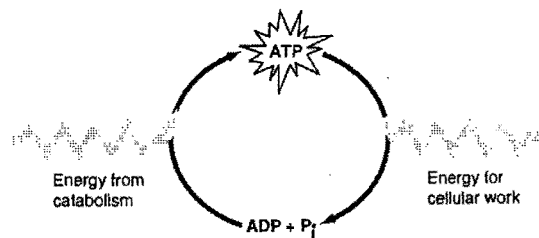


Figure 8.3

- 26) In coupled reactions, in which direction would the endergonic reaction be driven relative to the clockwise direction of the ATP reaction above and shown in the figure?
- from left to right at the top of the figure
 - from right to left at the bottom of the figure
 - it would be shown separately after the figure
 - it would be shown in a clockwise direction at the top of the figure
- 27) An important group of peripheral membrane proteins are enzymes, such as the phospholipases that attack the head groups of phospholipids leading to the degradation of damaged membranes. What properties must these enzymes exhibit?
- | | |
|---|------------------------------|
| A) independence from cofactor interaction | B) resistance to degradation |
| C) membrane spanning domains | D) water solubility |

- 28) Which of the following is likely to lead to an increase in the concentration of ATP in a cell?
- A) an increase in a cell's anabolic activity
 - B) an increased influx of cofactor molecules
 - C) an increase in a cell's catabolic activity
 - D) the cell's increased transport of materials to the environment
- 29) A molecule that is phosphorylated
- A) has been oxidized as a result of a redox reaction involving the gain of an inorganic phosphate.
 - B) has an increased chemical reactivity; it is primed to do cellular work.
 - C) has less energy than before its phosphorylation and therefore less energy for cellular work.
 - D) has been reduced as a result of a redox reaction involving the loss of an inorganic phosphate.
- 30) Cellular respiration harvests the most chemical energy from which of the following?
- A) generating carbon dioxide and oxygen in the electron transport chain
 - B) substrate-level phosphorylation
 - C) transferring electrons from organic molecules to pyruvate
 - D) chemiosmotic phosphorylation
- 31) Where are the proteins of the electron transport chain located?
- A) mitochondrial outer membrane
 - B) cytosol
 - C) mitochondrial inner membrane
 - D) mitochondrial intermembrane space
- 32) In chemiosmotic phosphorylation, what is the most direct source of energy that is used to convert ADP + P_i to ATP?
- A) No external source of energy is required because the reaction is exergonic.
 - B) energy released from substrate-level phosphorylation
 - C) energy released from ATP synthase pumping hydrogen ions from the mitochondrial matrix
 - D) energy released from movement of protons through ATP synthase
- 33) Glycolysis is thought to be one of the most ancient of metabolic processes. Which statement supports this idea?
- A) Glycolysis is found in all eukaryotic cells.
 - B) Glycolysis neither uses nor needs O₂.
 - C) Glycolysis is the most widespread metabolic pathway.
 - D) Ancient prokaryotic cells, the most primitive of cells, made extensive use of glycolysis long before oxygen was present in Earth's atmosphere.
- 34) Even though plants carry on photosynthesis, plant cells still use their mitochondria for oxidation of pyruvate. When and where will this occur?
- A) in photosynthesizing cells in dark periods and in other tissues all the time
 - B) in photosynthetic cells in the light, while photosynthesis occurs concurrently
 - C) in non-photosynthesizing cells only
 - D) in cells that are storing glucose only
- 35) Where do the catabolic products of fatty acid breakdown enter into the citric acid cycle?
- A) succinyl CoA
 - B) α-ketoglutarate
 - C) malate or fumarate
 - D) acetyl CoA

(背面仍有題目,請繼續作答)

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期： 0710 · 節次： 3

Use the data in Table 12.1 to answer the following questions.

The data were obtained from a study of the length of time spent in each phase of the cell cycle by cells of three eukaryotic organisms designated beta, delta, and gamma.

Cell Type	G ₁	S	G ₂	M
Beta	18	24	12	16
Delta	100	0	0	0
Gamma	18	48	14	20

Table 12.1: Minutes Spent in Cell Cycle Phases

- 36) Of the following, the best conclusion concerning the difference between the S phases for beta and gamma is that
- gamma contains more DNA than beta.
 - beta and gamma contain the same amount of DNA.
 - beta is a plant cell and gamma is an animal cell.
 - beta contains more RNA than gamma.
- 37) The research team established similar lymphocyte cultures from a number of human donors, including healthy teenagers of both genders, patients already suffering from long-term bacterial infections, and elderly volunteers. They found that the increase in lymphocyte incorporation after pathogen introduction was slightly lower in some of the women teenagers and significantly lower in each of the elderly persons. They repeated the study with a larger number of samples but got the same results. What might be among their conclusions?
- The young women showed these results because they have poorer nutrition.
 - The elderly donor samples represent cells no longer capable of any cell division.
 - The young men had higher response because they are generally healthier.
 - The elderly persons' samples demonstrated their lowered immune responses.
- 38) What is a genome?
- An ordered display of chromosomes arranged from largest to smallest
 - The complete complement of an organism's genes
 - A specialized polymer of four different kinds of monomers
 - A specific set of polypeptides within each cell
- 39) Referring to a plant sexual life cycle, which of the following terms describes the process that leads *directly* to the formation of gametes?
- Gametophyte meiosis
 - Sporophyte meiosis
 - Sporophyte mitosis
 - Gametophyte mitosis
- 40) Which of the following is an example of alternation of generations?
- A diploid cell divides by mitosis to produce two diploid daughter cells, which then fuse to produce a tetraploid cell.
 - A haploid mushroom produces gametes by mitosis, and the gametes undergo fertilization, which is immediately followed by meiosis.
 - A diploid plant (sporophyte) produces, by meiosis, a spore that gives rise to a multicellular, haploid pollen grain (gametophyte).
 - A diploid animal produces gametes by meiosis, and the gametes undergo fertilization to produce a diploid zygote.

- 41) A cell divides to produce two daughter cells that are genetically different.
 A) The statement is true for mitosis and meiosis I.
 B) The statement is true for mitosis only.
 C) The statement is true for meiosis I only.
 D) The statement is true for meiosis II only.
- 42) For a species with a haploid number of 23 chromosomes, how many different combinations of maternal and paternal chromosomes are possible for the gametes?
 A) 46 B) About 8 million C) 460 D) 920
- 43) In an experiment, DNA is allowed to replicate in an environment with all necessary enzymes, dATP, dCTP, dGTP, and radioactively labeled dTTP (^3H thymidine) for several minutes and then switched to nonradioactive medium. It is then viewed by electron microscopy and autoradiography. The drawing below represents the results.

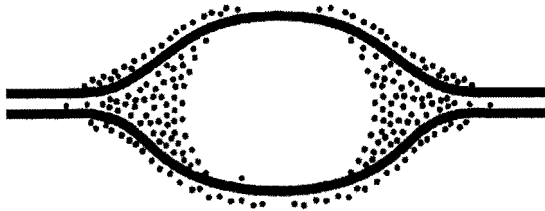


Figure 16.2

Grains represent radioactive material within the replicating eye.

Which is the most likely interpretation?

- A) There are two replication forks going in opposite directions.
 B) Replication proceeds in one direction only.
 C) Thymidine is only being added where the DNA strands are furthest apart.
 D) Thymidine is only added at the very beginning of replication.
- 44) What is the role of DNA ligase in the elongation of the lagging strand during DNA replication?
 A) join Okazaki fragments together B) stabilize the unwound parental DNA
 C) unwind the parental double helix D) catalyze the lengthening of telomeres
- 45) Which of the following help(s) to stabilize mRNA by inhibiting its degradation?
 A) introns B) spliceosomes
 C) TATA box D) 5' cap and poly (A) tail
- 46) When does translation begin in prokaryotic cells?
 A) as soon as transcription has begun
 B) once the pre-mRNA has been converted to mRNA
 C) after the 5' caps are converted to mRNA
 D) after a transcription initiation complex has been formed
- 47) Why might a point mutation in DNA make a difference in the level of protein's activity?
 A) It might exchange one serine codon for a different serine codon.
 B) It might substitute an amino acid in the active site.
 C) It might exchange one stop codon for another stop codon.
 D) It might substitute the N terminus of the polypeptide for the C terminus.

(背面仍有題目,請繼續作答)

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期： 0710 · 節次： 3

- 48) If you were to observe the activity of methylated DNA, you would expect it to
- A) be very actively transcribed and translated.
 - B) be replicating nearly continuously.
 - C) have turned off or slowed down the process of transcription.
 - D) induce protein synthesis by not allowing repressors to bind to it.
- 49) In eukaryotes, general transcription factors
- A) usually lead to a high level of transcription even without additional *specific* transcription factors.
 - B) inhibit RNA polymerase binding to the promoter and begin transcribing.
 - C) bind to other proteins or to a sequence element within the promoter called the TATA box.
 - D) are required for the expression of specific protein-encoding genes.
- 50) At the beginning of this century there was a general announcement regarding the sequencing of the human genome and the genomes of many other multicellular eukaryotes. There was surprise expressed by many that the number of protein-coding sequences is much smaller than they had expected. Which of the following accounts for most of the rest?
- A) rRNA and tRNA coding sequences
 - B) non-protein coding DNA that is transcribed into several kinds of small RNAs without biological function
 - C) non-protein coding DNA that is transcribed into several kinds of small RNAs with biological function
 - D) "junk" DNA that serves no possible purpose
- 51) In humans, the embryonic and fetal forms of hemoglobin have a higher affinity for oxygen than that of adults. This is due to
- A) histone proteins changing shape during embryonic development.
 - B) nonidentical genes that produce different versions of globins during development.
 - C) identical genes that generate many copies of the ribosomes needed for fetal globin production.
 - D) the attachment of methyl groups to cytosine following birth, which changes the type of hemoglobin produced.
- 52) RNAi methodology uses double-stranded pieces of RNA to trigger a breakdown or blocking of mRNA. For which of the following might it more possibly be useful?
- A) to form a knockout organism that will not pass the deleted sequence to its progeny
 - B) to decrease the production from a harmful gain-of-function mutated gene
 - C) to raise the concentration of a desired protein
 - D) to raise the rate of production of a needed digestive enzyme
- 53) A researcher has used in vitro mutagenesis to mutate a cloned gene and then has reinserted this into a cell. In order to have the mutated sequence disable the function of the gene, what must then occur?
- A) attachment of the mutated gene to an existing mRNA to be translated
 - B) replication of the cloned gene using a bacterial plasmid
 - C) transcription of the cloned gene using a BAC
 - D) recombination resulting in replacement of the wild type with the mutated gene

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期：0710 · 節次：3

- 54) In many ways, the regulation of the genes of a particular group of viruses will be similar to the regulation of the host genes. Therefore, which of the following would you expect of the genes of the bacteriophage?
- A) positive control mechanisms rather than negative
 - B) control of more than one gene in an operon
 - C) regulation via acetylation of histones
 - D) utilization of eukaryotic polymerases
- 55) What are prions?
- A) tiny molecules of RNA that infect plants
 - B) a mobile segment of DNA
 - C) viral DNA that has had to attach itself to the host genome
 - D) misfolded versions of normal brain protein
- 56) Which of Darwin's ideas had the strongest connection to Darwin having read Malthus's essay on human population growth?
- A) Variation among individuals in a population
 - B) That the ancestors of the Galapagos finches had come from the South American mainland
 - C) The ability of related species to be conceptualized in "tree thinking"
 - D) Struggle for existence
- 57) Logically, which of these should cast the *most* doubt on the relationships depicted by an evolutionary tree?
- A) The skeletal remains of the organisms depicted by the tree were incomplete (i.e., some bones were missing).
 - B) Transitional fossils had not been found.
 - C) Some of the organisms depicted by the tree had lived in different habitats.
 - D) Relationships between DNA sequences among the species did not match relationships between skeletal patterns.
- 58) Over time, the movement of people on Earth has steadily increased. This has altered the course of human evolution by increasing
- A) gene flow.
 - B) geographic isolation.
 - C) non-random mating.
 - D) genetic drift.
- 59) When imbalances occur in the sex ratio of sexual species that have two sexes (i.e., other than a 50:50 ratio), the members of the minority sex often receive a greater proportion of care and resources from parents than do the offspring of the majority sex. This is most clearly an example of
- A) disruptive selection.
 - B) sexual selection.
 - C) balancing selection.
 - D) frequency-dependent selection.
- 60) If archaeans are more closely related to eukaryotes than to bacteria, then which of the following is a reasonable prediction?
- A) Archaeal chromosomes should have no protein bonded to them.
 - B) Archaeal DNA should be single-stranded.
 - C) Archaeans should lack cell walls.
 - D) Archaeal ribosomes should be larger than typical prokaryotic ribosomes.

(背面仍有題目,請繼續作答)

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期：0710 · 節次：3

The following questions refer to the description below.

Healthy individuals of *Paramecium bursaria* contain photosynthetic algal endosymbionts of the genus *Chlorella*. When within their hosts, the algae are referred to as zoochlorellae. In aquaria with light coming from only one side, *P. bursaria* gathers at the well-lit side, whereas other species of *Paramecium* gather at the opposite side. The zoochlorellae provide their hosts with glucose and oxygen, and *P. bursaria* provides its zoochlorellae with protection and motility. *P. bursaria* can lose its zoochlorellae: (1) if kept in darkness, the algae die, and (2) if prey items (mostly bacteria) are absent from its habitat, *P. bursaria* will digest its zoochlorellae.

- 61) Can *P. bursaria* live in association with any and all strains/species of *Chlorella*? In an experiment to help answer this question, *Chlorella* was collected, and cultured separately, from three different sources: (1) *P. bursaria* cytoplasm, (2) free-living *Chlorella*, and (3) from cytoplasm of other protist species. A population of *P. bursaria* was treated with the herbicide, paraquat, which killed all of its zoochlorellae, but otherwise left *P. bursaria* unharmed. The zoochlorella-free paramecia were then introduced to a 1:1:1 mixture of *Chlorella* from the three cultures listed above, and subsequently reestablished a contingent of zoochlorellae. Two weeks later, zoochlorellae were collected from the *P. bursaria* cells and tested to determine which *Chlorella* strain(s) had been maintained within *P. bursaria*.

The different strains of *Chlorella* are morphologically indistinguishable. Consequently, which of these would be the best test to perform on *Chlorella*, both before and after re-establishment of zoochlorellae, to determine which *Chlorella* strains had been maintained within *P. bursaria*?

- A) Determine the absorption spectrum of its photosynthetic pigments.
 B) Determine the chemical composition of its cell wall.
 C) Determine the sequence of an exon of a ribosomal RNA gene.
 D) Determine the sequence of a portion of its mitochondrial DNA.
- 62) Within a gymnosperm megasporangium, what is the correct sequence in which the following should appear during development, assuming that fertilization occurs?
1. sporophyte embryo
 2. female gametophyte
 3. egg cell
 4. megaspore
- A) 4 → 1 → 2 → 3 B) 1 → 4 → 2 → 3 C) 1 → 4 → 3 → 2 D) 4 → 2 → 3 → 1
- 63) A botanist discovers a new species of land plant with a dominant sporophyte, chlorophylls *a* and *b*, and cell walls made of cellulose. In assigning this plant to a phylum, which of the following, if present, would be *least* useful?
- A) seeds B) sperm that lack flagella
 C) spores D) flowers
- 64) What are the sporangia of the bread mold *Rhizopus*?
- A) vegetative structures with no role in reproduction
 B) asexual structures that produce haploid spores
 C) sexual structures that produce haploid spores
 D) sexual structures that produce diploid spores
- 65) Which characteristic is shared by both cnidarians and flatworms?
- A) radial symmetry B) a digestive system with a single opening
 C) flame bulbs D) dorsoventrally flattened bodies

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期： 0710 · 節次： 3

66) A student observes a worm-like organism crawling about on dead organic matter. Later, the organism sheds its outer covering. One possibility is that the organism is a larval insect (like a maggot). On the other hand, it might be a member of which phylum, and one way to distinguish between the two possibilities is by looking for the presence of

- A) Platyhelminthes; a cuticle of chitin. B) Nematoda; a circulatory system.
C) Nematoda; an alimentary canal. D) Annelida; muscle in the body wall.

The following questions refer to the description below.

While on an intersession course in tropical ecology, Kris pulls a large, snakelike organism from a burrow (the class was granted a collecting permit). The 1-m-long organism has smooth skin, which appears to be segmented. It has two tiny eyes that are hard to see because they seem to be covered by skin. Kris brings it back to the lab at the field station, where it is a source of puzzlement to the class. Kris says that it is a giant oligochaete worm; Shaun suggests it is a legless amphibian; Kelly proposes it belongs to a snake species that is purely fossorial (lives in a burrow).

67) The organism was found to have two lungs, but the left lung was much smaller than the right lung. Kelly added that the herpetology instructor had said that in most snakes, the same condition exists. If the size difference between the lungs in this organism is *not* a shared ancestral characteristic with its occurrence in snakes, then its existence in this organism is explained as a(n)

1. result of convergent evolution.
 2. example of homologous structures.
 3. similar adaptation to a shared lifestyle or body-plan.
 4. result of having identical *Hox* genes.
 5. homoplasy.
- A) 3, 4, and 5 B) 1 and 5 C) 1, 3, and 5 D) 2, 3, and 5

68) Why is the amniotic egg considered an important evolutionary breakthrough?

- A) It provides insulation to conserve heat.
- B) It prolongs embryonic development.
- C) It allows incubation of eggs in a terrestrial environment.
- D) It permits internal fertilization to be replaced by external fertilization.

69) This is a cluster of genes coding for transcription factors involved in the evolution of innovations in early vertebrate nervous systems and vertebrae:

- A) *Otx* B) *Dlx* C) *FOXP2* D) *Hox*



Figure 35.1

70) Which of the following are true statements about the cells shown in the photograph in Figure 35.1 above?

- A) They are parenchyma cells.
- B) They are photosynthetic.
- C) They are phloem cells.
- D) Both A and B.

(背面仍有題目,請繼續作答)

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期： 0710 · 節次： 3

- 71) "Totipotency" is a term used to describe the ability of a cell to give rise to a complete new organism. In plants, this means that
- A) the cells of shoots and the cells of roots have different genes.
 - B) cell differentiation depends largely on the control of gene expression.
 - C) a cell's environment has no effect on its differentiation.
 - D) plant development is *not* under genetic control.
- 72) Assume that a particular chemical interferes with the establishment and maintenance of proton gradients across the membranes of plant cells. All of the following processes would be directly affected by this chemical *except*
- A) photosynthesis.
 - B) xylem transport.
 - C) phloem loading.
 - D) stomatal opening.
- 73) What are the three main elements on which plant growth and development depend?
- A) sulfur; nitrogen; phosphorus
 - B) nitrogen; carbon; oxygen
 - C) oxygen; carbon; hydrogen
 - D) phosphorus; nitrogen; oxygen
- 74) The most immediate potential benefits of introducing genetically modified crops include
- A) decreasing the mutation rate of certain genes.
 - B) overcoming genetic incompatibility.
 - C) increasing crop yield.
 - D) increasing the frequency of self-pollination.
- 75) Auxin is responsible for all of the following plant growth responses *except*
- A) the detection of photoperiod.
 - B) phototropism.
 - C) cell elongation.
 - D) formation of adventitious roots.
- 76) All of the following are responses of plants to cold stress *except*
- A) excluding ice crystals from the interior walls.
 - B) conversion of the fluid mosaic cell membrane to a solid mosaic one.
 - C) the production of a specific solute "plant antifreeze" that reduces water loss.
 - D) increasing the proportion of unsaturated fatty acids in the membranes.
- 77) Most scientists agree that global warming is underway; thus it is important to know how plants respond to heat stress. Which of the following is an immediate short-term response of plants to heat stress?
- A) the production of heat-shock proteins like those of other organisms
 - B) the production of heat-shock carbohydrates unique to each plant
 - C) their evolution into more xerophytic plants
 - D) the opening of stomata to increase evaporational heat loss
- 78) Seasonal changes in snake activity are explained by which statement?
- A) The snake is less active in winter because the food supply is decreased.
 - B) The snake is less active in winter because it does not need to avoid predators.
 - C) The snake is more active in summer because that is the period for mating.
 - D) The snake is more active in summer because it can gain body heat by conduction.
- 79) In which blood vessel is glucose concentration likely to vary the *most*?
- A) coronary arteries
 - B) pulmonary veins
 - C) abdominal artery
 - D) hepatic portal vessel

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期：0710 · 節次：3

- 80) Cyanide acts as a mitochondrial poison by blocking the final step in the electron transport chain. What will happen to human red blood cells if they are placed in an isotonic solution containing cyanide?
- A) The cells will probably be unaffected.
 - B) The cells will lyse as the cyanide concentration increases inside the cell.
 - C) The cell shape will be maintained, but the mitochondria will be poisoned.
 - D) The cells will not be able to carry oxygen.
- 81) Air rushes into the lungs of humans during inhalation because
- A) a positive respiratory pressure is created when the diaphragm relaxes.
 - B) pressure in the alveoli increases.
 - C) the rib muscles and diaphragm contract, increasing the lung volume.
 - D) gas flows from a region of lower pressure to a region of higher pressure.
- 82) Phagocytosis of microbes by macrophages is enhanced by which of the following?
- A) antibody-mediated agglutination of microbes.
 - B) the binding of antibodies to the surface of microbes.
 - C) the release of cytokines by activated B cells.
 - D) A and B only
- 83) Some pathogens can undergo rapid changes resulting in antigenic variation. Which of the following is such a pathogen?
- A) the influenza virus, which expresses alternative envelope proteins
 - B) the strep bacteria, which can be communicated from patient to patient with high efficiency
 - C) the causative agent of an autoimmune disease such as rheumatoid arthritis
 - D) human papilloma virus, that can remain latent for several years
- 84) Proper functioning of the human kidney requires considerable active transport of sodium in the kidney tubules. If these active transport mechanisms were to stop completely, how would urine production be affected?
- A) A less-than-normal volume of hypoosmotic urine would be produced.
 - B) No urine would be produced.
 - C) A less-than-normal volume of isoosmotic urine would be produced.
 - D) A greater-than-normal volume of isoosmotic urine would be produced.
- 85) One reason a person might be severely overweight is due to
- A) an undersecretion of thyroxine.
 - B) a defect in hormone release from the posterior pituitary.
 - C) hyposecretion of oxytocin.
 - D) a higher than normal level of melatonin.
- 86) This hormone is secreted directly from a structure in the brain:
- A) progesterone
 - B) gonadotropin-releasing hormone
 - C) testosterone
 - D) estradiol

(背面仍有題目,請繼續作答)

系所組別： 生命科學系學士班

考試科目： 普通生物學

考試日期： 0710 · 節次： 3

- 87) Evidence that parthenogenic whiptail lizards are derived from sexually reproducing ancestors includes
- A) the observation that all of the offspring are haploid.
 - B) the development and then regression of testes prior to sexual maturation.
 - C) the persistence of a vestigial penis among some of the females.
 - D) the requirement for male-like behaviors in some females before their partners will ovulate.
- 88) The "immunotolerance" of a pregnant woman toward her unborn child is the result of
- A) the unborn child having enough of the woman's identity so as to escape detection as foreign.
 - B) the relative quiescence of a pregnant woman's immune system compared to when she was not pregnant.
 - C) the tenacity with which the unborn child's immune system counteracts the woman's immune system.
 - D) the complete physical separation from her cells and those of the unborn child.
- 89) The small portion of the embryo that will become its dorsal side develops from the
- A) gray crescent.
 - B) morula.
 - C) archenteron.
 - D) blastocoel.
- 90) In placental mammals, the yolk sac
- A) transfers nutrients from the yolk to the embryo.
 - B) becomes a fluid-filled sac that surrounds and protects the embryo.
 - C) stores waste products from the embryo until the placenta develops.
 - D) produces blood cells that then migrate into the embryo.
- 91) One disadvantage to a nerve net is that it can conduct impulses in two directions from the point of the stimulus. Most of the synapses in vertebrates conduct information in only one direction
- A) as a result of the nodes of Ranvier.
 - B) because the sodium-potassium pump moves ions in one direction.
 - C) as a result of voltage-gated sodium channels found only in the vertebrate system.
 - D) because only the postsynaptic cells can bind and respond to neurotransmitters.
- 92) Functionally, this cellular location is the neuron's "decision-making site" as to whether or not an action potential will be initiated:
- A) axonal membranes
 - B) mitochondrial membranes
 - C) presynaptic membranes
 - D) axon hillocks
- 93) The establishment and expression of emotions involves the
- A) frontal lobes and limbic system.
 - B) frontal lobes and parietal lobes.
 - C) parietal lobes and limbic system.
 - D) occipital lobes and limbic system.
- 94) What is the role of calcium in muscle contractions?
- A) transmit the action potential across the neuromuscular junction
 - B) reestablish the polarization of the plasma membrane following an action potential
 - C) bind to the troponin complex, which leads to the exposure of the myosin-binding sites
 - D) break the cross-bridges as a cofactor in the hydrolysis of ATP

- 95) As climate changes because of global warming, species' ranges in the northern hemisphere may move northward. The trees that are most likely to avoid extinction in such an environment are those that
- A) have seeds that become viable only after a forest fire.
 - B) disperse many seeds in close proximity to the parent tree.
 - C) produce well-provisioned seeds.
 - D) have seeds that are easily dispersed by wind or animals.
- 96) Two plant species live in the same biome but on different continents. Although the two species are not at all closely related, they may appear quite similar as a result of
- A) parallel evolution.
 - B) convergent evolution.
 - C) gene flow.
 - D) allopatric speciation.
- 97) Carrying capacity is
- A) seldom reached by marine producers and consumers because of the vast resources of the ocean.
 - B) fixed for most species over most of their range most of the time.
 - C) determined by density and dispersion data.
 - D) the maximum population size that a particular environment can support.
- 98) Which of the following studies would shed light on the mechanism of spread of H5N1 from Asia?
- A) Perform cloacal or saliva smears of migrating waterfowl to monitor whether any infected birds show up in Alaska.
 - B) Test domestic chickens and ducks worldwide after they have been slaughtered for human consumption for the presence of H5N1.
 - C) Locate and destroy birds infected with H5N1 in Asian open-air poultry markets.
 - D) Test fecal samples for H5N1 in Asian waterfowl that live near domestic poultry farms.
- 99) Trophic efficiency is
- A) the ratio of net secondary production to assimilation of primary production.
 - B) usually greater than production efficiencies.
 - C) about 90% in most ecosystems
 - D) the percentage of production transferred from one trophic level to the next.
- 100) If the sex ratio in a population is significantly different from 50:50, then which of the following will always be true?
- A) The genetic variation in the population will increase over time.
 - B) The effective population size will be greater than the actual population size.
 - C) The effective population size will be less than the actual population size.
 - D) The population will enter the extinction vortex.