國立高雄大學 108 學年度研究所碩士班招生考試試題

科目：普通生物學　　系所：生命科學系　　是否使用計算機：是

考試時間：100 分鐘　　本科原始成績：100 分

一、　選擇題 60 分 (每題 2 分)

1. The host range of a virus is determined by
   A) the enzymes carried by the virus.
   B) whether its nucleic acid is DNA or RNA.
   C) the proteins in the host's cytoplasm.
   D) the enzymes produced by the virus before it infects the cell.
   E) the proteins on its surface and that of the host.
2. Most molecular biologists think that viruses originated from fragments of cellular nucleic acid. Which of the following observations supports this theory?
   A) Viruses contain either DNA or RNA.
   B) Viruses are enclosed in protein capsids rather than plasma membranes. C) Viruses can reproduce only inside host cells.
   D) Viruses can infect both prokaryotic and eukaryotic cells.
   E) Viral genomes are usually similar to the genome of the host cell.
3. Why are yeast cells frequently used as hosts for cloning?
   A) They easily form colonies.
   B) They can remove exons from mRNA.
   C) They do not have plasmids.
   D) They are eukaryotic cells.
   E) Only yeast cells allow the gene to be cloned.
4. Why is it so important to be able to amplify DNA fragments when studying genes?
   A) DNA fragments are too small to use individually.
   B) A gene may represent only a millionth of the cell's DNA.
   C) Restriction enzymes cut DNA into fragments that are too small.
   D) A clone requires multiple copies of each gene per clone.
   E) It is important to have multiple copies of DNA in the case of laboratory error.
5. Carl Woese and collaborators identified two major branches of prokaryotic evolution. What was the basis for dividing prokaryotes into two domains?
   A) microscopic examination of staining characteristics of the cell wall
   B) metabolic characteristics such as the production of methane gas
   C) metabolic characteristics such as chemoautotrophy and photosynthesis
   D) genetic characteristics such as ribosomal RNA sequences
   E) ecological characteristics such as the ability to survive in extreme environments
6. Mitochondrial DNA is primarily involved in coding for proteins needed for electron transport. Therefore, in which body systems would you expect most mitochondrial gene mutations to be

exhibited?

A) the immune system and the blood

B) the excretory and respiratory systems

C) the skin and senses

D) the nervous and muscular systems

E) the circulation system

7. What is a syndrome?

A) a characteristic facial appearance

B) a group of traits, all of which must be present if an aneuploidy is to be diagnosed

C) a group of traits typically found in conjunction with a particular chromosomal aberration or gene mutation

D) a characteristic trait usually given the discoverer's name

E) a characteristic that only appears in conjunction with one specific aneuploidy

8. In the formation of biofilms, such as those forming on unbrushed teeth, cell signaling serves which function?

A) formation of mating complexes

B) secretion of apoptotic signals

C) aggregation of bacteria that can cause cavities

D) secretion of substances that inhibit foreign bacteria

E) digestion of unwanted parasite populations

9. Which of the following is true of transcription factors?

A) They control gene expression.

B) They transcribe ATP into cAMP.

C) They initiate the epinephrine response in animal cells.

D) They regulate the synthesis of DNA in response to a signal.

E) They regulate the synthesis of lipids in the cytoplasm.

10. The toxin of *Vibrio cholerae* causes profuse diarrhea because it

A) modifies a G protein involved in regulating salt and water secretion.

B) decreases the cytosolic concentration of calcium ions, making the cells hypotonic.

C) binds with adenylyl cyclase and triggers the formation of cAMP.

D) signals IP_3 to act as a second messenger for the release of calcium.

E) modifies calmodulin and activates a cascade of protein kinases.

11. If you were to observe the activity of methylated DNA, you would expect it to

A) be replicating nearly continuously.

B) be unwinding in preparation for protein synthesis.

C) have turned off or slowed down the process of transcription.
D) be very actively transcribed and translated.
E) induce protein synthesis by not allowing repressors to bind to it.

12. Which of the following is released by platelets in the vicinity of an injury?
A) PDGF
B) MPF
C) protein kinase
D) cyclin
E) Cdk

13. Which of the following is a protein maintained at constant levels throughout the cell cycle that requires cyclin to become catalytically active?
A) PDGF
B) MPF
C) protein kinase
D) cyclin
E) Cdk

14. To view and analyze human chromosomes in a dividing cell, which of the following is/are required?
A) electron microscope
B) radioactive staining
C) fluorescent staining
D) DNA stain and a light microscope
E) a stain particular to human cell

15. Why do RNA viruses appear to have higher rates of mutation?
A) RNA nucleotides are more unstable than DNA nucleotides.
B) Replication of their genomes does not involve proofreading.
C) RNA viruses replicate faster.
D) RNA viruses can incorporate a variety of nonstandard bases.
E) RNA viruses are more sensitive to mutagens.

16. A principal problem with inserting an unmodified mammalian gene into a plasmid and then getting that gene expressed in bacteria is that _____.
A) bacteria translate only mRNAs that have multiple messages
B) prokaryotes use a different genetic code from that of eukaryotes
C) bacteria cannot remove eukaryotic introns
D) bacterial RNA polymerase cannot make RNA complementary to mammalian DNA

17. Most of the dry mass of a plant is the result of uptake of _____.
    A) water and minerals through mycorrhizae
    B) carbon dioxide and oxygen through stomata in leaves
    C) water and minerals through root hairs
    D) carbon dioxide through stoma
18. Which of the following traits do archaeans and bacteria share?
    1. composition of the cell wall; 2. presence of plasma membrane; 3. lack of a nuclear envelope 4. identical rRNA sequences.
    A) 2 and 3
    B) 1 only
    C) 3 only
    D) 1 and 3
    E) 2 and 4
19. At which developmental stage should one be able to first distinguish a protostome embryo from a deuterostome embryo?
    A) coelom formation
    B) metamorphosis
    C) fertilization
    D) cleavage
    E) gastrulation
20. Which of the following is (are) unique to animals?
    A) heterotrophy
    B) the structural carbohydrate, chitin
    C) flagellated gametes
    D) nervous system signal conduction and muscular movement
21. If all individuals in the last remaining population of a particular bird species were all highly related, which type of diversity would be of greatest concern when planning to keep the species from going extinct?
    I) genetic diversity; II) species diversity; III) ecosystem diversity
    A) only I
    B) only II
    C) only III
    D) only II and III
22. Which of these is a major trend in land plant evolution?
    A) the trend toward a sporophyte-dominated life cycle

B) the trend toward a gametophyte-dominated life cycle
C) the trend toward larger gametophytes
D) the trend toward smaller size

23. Albinism is an autosomal (not sex-linked) recessive trait. A man and woman are both of normal pigmentation, but both have one parent who is albino (without melanin pigmentation). What is the probability that their first child will be an albino?
A) 1/4
B) 1/2
C) 1
D) 0

24. When crossing an organism that is homozygous recessive for a single trait with a heterozygote, what is the chance of producing an offspring with the homozygous recessive phenotype?
A) 50%
B) 75%
C) 100%
D) 25%
E) 0%

25. What is metagenomics?
A) the sequencing of only the most highly conserved genes in a lineage
B) the sequencing of one or two representative genes from several species
C) sequencing DNA from a group of species from the same ecosystem
D) genomics as applied to a species that most typifies the average phenotype of its genus

26. If the original finches that had been blown over to the Galápagos from South America had already been genetically different from the parental population of South American finches, even before adapting to the Galápagos, this would have been an example of
A) genetic drift.
B) bottleneck effect.
C) founder effect.
D) all three of these.
E) both the first and third of these.

27. There is still some controversy among biologists about whether Neanderthals should be placed within the same species as modern humans or into a separate species of their own. Most DNA sequence data analyzed so far indicate that there was probably little or no gene flow between Neanderthals and *Homo sapiens*. Which species concept is most applicable in this example?
A) morphological

B) phylogenetic
C) ecological
D) biological

28. Which of the following characteristics are expected in the first animals to have colonized land?
1. were probably herbivores (ate photosynthesizers); 2. had four appendages; 3. had the ability to resist dehydration; 4. had lobe-finned fishes as ancestors; 5. were invertebrates
A) 1, 3, and 5
B) 1, 2, 3, and 4
C) 3 only
D) 3 and 5

29. If, someday, an archaean cell is discovered whose rRNA sequence is more similar to that of humans than the sequence of mouse rRNA is to that of humans, the best explanation for this apparent discrepancy would be
A) common ancestry.
B) coevolution of humans and that archaean.
C) retro-evolution by humans.
D) homoplasy.
E) homology.

30. If two species are close competitors, and one species is experimentally removed from the community, the remaining species would be expected to _____.
A) become the target of specialized parasites
B) change its fundamental niche
C) decline in abundance
D) expand its realized niche

二、　名詞解釋 40 分 (每題 4 分)

1. Antagonist
2. Apoptosis
3. Epigenetic regulation
4. Transcriptomic sequencing
5. RNA dicer
6. Biodiversity
7. Phylogeny
8. Heterozygote
9. Community ecology
10. Mitosis