

單選題, 每題 2 分

1. This question refers to the 5-stage process of hypothesis testing. What is the appropriate order of the stages when generating and testing a hypothesis?
  - (1) Experimentation is conducted to determine if the predictions are correct.
  - (2) The hypothesis is accepted or rejected.
  - (3) Observations are made regarding a natural phenomenon.
  - (4) The observations lead to a hypothesis that tries to explain the phenomenon. A useful hypothesis is one that is testable because it makes specific predictions.
  - (5) The data from the experiment is analyzed.
  - A. 1, 2, 3, 4, 5
  - B. 3, 4, 5, 1, 2
  - C. 1, 3, 4, 2, 5
  - D. 3, 4, 1, 5, 2
  - E. 3, 4, 2, 1, 5
  
2. A covalent chemical bond is one in which
  - A. electrons are removed from one atom and transferred to another atom so that the two atoms become oppositely charged.
  - B. protons and neutrons are shared by two atoms so as to satisfy the requirements of both atoms.
  - C. outer-shell electrons of two atoms are shared so as to satisfactorily fill the outer electron shells of both atoms.
  - D. outer-shell electrons of one atom are transferred to the inner electron shells of another atom.
  - E. inner-shell electrons of one atom are transferred to the outer electron shell of another atom.
  
3. Which of the following is possible due to the high surface tension of water?
  - A. Lakes don't freeze solid in winter, despite low temperatures.
  - B. A water strider can walk across the surface of a small pond.
  - C. Organisms resist temperature changes, although they give off heat due to chemical reactions.
  - D. Water can act as a solvent.
  - E. The pH of water remains exactly neutral.
  
4. Which of the following type of microscopy would be most effective in visualizing the fine structure of viruses and cytoskeletal filaments?
  - A. standard light microscopy
  - B. phase-contrast light microscopy
  - C. transmission electron microscopy
  - D. darkfield light microscopy
  - E. differential-interference microscopy
  
5. Cell membrane molecules are labeled with a fluorescent tag and then a portion of them are bleached with a laser beam. What would one observe after the cell is incubated for a few minutes?
  - A. The bleached molecules would disappear into the cell.
  - B. The bleached molecules would diffuse laterally through the membrane and intermix with unbleached molecules.
  - C. The bleached molecules would remain in the spot where bleaching occurred.
  - D. All the bleached molecules would flip-flop across the cell membrane.
  - E. All of the choices are correct.
  
6. Sports physiologists at an Olympic training center wanted to monitor athletes to determine at what point their muscles were functioning anaerobically. They could do this by checking for the buildup of which molecule?
 

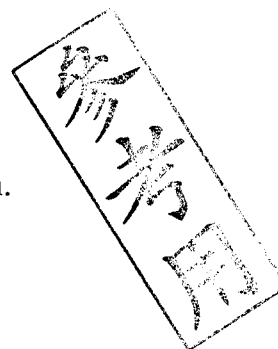
A. ATP	B. lactate	C. carbon dioxide
D. pyruvic acid	E. oxygen	

參考用

注意：背面有試題

7. The binding (or fusion) of vesicles to target membranes requires which of the following?
- signal recognition particle
  - proteasome
  - v-snare and t-snare interactions
  - dynamin
  - vesicle peptidase
8. Autophagy provides a way for cells to
- degrade entire organelles and recycle their components.
  - automatically control the level of ATP.
  - engulf bacterial cells.
  - export unwanted organelles out of the cell.
  - degrade unwanted proteins.
9. Which of the following reactions would require the hydrolysis of at least two ATP molecules for it to occur?
- A reaction that has a  $G = -8$  kCal.
  - A reaction that has a  $G = +9$  kCal.
  - A reaction that has a  $G = -16$  kCal.
  - A reaction that has a  $G = +18$  kCal.
  - A reaction that has a  $G = -14.6$  kCal.
10. Which of the following statements about steroid receptors is FALSE?
- The receptors undergo a conformational change after binding the steroid.
  - The receptors are localized to the plasma membrane.
  - Once the steroid binds the receptor, the steroid/receptor complexes dimerize.
  - Steroid receptors act as transcriptional factors, regulating the expression of certain genes and the subsequent production of proteins.
  - Steroid receptors are localized to either the cytoplasm or nucleus.
11. The grass lands do not flourish if there is no animal feed on grass. Most of monocot plants are taken over by dicots. Which of the following statements is the most likely reason?
- Monocot roots have weaker adsorption of nutrients.
  - Without animal, monocot roots expand too quickly and cause depletion of nutrients. Then, whole population will be extinct.
  - Monocot will grow too tall, and will be destroyed by typhoon.
  - Monocots are light sensitive, and need animals to protect them avoid UV irradiations.
  - Dicots have fibrous roots to compete more nutrients.
12. A plant cell with solute potential  $-0.65$ MPa maintains a constant volume when bathed with solution that has  $-0.30$ MPa, and is in an open container. The cells has pressure potential of
- $-0.30$ MPa
  - $-0.35$ MPa
  - $+0.30$ MPa
  - $+0.35$ MPa
  - 0MPa
13. Movement of xylem sap from roots to leaves
- occurs through the symplast of xylem
  - results mainly from diffusion within symplast.
  - depends on active transport.
  - usually depends on tension or negative pressure potential.
  - is accomplished by aquaporins.
14. A seed develops from
- an ovum.
  - a pollen grain.
  - an ovule.
  - an ovary.
  - an embryo.

15. Genetic variations are important for evolution. Which of following statements is true?  
 A. Mutations are the only way to make more genetic variations.  
 B. Sexual recombination increases genetic variations for all organisms.  
 C. Heterozygote advantage is one of mechanisms to preserve genetic variations in diploid organisms.  
 D. Directional natural selections increase diversity of organisms in one population.  
 E. Darwin applied genetic principles to explain importance of genetic variation in evolution.
16. What is the trait used to group the organisms in to a clad?  
 A. Derived trait                      B. Homologous traits                      C. Heterologous traits  
 D. Sex traits                              E. Unique traits
17. Two potential devices that eukaryotic cells use to regulate transcription are DNA \_\_\_\_\_ and histone \_\_\_\_\_.  
 A. methylation; amplification  
 B. amplification; methylation  
 C. acetylation; methylation  
 D. methylation; acetylation  
 E. amplification; acetylation
18. What is the effect of a frame-shifting mutation in a gene?  
 A. It changes an amino acid in the encoded protein.  
 B. It has no effect on the amino acid sequence of the encoded protein.  
 C. It introduces a stop codon into the mRNA.  
 D. It alters the reading frame of the mRNA.  
 E. It prevents introns from being expressed.
19. Absence of bicoid gene mRNA from a Drosophila egg leads to the absence of anterior larval body parts and mirror-image duplication of posterior parts. This is evidence that the product of the bicoid gene  
 A. is transcribed in the early embryo.  
 B. normally leads to formation of tail structures.  
 C. normally leads to formation of head structures.  
 D. is a protein present in all head structures.  
 E. leads to programmed cell death
20. Which of the following is (are) the characteristics of microRNAs?  
 A. The microRNAs precursors form hair-pin (stem-loop) structure  
 B. Dicer enzyme cuts into shorter fragments  
 C. microRNAs prevent gene expression either by degrading the target mRNA or by blocking its translation  
 D. B and C only  
 E. A, B, and C
21. What is the function of reverse transcriptase in retroviruses?  
 A. It hydrolyzes the host cell's DNA.  
 B. It uses viral RNA as a template for DNA synthesis.  
 C. It converts host cell RNA into viral DNA.  
 D. It translates viral RNA into proteins.  
 E. It uses viral RNA as a template for making complementary RNA strands.
22. Which of the following helps to stabilize mRNA by inhibiting its degradation?  
 A. TATA box  
 B. Spliceosomes  
 C. 5' cap  
 D. poly-A tail  
 E. both C and D





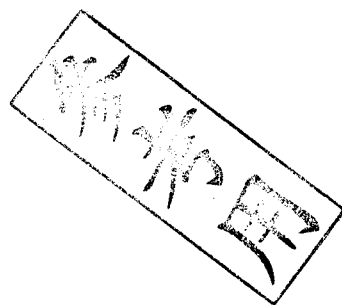
32. There are several mechanisms to maintain the blood glucose concentration during the postabsorptive state. Which one is not correct?
- Glycogenolysis
  - Gluconeogenesis
  - Glucose sparing
  - Cells use fatty acid as an alternate energy source.
  - The liver will convert glycerol into ketones, which are released into the blood during prolonged fasting.
33. What causes the animal heart to beat so steadily?
- Heart center of the brain
  - Sinoatrial node
  - Atrioventricular node
  - Purkinje fiber
  - Hypothalamus
34. CO<sub>2</sub> is transported from inner tissues to lung mainly by which of the following ways?
- Dissolved in the plasma
  - Attached to the hemoglobin
  - As carbonic acid
  - As bicarbonate ions
  - As carbon dioxide
35. Which of the following statements regarding the functions of your kidney is not correct?
- Filtration of blood
  - Water reabsorption
  - Excretion of nitrogenous waste
  - Production of urea as a waste product of protein
  - Regulation of salt balance
36. The main target site of ADH (antidiuretic hormone) is \_\_\_\_
- Proximal convoluted tubule of the kidney
  - Collecting duct of the kidney
  - The Henle loop of the kidney
  - Posterior pituitary gland
  - Adrenal gland
37. Which of the following statements about protein and steroid hormones is wrong?
- Most of protein hormones bind to receptors located on the cytoplasm.
  - Steroid hormones are lipophilic.
  - Protein hormones bind noncovalently to receptors.
  - Steroid hormones usually stimulate gene transcription directly.
  - Protein hormone will stimulate second messenger pathway.
38. The luteinizing hormone (LH) will stimulate \_\_\_\_\_ and follicle-stimulating hormone (FSH) stimulates \_\_\_\_\_. That controls male spermatogenesis.
- Corpus luteum, follicle cell
  - Sertoli cells, follicle cells
  - Sertoli cells, Leydig cells
  - Leydig cells, Sertoli cells
  - Follicle cells, Sertoli cells
39. Which of the following statements regarding fertilization in sea urchins is not correct?
- The sperm will proceed acrosomal reaction.
  - The egg will proceed cortical reaction
  - The fast block to polyspermy is due to depolarization after sperm and egg fusion.
  - The slow block to polyspermy is due to the release of Ca<sup>2+</sup>.
  - The increase in cytosolic Ca<sup>2+</sup> begins in the opposite site of sperm entry and propagates throughout the egg.

參考用

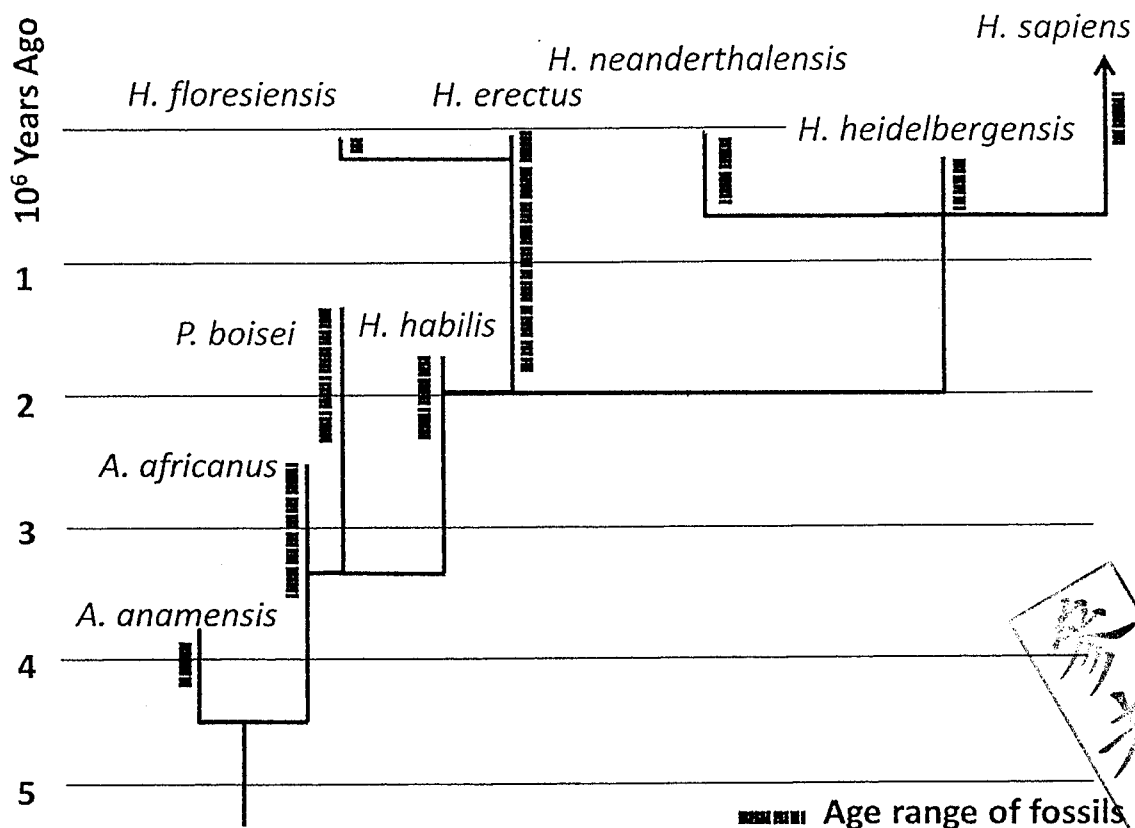
科目 普通生物學 類組別 A1

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\*請在答案卡內作答

40. What stages is the three germ layers formation in the embryo?  
 A. Blastula formation                      B. Gastrulation                      C. Organ formation  
 D. Pattern formation                      E. Neurulation
41. What kind of molecule should all antigen-presenting cells express to hold the antigen?  
 A. T cell receptor                      B. Antibody                      C. Class I MHC proteins  
 D. Class II MHC proteins                      E. CD4
42. What kind of immunoglobulin involves in allergy?  
 A. Ig A                      B. Ig G                      C. Ig M                      D. Ig D                      E. Ig E
43. Which of the following structure is not a mechanoreceptor?  
 A. Meissner's corpuscles                      B. Ruffini corpuscles  
 C. Hair cells                      D. Stretch receptor  
 E. Nociceptor
44. In nerve cells, an action potential is actively propagated along axon  
 A. to the cell body.  
 B. to the axon terminal.  
 C. to the cell body or the axon terminal dependent on animal needs.  
 D. to the dendrites.  
 E. away from synapse
45. Which of the statements of population conservation is true?  
 A. Larger population is more eagerly conserved than smaller population.  
 B. It is not necessary to conserve population with low genetic diversity.  
 C. Extinction vortex is a downward population spiral. Unless reversed the process, populations will be extinct.  
 D. Effective size of population is always larger than that of total population.  
 E. The maximal population size at which a species is able to sustain its numbers and survive is known as the maximal viable population, MVP.
46. What is the sustainable biosphere initiative?  
 A. A plan to convert all natural ecosystems in the biosphere to carefully engineered ones.  
 B. A program that uses adaptive management to experiment and learn while working with disturbed ecosystem.  
 C. A conservation practice that sets up zoned reserves surrounded the buffer zones.  
 D. A research agenda to study biodiversity and support sustainable development.  
 E. The declining population approach to conservation that seeks to identify and remedy causes of species' declines.
47. According to climograph for biomes in North America, annual mean temperature and precipitation of Area A are 10 degree C and 2500mm. The type of biome for this area is  
 A. Coniferous forest  
 B. Desert  
 C. Tropical forest  
 D. Temperate grassland  
 E. Temperate broadleaf forest



Please read the following graph and answer questions 48 and 49.



<http://2.bp.blogspot.com/-Rj3pgy1XdFQ/Tf30uXiIDrI/AAAAAAAAAWg/M25goqcwSJ4/s1600/image-05-large.jpg>

48. If all species existed now, which one of the followings species have nucleotide polymorphism?

- A. *H. erectus*
- B. *A. anamensis*
- C. *P. boisei*
- D. *H. sapiens*
- E. *H. floresiensis*

49. If there was no geographic isolation and *H. neanderthalensis* and *H. sapiens* could have offsprings but hybrids did not survive, which of following statements is true?

- A. The mechanism of speciation is allopatric speciation.
- B. Such speciation may be due to polyploidy.
- C. This speciation process is a type of anagenesis.
- D. Speciation occurs at steps of prezyotic isolation.
- E. There is mechanic isolation between these species.

50. According to the following tables, which of countries needs resources from other countries most?

Country	Ecological footprint (ha/person)	Available ecological capacity (ha/person)
India	1	1
China	2	2
USA	8	6
Japan	6	2
Sweden	6	8

- A. India
- B. China
- C. USA
- D. Japan
- E. Sweden