國立中山大學103學年度碩士暨碩士專班招生考試試題

科目名稱：生物化學【生科系碩士班乙組】　　題號：421001

※本科目依簡章規定「不可以」使用計算機　　

1. (1) Give the four major classes of biomolecules and (2) use specific examples to illustrate at least two biological functions for each class of biomolecules. **(16 分)**

2. Consider the peptide Val-Lys-Cys-Pro-Glu-Ser-Phe-Gly-His-Asn and answer the following questions. **(12 分)**

(1) What amino acid is the N-terminus?
(2) What amino acid is the C-terminus?
(3) What amino acid has an amide side chain?
(4) What amino acid absorbs UV light?
(5) What amino acid has a sulfhydryl side chain?
(6) What amino acid is not an α-amino acid?
(7) What amino acid has the smallest side chain?
(8) What amino acid has an imidazole side chain?
(9) What amino acid has a more nonpolar side chain?
(10) What amino acid has a positively charged side chain?
(11) What amino acid has a negatively charged side chain?
(12) What amino acid has a hydroxyl side chain?

3. Describe the molecular basis of separation in the following chromatographic techniques: **(15 分)**

(1) Gel filtration chromatography
(2) Ion-exchange chromatography
(3) Affinity chromatography

4. Compare globular proteins with fibrous proteins in the following aspects: **(12 分)**

(1) Biological functions
(2) Water solubility
(3) Amino acid composition
(4) Type of secondary and tertiary structure

5. Describe the effects of the following factors influence (increase, decrease or have no effect) on the reaction rate for a typical enzyme and explain. **(12 分)**

(1) Increase in substrate concentration
(2) Increase in enzyme concentration
(3) Increase in temperature from 25°C to 37°C
(4) Increase in temperature from 37°C to 100°C
(5) Addition of a competitive inhibitor
(6) Change in pH from 7 to 1

6. Compare and contrast the characteristics of the following types of enzyme regulation: **(15 分)**

(1) Allosterism
(2) Covalent modification
(3) Proteolytic cleavage

7. Answer the following questions about ATP. **(6 分)**

(1) How many phosphoanhydride bonds are present?
(2) What kind of chemical bond links the ribose and the triphosphate group?
(3) How are usually the negative charges on ATP neutralized in the cell?
(4) What kind of chemical bond links the adenine and the ribose?

8. Which of the following statements about mitochondrial respiration are <u>true</u>? <u>Rewrite</u> the false statements to make them true. **(12 分)**

(1) The electron carriers involved in electron transport are present in the cytoplasm of the cell.
(2) NADH is a more powerful reducing agent than $FADH_2$.
(3) The final electron acceptor is O_2.
(4) The electron carriers are arranged in order of decreasing electron affinity.
(5) Fe^{3+} atoms in cytochromes and iron-sulfur proteins act as electron acceptors
(6) Protons are pumped from the inner mitochondrial matrix to the other side of the membrane during electron transport.

國立中山大學103學年度碩士暨碩士專班招生考試試題

科目名稱：生態學【生科系碩士班甲組】　　題號：421002

※本科目依簡章規定「不可以」使用計算機　　

一、選擇題（單選，共15 分，每題3 分）

1. GARP (Genetic Algorithm for Rule-set Prediction) is most likely to be used in
   A. constructing niche models.
   B. mark–recapture studies.
   C. area-based counts.
   D. assessing dispersal rates.
   E. determining patterns of dispersion.

2. Which of the following types of survivorship curves is seen most frequently in the wild?
   Type I: most individuals survive to old age
   Type II: constant rate of mortality throughout lifetime
   Type III: most individuals die young
   A. Type I and Type II are about equally common.
   B. Type II and Type III are about equally common.
   C. Type I
   D. Type II
   E. Type III

3. A population of *Drosophila mauritiana* reproduces in synchrony at discrete time periods every generation. Generations occur at two-week intervals. The current population size is 1000 and its geometric population growth rate is 3.0 per generation. After six weeks, the expected size of the population would be
   A. 3000　B. 9000　C. 27,000　D. 81,000　E. 729,000.

4. Which of the following is an extreme case of population fluctuations?
   A. Logistic growth　B. Population outbreaks
   C. Demographic stochasticity　D. Delayed density dependence
   E. Genetic drift

5. Only two females of a highly endangered bird species are left in the population. Although these females are healthy, by chance, both fail to reproduce, and the population goes to extinction. This extinction is best described as a consequence of
   A. inbreeding　B. genetic drift
   C. environmental stochasticity　D. demographic stochasticity
   E. isolation by distance

二、問答題（85 分）

6. 今年冬季「北極漩渦」（polar vortex）向南延伸形成大規模北極寒流，導致全球天氣異常，若是此現象持續下去，請試述對於地球極地、寒帶、溫帶、熱帶生物群落的可能造成影響與生物群落的反應？(20 分)

7. 在生物交互作用方式，請對「體內寄生」和「體外寄生」進行定義，針對此二物種交互作用舉出一個例子，描述此二類型交互作用的優點和缺點。(15 分)

8. 試述水的特性及其對生物及生態環境的重要性與影響？淡水與鹹水生物如何調節體內水分與離子濃度？(20 分)

9. 舉例說明地球之生態系中，能量來源類型、流動之模式與效能。(15 分)

10. 試述動物對溫度調節的類型與方式；極端溫度時，動物如何應對？(15 分)

國立中山大學103學年度碩士暨碩士專班招生考試試題

科目名稱：分子生物學【生科系碩士班乙組】　　題號：421003

※本科目依簡章規定「不可以」使用計算機　　

一、選擇題每題1分(35%) 單選

1. Which of the following is not a constituent of deoxyribonucleotides?
a. phosphate moieties　b. deoxyribose　c. ribose　d. organic bases

2. Which structural property of DNA is crucial for the conservation of genetic information?
a. antiparallelism　b. the ability to form a double helix
c. base-pair complementarity　d. all of the above

3. The ability of DNA to denature is important for which process?
a. DNA synthesis　b. nucleic acid hybridization experiments　c. RNA synthesis　d. all of the above

4. Which of the following are removed from mRNAs during processing?
a. exons　b. noncoding sequences　c. RNA cap structure　d. poly(A) tail

5. The base in the wobble position of a codon
a. is the 5′ (first) base.　b. is the 3′ (third) base.　c. is the second base.　d. often contains adenine.

6. Which of the following is not a recognized stage of protein synthesis in both prokaryotes and eukaryotes?
a. elongation　b. initiation　c. translation　d. termination

7. Which codon serves as the start codon in mRNA for translation?
a. AGU　b. AUG　c. UGA　d. UGG

8. Which of the following is a protein that is involved in translation?
a. topoisomerase　b. ribosomal RNA　c. RNA polymerase　d. aminoacyl-tRNA synthetase

9. Cellular protein synthesis proceeds in which direction?
a. carboxyl to amino terminus　b. amino to carboxyl terminus　c. 3′ to 5′　d. 5′ to 3′

10. An enzyme that breaks DNA, dispels the tension, and reseals the strand ahead of a DNA replication growing fork is called a(n)
a. topoisomerase.　b. DNA polymerase.　c. phosphodiesterase.　d. aminoacyl-tRNA synthetase.

11. A mutation that changes a cysteine codon to a tryptophan codon is called
a. a missense mutation.　b. a nonsense mutation.　c. a frameshift mutation.　d. a silent mutation.

12. A mutation in one gene that counteracts the effects of a mutation in another gene is known as a
a. temperature-sensitive mutation.　b. recessive mutation.
c. conditional mutation.　d. suppressor mutation.

13. DNA ligase
a. synthesizes DNA from an RNA template.　b. forms a phosphodiester bond.
c. joins Okazaki fragments.　d. b and c　e. all of the above

14. Which of the following is a functional element of a plasmid?
a. origin of replication　b. drug-resistance gene　c. polylinker sequence
d. a and b　e. all of the above

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15. The polymerase chain reaction (PCR) technique can be used for
a. direct isolation of a specific segment of genomic DNA.　b. preparation of probes.
c. synthesis of RNA from genomic DNA.　d. a and b　e. all of the above

16. The identification of disease genes can be made more complicated because of
a. genetic heterogeneity.　b. location of the gene on the X chromosome.
c. polygenic traits.　d. a and c　e. all of the above

17. What method can be used to functionally inactivate a gene without altering its sequence?
a. gene knockout　b. RNA interference　c. dominant negative mutation
d. b and c　e. all of the above

18. Which process involves two transesterification reactions?
a. splicing　b. RNA editing　c. capping　d. nuclear transport

19. Which of the following does not require protein enzymes?
a. RNA editing　b. excision of group II introns　c. transsplicing　d. excision of group III introns

20. microRNAs play a key role in which of the following?
a. translational repression　b. viral RNA degradation　c. RNA interference　d. all of the above

21. A ribozyme is an RNA sequence
a. that has Mg^{2+} ions as a cofactor　b. with catalytic ability to cleave RNA
c. that acts in the spliceosome　d. all of the above

22. Which of the following is NOT an example of a regulatory DNA site?
a. Enhancer　b. Insulator　c. Repressor　d. Operator

23. Proteins that act by bridging activators and RNA polymerase are called:
a. enhancers.　b. coactivators.　c. corepressors.　d. insulators.

24. Which of the following is NOT true of the *lac* operon?
a. Transcription produces a single polycistronic mRNA containing the *lacZ*, *lacY*, and *lacA* genes.
b. The *lacI* gene is controlled from the same promoter as the lacZ gene.
c. The Lac repressor protein is constitutively expressed.
d. The operator region regulates transcription through interaction with the Lac repressor protein.

25. Which of the following is a characteristic of the set of genes in an operon that is NOT true of a regulon?
a. Transcription can produce long polycistronic mRNA that contains multiple genes in each transcript.
b. Each gene of the set usually contains its own Shine-Dalgarno sequence.
c. Regulation of gene expression can occur through activation or repression mechanisms.
d. All of the genes in the set are controlled by a single promoter.

26. Which of the following sequences contain a six-nucleotide inverted repeat?
a. GTCACGCGACGATACGGTCACG　b. GTCACGACTAGCCTAGTCGCTG
c. GTCACGACTAGCCATCAGCCTG　d. GTCACGACTAGCCCGACTAGTG

27. Which of the following structural motifs are NOT *commonly* found in the DNA-binding motifs of proteins that act as transcriptional regulators?

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a. Homeodomain b. Leucine zipper c. b-barrel d. Helix-turn-helix

28. Which of the following is NOT a mechanism for regulating gene expression before the mature RNA transcript is produced?
a. mRNA splicing b. Protein degradation
c. Attenuation of transcription elongation d. Modification of mRNA termini

29. The covalent modification most critical to the insulin signaling pathway is:
a. phosphorylation. b. methylation. c. acetylation. d. ubiquitination.

30. Which of the following events is least likely a result of protein phosphorylation?
a. Reduction in the activity of an enzyme b. Transport of the protein to the nucleus
c. The specific binding of a regulatory protein d. Targeting of the protein for degradation

31. Which of the following is NOT true of the regulation of the arabinose operon?
a. CRP activates expression when bound to cAMP.
b. AraC protein recruits RNA polymerase when bound to arabinose.
c. Arabinose binds to AraC protein, decreasing its affinity for a DNA site near the promoter.
d. Arabinose binding alters the conformation of the dimerization domain of the AraC protein.

32. Enzymes known as HATs _____ histones, while HDACs _____ histones.
a. deacetylate; phosphorylate b. acetylate; deacetylate
c. deacetylate; acetylate d. acetylate; hypermethylate

33. The upstream activator sequences (UASs) of yeast are analogous to _____ in higher eukaryotes.
a. promoters b. TATA boxes c. operators d. enhancers

34. Basal transcription factors are:
a. necessary only for initiation of transcription of house-keeping genes.
b. factors that bind to other proteins, not to DNA directly.
c. required at every Pol II promoter.
d. factors that bind to enhancers.

35. Which of the following general transcription factor phosphorylates the C-terminal domain of RNA Pol II?
a. TFIID b. TFIIA c. TFIIH d. TFIIF

二、選擇題每題 1.5 分(15%) 單選

1. All the following statements about λ phage are true except:
a. λ phage lyse *E. coli* upon release of newly synthesized phage.
b. Foreign DNA up to approximately 50 kilobases can be cloned into λ phage.
c. Both cDNA and genomic DNA can be cloned into λ phage.
d. λ Phage consists of a head and tail region.

2. In the large-scale production of a particular human protein in *E. coli* cells, the cDNA corresponding to the protein was modified so that the expressed protein would have six histidine residues at the C-terminus. The purpose of this modification was
a. to facilitate transfer of the cDNA into the *E. coli* cells.
b. to provide a promoter for the transcription of the cDNA in *E. coli.*

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c. to facilitate purification of the expressed protein though binding to an affinity column containing chelated nickel atoms.
d. to prevent degradation of the expressed protein by *E. coli* proteases.

3. A mutation that changes the recognition sequence for the restriction enzyme *Eco*RI from GAATTC to GATTTC is an example of a
a. restriction fragment length polymorphism (RFLP). b. single nucleotide polymorphism (SNP).
c. simple sequence repeat (SSR). d. a and b e. all of the above

4. Indicate the order in which the following steps occur in the production of a mature mRNA.
a. initiation of transcription, splicing, addition of 5′′ cap, addition of poly(A) tail, transport to cytoplasm
b. initiation of transcription, addition of 5′ cap, splicing, addition of poly(A) tail, transport to cytoplasm
c. initiation of transcription, addition of poly(A) tail, addition of 5′ cap, splicing, transport to cytoplasm
d. initiation of transcription, addition of 5′ cap, addition of poly(A) tail, splicing, transport to cytoplasm

5. Which of the following characteristics of protein degradation in eukaryotic cells is NOT true of protein degradation in bacterial cells?
a. Proteins with an Arg residue at their N-termini have short half-lives.
b. Proteins are degraded by a large, barrel-shaped protease.
c. Proteolysis is ATP dependent in regulated protein degradation.
d. Protein degradation is directed by the covalent attachment of ubiquitin.

6. The sequence of a promoter constitutes the most basic mechanism of transcription regulation because
a. promoters are always bound by activators.
b. RNA polymerase has differential affinities for different sequences that correlate with the efficiency of transcription.
c. promoters are always bound by repressors.
d. the expression levels of different housekeeping genes are always identical.

7. Which of the following is the least likely mechanism for reducing the rate of gene transcription by a repressor?
a. The repressor binds directly to the RNA polymerase to block the closed-to-open transition at initiation.
b. The repressor induces a conformational change in the polymerase that accelerates the closed-to-open transition.
c. The binding of the repressor sterically occludes binding of the RNA polymerase to the promoter.
d. The repressor binds directly to the DNA to stabilize the closed complex over the open complex.

8. Which of the following is true of the structure of typical transcriptional activators?
a. They contain only one type of motif.
b. The regulatory domain contains the DNA-binding motif.
c. The DNA-binding domain always binds to the coactivator.
d. They contain a regulatory domain that is functional when removed from the DNA-binding domain.

9. Which of the following is true of the mechanism of transcription attenuation of the *trp* operon?
a. The leader peptide mechanism is analogous to a repressor protein.
b. The ribosome stalls at the adjacent Trp codons when the levels of tryptophan in the cell are high.
c. The stalling of the ribosome at region 1 of the leader sequence inhibits the formation of the terminator structure.
d. When sequences 2 and 3 of the leader sequence associate, transcription is terminated prematurely.

10. Which of the following is NOT true about the role of Mediator complex in transcription initiation?

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a. Mediator binds to RNA polymerase II.
b. Mediator binds to upstream enhancer sequences.
c. Mediator binds to general transcription factors.
d. Mediator binds to transcription activators.

三、配合題 (5%): Match up the important persons and their significant discoveries

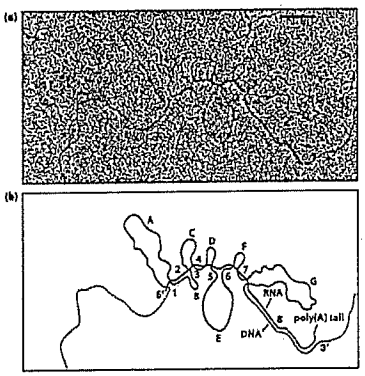
1. Maurice Wilkins and Rosalind Franklin
2. James Watson and Francis Crick
3. Stanley Miller
4. Jacob and Monod
5. Howard Temin

a. generate X-ray diffraction photograph of DNA
b. resolve a double-helical model for the structure of deoxyribonucleic acid
c. discovered the first ribozyme and show life may have originated in an RNA world
d. proposed the regulation of the *lac* operon model to explain gene regulation
e. discover the retroviruses' replication involved in reverse transcriptase
f. discover the DNA polymerase for DNA replication
g. decipher the structure of transfer RNA

四、問答題(45%)

1. 解釋下列名詞或分生技術: (each 1.5 pts)
   a. cDNA library
   b. pseudogene
   c. RNA editing
   d. reassociation kinetics
   e. Single-nucleotide polymorphism (SNPs)
   f. chromosome walking
   g. Loss of heterozygosity
   h. Southern blotting or Northern blotting
   i. Fluorescent *in situ* hybridization (FISH)
   j. Sanger method to DNA sequencing

2. The picture (a) taken from transmission electron microscope and schematic drawing (b) are represent a DNA-mRNA hybrid, what is the important discovery in the field of molecular biology from this picture? (3 pts)



3. Please describe the difference between transcriptomics and proteomics? (4pts)

4. Please describe how to use yeast two-hybrid system to identify protein-protein interaction? (hint: DNA binding domain (DBD), Activation domain (AD), reporter gene, such as *lacZ* or *Luciferase* gene) (5pts)

5. Genetic recombination involves 5 key steps, please put these steps in order. (A)form Holliday structure; (B)branch migration; (C)ligation; (D)strand displacement; (E)endonuclease nicking (1.5pts)

6. Following are four processes common to most cloning experiments. (a) transforming bacteria, (b) plating bacteria on selective medium, (c) cutting DNA with restriction endonucleases, (d) ligating DNA fragments. Please put these steps in order while doing a cloning experiment. (1.5 pts)

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7. Why is the enzyme reverse transcriptase found within retroviral virions? (5pts)

8. Describe how a dominant negative mutation can functionally inhibit the activity of a wild-type GTPase. (5pts)

9. In animal cells, nearly all cytoplasmic mRNAs have a 3′ poly(A) tail, which is added to the pre-mRNA before splicing. What proteins are involved in polyadenylation? Indicate their order of association with pre-mRNA and their functions. (5pts)

國立中山大學103學年度碩士暨碩士專班招生考試試題

科目名稱：普通生物學【生科系碩士班甲組】　　題號：421004

※本科目依簡章規定「可以」使用計算機　　

選擇題 (單選，每題一分，共 40 題)

1. The world oldest tree recently found in northern Europe is a(n)
   A. dicot.
   B. fern.
   C. gymnosperm.
   D. monocot.

2. What do fungus-farming ants and their fungi have in common?
   A. Both groups are heterotrophic.
   B. Both groups have cell walls.
   C. Both groups ingest food.
   D. The diploid state is dominant in both groups.

3. Lichens are symbiotic associations of fungi and
   A. algae.
   B. animals.
   C. bacteria.
   D. plants.

4. What does the mycorrhizal fungus provide to its photosynthetic partner?
   A. Antibiotics
   B. Carbohydrates
   C. Nitrogen compounds
   D. Phosphate ions and minerals

5. Mushrooms are examples of
   A. ascocarps.
   B. basidiocarps.
   C. mycorrhizae.
   D. soredia.

6. The large-scale frog deaths in Australia and Central America in the late 20 century is most likely caused by
   A. ascomycetes.
   B. basidiomycetes.
   C. chytrids.
   D. glomeromycetes.

7. The middle age witch phenomena may be partially explained by the food crops attacked by
   A. ascomycetes.
   B. basidiomycetes.
   C. chytrids.
   D. zygomycetes.

8. Which of the following characterizes monocotyledonous plants?
   A. Their flowers usually with betalain pigments
   B. Their flowers usually have parts in multiples of four or five.
   C. Their pollen grains usually have one opening.
   D. Their stems usually show significant growth rings.

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9. The one gene one enzyme concept was first proposed on genetic mutations in the red bread mold *Neurospora crassa* inferred from its unique sexual spore arrangement. The number and arrangement of sexual spores within this mold sporangium is
   A. 4 in linear sequence
   B. 4 in tetrahedral arrangement
   C. 8 in linear sequence
   D. 8 in cluster arrangement

10. If all fungi in an environment that perform decomposition were to suddenly die, then which group of organisms should benefit most, due to the fact that their fungal competitors have been removed?
   A. Animals
   B. Plants
   C. Prokaryotes
   D. Protists

11. All of the following are common to both green algae and land plants *except*
   A. cellulose cell wall.
   B. chlorophyll b.
   C. oogamy.
   D. starch storage.

12. Which of the following has flagellated sperm?
   A. Conifers
   B. Dicots
   C. Ferns
   D. Monocots

13. Which of the following sex and generation combinations most directly produces the fruit?
   A. female gametophyte
   B. female sporophyte
   C. male gametophyte
   D. male sporophyte

14. What is the greatest threat to plant diversity?
   A. grazing and browsing by animals
   B. human population growth
   C. insects
   D. pathogenic fungi

15. Which of the following statements about peatland is *false*?
   A. A drop in water level in peatlands could release stored CO_2 to the atmosphere
   B. It could preserve human for thousands of years, such as "Tolland" man, a bog mummy dating from 405-100 B.C.
   C. Peats are harvested and used as a source of fuel.
   D. Some of the Carboniferous forests decayed into modern day peatlands.

16. Stomata is absent in
   A. ferns.
   B. horsetails.
   C. liverworts.
   D. mosses.

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17. Which group is noted for the independence of gametophyte and sporophyte generations from each other?
A. Angiosperms
B. Ferns
C. Gymnosperms
D. Mosses

18. Whisk ferns (*Psilotum*) is
A. closely related to modern ferns.
B. the most primitive living vascular plant.
C. the plant without alternation of generation.
D. the plant without sexual reproduction.

19. In plants, which of the following are produced by meiosis?
A. diploid spores
B. haploid gametes
C. haploid gametophytes
D. haploid spores

20. If a tree plantations grew vigorously, produced healthy flowers in profusion, but set no fruit. Consequently, what is the likely source of the problem?
A. failure to produce fertile ovules
B. failure to produce pollen
C. pollination failure
D. poor gametophyte viability

21. How many years are needed for most pine species to produce mature seed from cone initiation period?
A. 2
B. 3
C. 4
D. 6

22. Pollen grains of flowering plants are
A. gametes.
B. gametophytes.
C. spores.
D. sporophytes.

23. Generally, wind pollination is most likely to be found in seed plants that grow
A. close to the ground.
B. in area where winds prevailing.
C. in dense, single-species stands.
D. in dry, hot area.

24. In flowering plants, the clades with bilaterally symmetrical flowers have ___ species than those with radially symmetrical flowers.
A. equal
B. equal or more
C. less
D. more

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25. The sequence of floral part from the outmost to the center of the flower is
A. carpels, petals, sepals, stamens
B. petals, sepals, stamens, carpel
C. sepals, petals, stamens, carpel
D. sepals, stamens, petals, carpel

26. Which of the following flower parts develops into a seed?
A. Ovary
B. Ovule
C. Stigma
D. Style

27. The fruit of the mistletoe, a parasitic angiosperm, is a one-seeded berry. In members of the genus *Viscum*, the outside of the seed is viscous (sticky), which permits the seed to adhere to surfaces, such as the branches of host plants or the beaks of birds. What should be expected of the fruit if the viscosity of *Viscum* seeds is primarily an adaptation for dispersal rather than an adaptation for infecting host plant tissues?
A. It should be colored so as to provide it with camouflage.
B. It should be drab in color.
C. It should be nutritious.
D. It should secrete enzymes that can digest bark.

28. Which of the following is true concerning flowering plants?
A. The flower is the modification of a shoot.
B. The gametophyte generation is dominant.
C. The sporophyte generation is not photosynthetic.
D. There is no spore found in flowering plants.

29. How many cotyledons are found in a Gymnosperm embryo?
A. 0
B. 1
C. 2
D. More than 3

30. Gymnosperms differ from both extinct and extant (living) ferns because they
A. are woody.
B. have pollen.
C. have spores.
D. have sporophylls.

31. Which of the following statements is true of archegonia?
A. They are asexual reproductive structures.
B. They are not found in Gymnosperm.
C. They are the same as sporangia.
D. They are the sites where female gametes are produced.

32. Which angiosperm group has its egg formation resembling that of the gymnosperms?
A. Amborella
B. Eudicots
C. Magnoliids
D. Monocots

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33. Which of the following is *not* found in seed plants?
A. Homospory
B. Ovules
C. Pollen grains
D. Reduced gametophytes

34. Which of the following does not have vascular tissue?
A. Fruit
B. Pollen
C. Seed
D. All of the above

35. The peristome found in some moss capsule regulates
A. egg release.
B. sperm release.
C. spore release.
D. water evaporation.

36. Which of the following does have true root?
A. Fern gametophyte
B. Fern sporophyte
C. Moss gametophyte
D. Moss sporophyte

37. Which of the following is true of the life cycle of mosses?
A. Antheridia and archegonia are produced by sporophytes.
B. Spores are primarily distributed by water currents.
C. The gametophyte generation is dominant.
D. The sporophyte generation is haploid.

38. The moss spore germinates into
A. embryo.
B. gametophore.
C. protonema.
D. sporophyte.

39. The main plant group in Carboniferous forests is
A. bryophytes.
B. conifers.
C. ferns.
D. lycophytes.

40. The structural integrity of bacteria is to peptidoglycan as the structural integrity of plant spores is to
A. cellulose.
B. lignin.
C. secondary compounds.
D. sporopollenin.

背面有題

國立中山大學103學年度碩士暨碩士專班招生考試試題

科目名稱：普通生物學【生科系碩士班甲組】　　題號：421004

※本科目依簡章規定「可以」使用計算機　　

問答題 (共六題，一題 10 分，此部份共計 60 分)

41. 請將以下的一篇論文摘要翻譯成精確的中文

Thermoregulatory behavior is an important component of daily activities for many reptiles, especially for small heliothermic (sun-basking) species that inhabit cold climates. However, the relative costs and benefits of thermoregulation depend on numerous factors, such that reptiles may sometimes accord a low priority to precise control of body temperatures. We observed and radio tracked green snakes in central Malaysia during the mating season (spring). Previous studies on this species have documented precise behavioral regulation of body temperatures during summer. In contrast, the courting snakes that we studied in springtime spent little time in overt thermoregulatory behavior.

42. 線性演化(anagenesis)與分支演化(cladogenesis)對物種形成(speciation)的觀點有何差異？

43. 系統分類(systematics)、分類架構(classification)與系統發育(phylogenetics)之間的關係是什麼？

44. 有一個科的淡水魚分布於澳洲、新幾內亞及馬達加斯加，那麼研究者應該要如何設想假說才能知道這樣的分布究竟與岡瓦納大陸(Gondwana)的分割(vicariance)有什麼關係？

45. 假設有一種動物在台灣曾經非常普遍，且只分布全島的平原。但是在 1950 年代就在野外絕種。那麼政府打算從民間飼養的個體挑出個體來復育，但遇到幾個麻煩: (1) 民間業者曾經在繁殖場中進行本土種與外來種的雜交，但規模不大；(2) 繁殖出來野放以後又可能會因為啃食危害稀有植物；(3) 原本的棲地已經消失且破碎化。請問你認為政府應該根據什麼樣的科學研究怎麼解決此事？

46. 解釋名詞 (一小題 2 分)

(1) 表徵遺傳學(epigenetics)
(2) 內共生學說(endosymbiosis theory)
(3) 天擇(natural selection)
(4) 趨同演化(convergent evolution)
(5) 瓶頸效應(bottle neck effect)