

一、配合題 (30%, 2% each)

A. Stabilizing selection	B. Balancing selection	C. Sympatric speciation
D. Allopatric speciation	E. Kin selection	F. Convergent evolution
G. Selective sweep	H. Founder effect	I. Horizontal gene transfer
J. Sister taxa	K. Heritability	L. Polyploid
M. F_{ST}	N. Pleiotropy	O. Neutral theory

- ___ 1. The generation of new species in the same location
- ___ 2. The exchange of genetic materials between different species
- ___ 3. Selection actively maintains genetic variation
- ___ 4. The mutation of a gene has effects on several traits
- ___ 5. Strong selection on a new mutation, removing most genetic variation around the mutant site
- ___ 6. Individuals with intermediate (non-extreme) phenotypic values have higher fitness
- ___ 7. Two species that are each other's closest relatives
- ___ 8. An individual with more copies of the same chromosome than the original diploid ancestor
- ___ 9. Helping relatives survive and reproduce to pass on shared genes
- ___ 10. Species differentiation in isolated locations without gene flow
- ___ 11. The proportion of total phenotypic variation caused by genetic effects
- ___ 12. The loss of genetic diversity when a small group starts a new population
- ___ 13. The idea that most genetic differences among species do not relate to selection
- ___ 14. Different species evolve similar trait characteristics because they live in similar environments
- ___ 15. An estimate of the degree of genetic differentiation among populations

二、單選題 (42%, 3% each) ※ 本大題請於試卷內之「選擇題作答區」依序作答。

- ___ 1. Human arms and bird wings are in:
 - (A) Homology
 - (B) Paralogy
 - (C) Homoplasy
 - (D) Monophyletic

- ___ 2. Which one of the following is important in organisms' response to selection?
 - (A) Their color
 - (B) Genetic variation
 - (C) Allopatric speciation
 - (D) Homology

- ___ 3. About the origin of modern humans in Asia, Europe, and Africa, which is correct?
 - (A) Their common ancestors once existed in Africa
 - (B) They evolved independently from local apes in Asia, Europe, and Africa
 - (C) Neanderthals are their common ancestors
 - (D) Asians have the highest genetic variation

見背面

___ 4. In the Red Queen Hypothesis, species must keep evolving even in a stable environment. This is because:

- (A) The interacting species (competitors or parasites) are also evolving
- (B) To become the strongest species in the ecosystem
- (C) To adapt to global warming
- (D) Strong sexual selection

___ 5. Human and chimpanzee have a common ancestor, and they are the only descendant species of that common ancestor. They are:

- (A) Polyphyletic
- (B) Paraphyletic
- (C) Monophyletic
- (D) Duophyletic

___ 6. In evolution, the "two fold cost of sex" is:

- (A) Asexual populations can grow twice as fast as sexual populations.
- (B) Sexual animals need to find twice as much food to survive.
- (C) Sexual organisms live twice as long as asexual organisms.
- (D) It takes two parents to produce twice as many mutations.

___ 7. Which of the following is true about genetic drift?

- (A) It always helps animals adapt to their environment.
- (B) It is the same thing as natural selection.
- (C) It has a much stronger effect on small populations.
- (D) It only happens when new species are created.

___ 8. A human fetus, if born too early, has a low survival rate. If born too late, it would grow too big and difficult to be born. This is an example of:

- (A) Background selection
- (B) Directional selection
- (C) Stabilizing selection
- (D) Disruptive selection

___ 9. In a gene, the fitness of the three genotypes is: $AA = 1$, $Aa = 1$, $aa = 0.8$. The selection coefficient of genotype aa is:

- (A) 1.2
- (B) 0.2
- (C) 0.8
- (D) 0.4

___ 10. Two species originally exist in different locations and developed hybrid incompatibility. After secondary contact, they evolved different secondary sexual characteristics to prevent hybridization. This is called:

- (A) Sympatric speciation
- (B) Cryptic female choice
- (C) Behavior isolation
- (D) Reinforcement

___ 11. After gene duplication, the two duplicates are redundant. Loss-of-function mutations later accumulate in one gene copy, making it a:

- (A) Oncogene
- (B) Neogene
- (C) Pseudogene
- (D) Nonsynonymous gene

___ 12. A single ancestor species evolves into many different species to fit into different environments. This is called:

- (A) Adaptive radiation
- (B) Genetic drift
- (C) Mass extinction
- (D) Convergent evolution

___ 13. Organisms have limited dispersal and migration distances, and therefore, a population often has highest gene flow with nearby populations. This caused:

- (A) Hybrid incompatibility
- (B) Migration-selection balance
- (C) Isolation by distance
- (D) Sympatric speciation

___ 14. Heterosis is:

- (A) Brother-sister mating of fruit flies results in weaker offsprings.
- (B) The excess of heterozygotes in the population due to high mutation rate.
- (C) When two animals from the same family have more offsprings than their siblings do.
- (D) When the offspring of two different parents is stronger or healthier than both parents.

三、問答題 (28%, 可用中文回答)

1. (18%) For the following descriptions, please fill in whether they are (A) pre-mating reproductive isolation, (B) post-mating pre-zygotic isolation, or (C) post-zygotic isolation

___ (1) Insect populations living in Taiwan and Japan

___ (2) Hybrid sterility

___ (3) Pollen tube fails to grow in another flower's pistil

___ (4) Hybrid not preferred by either parental species during mate choice

___ (5) Plant species with different pollinators

___ (6) Sperms reach the egg but cannot enter due to un-matching surface receptors

___ (7) Two insect species depending on different host plants and never meet

___ (8) Seeds from crossing two plant species cannot germinate

___ (9) Two plant species with the same pollinator (bee) but one deposits pollens on the bee's head but the other deposits pollens on the bee's back

2. (10%) Below is the number of individuals of three genotypes. (1) What is the relative fitness of the three genotypes? (2) BEFORE selection, what is the frequency of alleles A and a?

	AA	Aa	aa
Before selection	200	200	100
After selection	100	200	80

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