

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。 本科試題共計 1/10 頁			
※共 50 題選擇題，單選，每題 2 分，不倒扣。			
1. In a multiplexed next-generation sequencing experiment, DNA from four plants is fragmented, ligated to adapters, and each sample receives a different short index sequence. After sequencing, reads are separated by sample before alignment to the reference genome. What is the primary purpose of the index sequence?			
(A) To mark the beginning and end of every exon in the genome.			
(B) To increase the melting temperature of all DNA fragments equally.			
(C) To identify which sample each sequencing read came from.			
(D) To distinguish mRNA from genomic DNA during PCR amplification.			
(E) To replace the need for a reference genome during base calling.			
2. A diploid plant genome is sequenced at high depth. At a uniquely mappable nuclear locus, 96 high-quality reads support nucleotide A and 104 high-quality reads support nucleotide G. The reference genome has A at this position. Which interpretation is most consistent with these data?			
(A) The plant is heterozygous A/G at this locus.			
(B) All G reads must be sequencing errors because the reference has A.			
(C) The plant must be haploid at this locus.			
(D) The locus cannot be in nuclear DNA.			
(E) The reference genome must contain two identical copies of this locus.			
3. A researcher uses RNA-seq to compare Gene M expression in untreated and drought-treated leaves. Both samples were prepared with the same library method and sequenced to similar depth. After normalization for library size, Gene M has many more reads mapping to its exons in the drought-treated sample. Which conclusion is best supported?			
(A) Gene M must have acquired more introns during drought treatment.			
(B) The DNA sequence of Gene M must have changed in every drought-treated cell.			
(C) RNA-seq directly proves that the Gene M protein is more active.			
(D) Gene M is likely more highly expressed after drought treatment.			
(E) The reads must represent xylem sap rather than RNA molecules.			
4. In the Hershey-Chase experiment, T2 phages were labeled either with radioactive sulfur-35 or radioactive phosphorus-32 before infecting bacteria. After infection, the samples were blended and centrifuged. Which result most directly supported the conclusion that DNA, rather than protein, is the genetic material of the phage?			
(A) Most sulfur-35 entered the bacterial pellet and directed production of new phages.			
(B) Most phosphorus-32 entered the bacterial pellet and was associated with production of new phages.			
(C) Both isotopes remained only in the surrounding medium after blending.			
(D) Neither isotope could be detected after infection.			
(E) Sulfur-35 labeled bacterial DNA, whereas phosphorus-32 labeled bacterial protein.			
5. A temperate phage infects a bacterial cell. In one condition, the phage genome integrates into the bacterial chromosome and is replicated with the host genome for many bacterial generations. Which term best describes this integrated phage DNA?			
(A) capsid			
(B) virion			
(C) plasmodesma			

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。 本科試題共計 2/10 頁			
(D) prion (E) prophage 6. In the <i>E. coli lac</i> operon, lactose is present and can be converted to allolactose, while glucose is absent. Which regulatory state is expected? (A) The <i>lac</i> repressor binds tightly to the operator, and CAP is inactive. (B) The <i>lac</i> repressor is inactive, but CAP cannot bind because cAMP is high. (C) The <i>lac</i> repressor is inactive, CAP-cAMP binds near the promoter, and transcription is high. (D) RNA polymerase is blocked because lactose directly binds the promoter. (E) The structural genes are permanently deleted from the chromosome. 7. A mutation deletes a DNA sequence located several kilobases upstream of a eukaryotic gene. The promoter and coding sequence remain unchanged, but transcription of the gene drops sharply in the tissue where an activator protein normally binds that upstream sequence. Which explanation is most likely? (A) The deleted sequence was the ribosome-binding site required for translation in eukaryotes. (B) The deleted sequence encoded the entire protein product of the gene. (C) The deleted sequence was a telomere required for chromosome end protection. (D) The deleted sequence was the mRNA cap added after transcription. (E) The deleted sequence functioned as an enhancer that helped increase transcription. 8. When chromatin is mildly digested with micrococcal nuclease, many protected DNA fragments are approximately 147 base pairs long. Which structure most directly accounts for these protected fragments? (A) A DNA segment wrapped around a histone octamer in a nucleosome. (B) A mature mRNA molecule bound to a ribosome. (C) A bacterial operator bound by RNA polymerase. (D) A phospholipid bilayer surrounding the nucleus. (E) A plasmid origin of replication bound by DNA ligase. 9. A region of a eukaryotic chromosome is highly condensed, has low transcriptional activity, and replicates relatively late in S phase. Which description best fits this region? (A) Euchromatin, because it is open and actively transcribed. (B) Heterochromatin, because it is compact and relatively transcriptionally inactive. (C) A nucleolus, because it contains only mitochondrial DNA. (D) A lysogenic phage, because it always produces capsid proteins. (E) A spliceosome, because it removes exons from pre-mRNA. 10. A loss-of-function allele <i>a</i> affects a gene subject to genomic imprinting. In the relevant tissue, <i>A/a</i> offspring show the mutant phenotype only when allele <i>a</i> is inherited from the father, but not when allele <i>a</i> is inherited from the mother. Which model best explains this pattern? (A) The paternal allele is epigenetically silenced, so only the maternal allele is expressed. (B) Both alleles are expressed equally regardless of parent of origin. (C) The mutation changes the genetic code only in sperm. (D) The maternal allele is epigenetically silenced, so the paternal allele determines the phenotype. (E) The loss-of-function allele is repaired whenever it is inherited from the mother.			

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。 本科試題共計 3/10 頁			
11. A small RNA is processed from a hairpin precursor and loaded into a protein complex. The complex binds a complementary sequence in a target mRNA, leading to reduced protein production from that mRNA. Which statement best describes this mechanism? (A) A small RNA directly becomes a histone protein in the nucleosome. (B) A small RNA increases transcription by replacing RNA polymerase at the promoter. (C) A small RNA always removes methyl groups from both DNA strands. (D) A small RNA converts a lytic phage into a prophage. (E) A miRNA or related small RNA can guide sequence-specific repression or degradation of target mRNAs.			
12. A researcher examines a secondary xylem sample from a woody angiosperm stem. Cell type I is dead at maturity and has perforation plates that allow water to pass between adjacent cells. Cell type II is also dead at maturity, has thick lignified secondary walls, lacks perforation plates, and primarily contributes to mechanical support. Which identification is most accurate? (A) Cell type I is a xylem fiber, and cell type II is a vessel element. (B) Cell type I is a sieve-tube element, and cell type II is a companion cell. (C) Cell type I is a vessel element, and cell type II is a xylem fiber. (D) Cell type I is a tracheid, and cell type II is a guard cell. (E) Cell type I is xylem parenchyma, and cell type II is a vessel element.			
13. A mineral ion moves through cell walls and extracellular spaces of the root cortex. At the endodermis, this apoplastic movement is blocked, forcing the ion to cross a plasma membrane before entering the vascular cylinder. Which pathway is being blocked, and which structure is responsible for the block? (A) symplastic pathway and sieve plate (B) apoplastic pathway and Casparian strip (C) transpiration stream and stomatal pore (D) pressure-flow pathway and companion cell (E) lysogenic pathway and prophage			
14. In the ABC model of flower development, B-function activity is lost, while A- and C-function activities remain normal. What organ pattern is expected from the outermost whorl to the innermost whorl? (A) sepal, petal, stamen, carpel (B) petal, petal, stamen, stamen (C) carpel, stamen, petal, sepal (D) sepal, sepal, carpel, carpel (E) leaf, root, stem, seed			
15. A plant grown in nutrient-poor soil shows chlorosis first in older leaves, while younger leaves remain relatively green. Which explanation is most consistent with this pattern? (A) A mobile nutrient, such as nitrogen or magnesium, is deficient and is being remobilized from older leaves to younger tissues. (B) An immobile nutrient, such as calcium, is deficient and therefore symptoms must appear first in older leaves. (C) The plant lacks phloem, so sugars cannot move from source to sink.			

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。		本科試題共計 4/10 頁	
(D) The plant has excess chlorophyll in older leaves but none in roots.			
(E) The symptom is diagnostic only of viral infection and cannot involve mineral nutrition.			
16. During a hot, dry day, air bubbles form in some xylem conduits, reducing hydraulic conductivity. What is the most direct consequence of this xylem cavitation?			
(A) Sucrose loading into phloem immediately stops in all leaves.			
(B) The Casparian strip becomes freely permeable to mineral ions.			
(C) Water transport through affected xylem conduits is impaired.			
(D) Water movement through the affected conduits increases because air has lower viscosity than water.			
(E) The affected conduits begin transporting sugars instead of water.			
17. Which of the following statements about the plasma membrane is most accurate?			
(A) Phospholipids form a bilayer mainly because extracellular forces push their hydrophobic tails into the interior of the membrane.			
(B) Once the plasma membrane is formed, its phospholipids and proteins become fixed in position and show little lateral movement.			
(C) The two leaflets of the plasma membrane have almost identical lipid compositions, with phosphatidylcholine and sphingomyelin distributed equally on both sides.			
(D) Membrane proteins perform diverse functions, including signal reception, enzymatic activity, and attachment of the membrane to the cytoskeleton.			
(E) Most transmembrane domains of transmembrane proteins are composed primarily of hydrophilic amino acids, allowing them to interact favorably with the hydrophobic core of the lipid.			
18. Which of the following best describes the cellular process that underlies Mendel's law of segregation?			
(A) the separation of homologous chromosomes during meiosis I			
(B) the crossing over of non-sister chromatids during prophase I			
(C) the separation of sister chromatids during mitosis			
(D) the random alignment of bivalents at the metaphase plate during meiosis I			
(E) the formation of the synaptonemal complex			
19. In a plant species, a purple flower color is produced only when two enzymes in the same biosynthetic pathway are functional. Gene A encodes the first enzyme, and Gene B encodes the second enzyme. A plant must have at least one dominant allele at both loci to produce purple flowers. If two double heterozygotes are crossed, AaBb x AaBb, what phenotypic ratio is expected in the offspring?			
(A) 3 purple: 1 white			
(B) 9 purple: 3 white: 4 colorless			
(C) 9 purple: 7 white			
(D) 12 purple: 3 white: 1 colorless			
(E) 15 purple: 1 white			
20. Which of the following is a digestive compartment within a cell?			
(A) the Golgi apparatus			
(B) rough endoplasmic reticulum (rER)			
(C) smooth endoplasmic reticulum (sER)			

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。		本科試題共計 5/10 頁	
(D) lysosome (E) mitochondria			
21. The phenotype for a character that is most commonly observed in natural populations is called the _____.			
(A) wild type (B) polymorphic trait (C) dominant trait (D) true-breeding variant (E) hybrid variant			
22. Which of the following statements about the cell cycle is correct?			
(A) The mitotic phase alternates with interphase and takes the longest. (B) The concentration of cyclin-dependent kinases (Cdks) fluctuates throughout the cell cycle and peaks at the same time as cyclin. (C) If a cell does not receive a go-ahead signal at the M checkpoint, it may exit the cell cycle and enter a nondividing state called the G ₀ phase. (D) During the S phase, sister chromatids separate and move to opposite poles of the cell. (E) A growth factor added to the cell culture medium can stimulate the cultured cells to divide.			
23. Which of the following is an example of a ribozyme?			
(A) RNA polymerase (B) 23s rRNA (C) DNA ligase (D) helicase (E) restriction endonuclease			
24. A researcher identifies a point mutation in a eukaryotic gene that changes the highly conserved 5'-GU-3' sequence at the 5' end of an intron into a 5'-AU-3' sequence. Which of the following is the most likely direct consequence of this mutation during gene expression?			
(A) The spliceosome will successfully remove the mutated intron but will be unable to catalyze the phosphodiester bond formation that joins the adjacent exons. (B) RNA polymerase II will stall at the mutation site, prematurely terminating the transcription of the pre-mRNA. (C) The spliceosome will fail to recognize the splice site, leading to a mature mRNA that improperly retains the intron. (D) The resulting pre-mRNA will fail to receive a 5' cap and a 3' poly-A tail, marking it for rapid degradation in the nucleus. (E) The branch-point adenine will be removed from the intron, preventing formation of the lariat intermediate during splicing.			
25. In the context of cell cycle regulation and cancer development, the <i>ras</i> and <i>p53</i> genes play critical roles. The normal <i>ras</i> gene is a _____ that stimulates cell division, while the normal <i>p53</i> gene is a _____ that inhibits division or promotes apoptosis. Cancer-causing mutations typically involve a gain of function for _____ and a loss of function for _____.			
(A) tumor-suppressor gene; proto-oncogene; <i>ras</i> ; <i>p53</i> (B) oncogene; tumor-suppressor gene; <i>ras</i> ; <i>p53</i>			

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。 本科試題共計 6/10 頁			
(C) proto-oncogene; oncogene; <i>p53</i>; <i>ras</i> (D) tumor-suppressor gene; proto-oncogene; <i>p53</i>; <i>ras</i> (E) proto-oncogene; tumor-suppressor gene; <i>ras</i>; <i>p53</i> 26. <i>Limulus polyphemus</i>, commonly known as the Atlantic horseshoe crab, is of great interest in both evolution and biomedicine. Which of the following accurately pairs its phylogenetic classification with a distinguishing physiological feature? (A) It is classified within the subphylum <i>Mandibulata</i> because it possesses specialized chewing mouthparts, and its clear lymphatic fluid contains enzymes used in DNA cloning. (B) It belongs to the subphylum <i>Chelicerata</i>, making it more closely related to spiders than to true crabs, and its blue, hemocyanin-rich blood contains amebocytes that detect gram-negative bacterial endotoxins. (C) It belongs to the subphylum <i>Hexapoda</i>, exhibiting a distinct head, thorax, and abdomen, and its tail contains venom glands that produce a potent neurotoxin. (D) It is a member of the subphylum <i>Crustacea</i>, and its red, hemoglobin-rich blood is harvested to test medical equipment for viral contamination. (E) It is a surviving member of the extinct class <i>Trilobita</i>, and its adaptive immune system produces unique, mammalian-like antibodies that are isolated for vaccine development. 27. _____ determine the anterior-posterior body plan by regulating the identity of different body regions; in arthropods, changes in their gene expression can affect segment identity and appendage development. (A) Maternal effect genes (B) Morphogens (C) Organizers (D) Homeotic genes (E) Segment polarity genes 28. During frog embryonic development, _____, the process that leads to the formation of three germ layers, begins when cells move through the _____, which is associated with the future anus; therefore, frogs are classified as _____. (A) cleavage, blastopore, deuterostomes (B) gastrulation, primitive streak, protostomes (C) neurulation, neural plate, protostomes (D) neurulation, primitive streak, deuterostomes (E) gastrulation, blastopore, deuterostomes 29. Which of the following cell types recognize viral antigens presented by antigen-presenting cells and release cytokines that help activate other immune cells during a primary adaptive immune response to a viral pathogen? (A) helper T cells (B) cytotoxic T cells (C) B cells (D) plasma cells (E) mast cells			

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。 本科試題共計 7/10 頁			
30. During the repolarization phase of an action potential in a typical mammalian neuron, which of the following cellular events is primarily responsible for returning the membrane potential towards its resting negative value? (A) the continuous passive efflux of potassium ions through non-gated channels in the axonal membrane (B) the opening of ligand-gated chloride channels at the axon hillock, allowing chloride ions to rush into the cytoplasm (C) the inactivation of voltage-gated sodium channels and the efflux of potassium ions through voltage-gated potassium channels (D) the rapid influx of sodium ions through open voltage-gated sodium channels (E) the immediate rapid exchange of three sodium ions out of the cell for two potassium ions into the cell by the sodium-potassium pump 31. Which of the following best describes the general sequence of events in a cell signaling pathway? (A) A signaling molecule enters the nucleus directly, binds DNA, and immediately causes cell division. (B) A receptor detects a signal, transmits the information through intracellular molecules, and produces a specific cellular response. (C) A receptor internalizes the signal, releases it into the bloodstream, and permanently alters neighboring cells. (D) A signaling molecule binds randomly to membrane lipids, increasing cell membrane permeability. (E) A receptor permanently changes gene expression within the cell after binding to a signal. 32. Which of the following is the major excitatory neurotransmitter in the vertebrate central nervous system? (A) acetylcholine (B) gamma-aminobutyric acid (GABA) (C) serotonin (D) glutamate (E) dopamine 33. The following events occur during muscle fiber contraction. I: The myosin head of the thick filament hydrolyzes ATP to ADP and inorganic phosphate; II: The release of ADP and inorganic phosphate is coupled to a power stroke; III: The thin filament moves toward the center of the sarcomere; IV: An ATP molecule binds to the myosin head of the thick filament; V: A cross-bridge forms between the thin and thick filaments. Which of the following depicts the correct chronological order of these events? (A) I → IV → V → II → III (B) IV → II → V → I → III (C) IV → I → V → II → III (D) V → I → II → III → IV (E) I → V → IV → II → III 34. In the life cycle of <i>Neurospora crassa</i>, the transient diploid zygote undergoes _____ followed immediately by _____ to produce eight _____ ascospores within the ascus. (A) meiosis; mitosis; haploid (B) meiosis; meiosis; haploid (C) mitosis; mitosis; diploid			

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。		本科試題共計 8/10 頁	
(D) mitosis; meiosis; haploid (E) meiosis; mitosis; diploid			
35. Ecology is best defined as the study of: (A) how genes are passed from parents to offspring (B) interactions between organisms and their biotic and abiotic environment (C) the chemical composition of cells (D) the structure of animal organs (E) the classification of rocks and minerals			
36. A biological population consists of: (A) all organisms living on Earth (B) all physical conditions, such as temperature and rainfall, in an environment (C) all species in a particular ecosystem (D) all abiotic factors in a habitat (E) all individuals of the same species living in the same area			
37. Which of the following is a requirement for natural selection to occur? (A) All individuals must be genetically identical. (B) Individuals must have no variation in survival or reproductive success. (C) The environment must remain constant. (D) Reproduction must not occur. (E) Traits must be heritable.			
38. Species richness refers to: (A) the number of individuals in one species (B) the number of different species in a community (C) the genetic variation within one population (D) the amount of energy transferred between trophic levels (E) the biomass of the largest species in an ecosystem			
39. Which statement best defines biodiversity? (A) the growth of one population until it reaches carrying capacity (B) the total amount of solar energy available in an ecosystem (C) the number of predators in a single food chain (D) the process by which one species outcompetes all others (E) the variety of living organisms, including different species, genes, and ecosystems			
40. Which statement best describes the relationship between biodiversity and ecosystem functioning? (A) Biodiversity only refers to the number of animals in an ecosystem. (B) Ecosystems with higher biodiversity often function better because different species can contribute in different ways. (C) Ecosystems with fewer species always produce higher biomass and thus higher productivity. (D) Biodiversity has no effect on ecosystem stability or ecosystem productivity. (E) Biodiversity only affects ecosystems when all species have the same ecological role.			

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。 本科試題共計 9/10 頁			
41. Which statement best describes a density-dependent factor in population dynamics? (A) It becomes more influential as population density increases. (B) It affects populations regardless of population size. (C) It only affects abiotic components of ecosystems. (D) It prevents natural selection from occurring. (E) It only influences the per-capita birth but not death rate of a population. 42. According to island biogeography theory, which island would generally have the greatest species richness at equilibrium? (A) a small island far from the mainland (B) a small island near the mainland (C) a large island far from the mainland (D) a large island near the mainland (E) Above are all possible based on the theory 43. Which condition is required for Hardy-Weinberg equilibrium? (A) frequent mutation (B) strong natural selection (C) random mating (D) very small population size (E) Individuals with certain alleles always have higher survival and reproduction 44. Resource partitioning can allow similar species to coexist because it: (A) eliminates all predators (B) prevents reproduction between species (C) promotes niche differentiation that reduces competition by using resources differently (D) stops energy flow through ecosystems (E) ensures all species use the same resource in the same way 45. Two competing species are most likely to coexist when: (A) Each species limits its own population growth more than it limits the other species. (B) One species completely eliminates the other. (C) Both species use identical resources in the same way. (D) Predation is absent from the ecosystem. (E) Interspecific competition is stronger than intraspecific competition for both species. 46. A population has two alleles, A and a. If the frequency of allele a is 0.3 and the population is in Hardy-Weinberg equilibrium, what is the expected frequency of heterozygotes? (A) 0.09 (B) 0.21 (C) 0.42 (D) 0.49 (E) 0.7 47. In a food chain, only a fraction of energy is transferred from one trophic level to the next trophic level mainly because: (A) Energy is destroyed during digestion.			

臺灣綜合大學系統 115 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401
※本項考試依簡章規定所有考科均「不可」使用計算機。		本科試題共計 10/10 頁	
(B) Energy is lost as heat through metabolism. (C) Producers absorb energy from consumers. (D) Decomposers prevent energy transfer. (E) Predator-prey mass ratio makes energy transfer 100% efficient between trophic levels.			
48. A small population becomes isolated, and several rare alleles become common by chance over many generations. This is most likely an example of: (A) directional selection (B) adaptive radiation (C) stabilizing selection (D) genetic drift (E) gene flow caused by frequent migration between populations			
49. In a long-term grassland experiment, researchers find that plots with higher plant species richness produce more total biomass than plots with fewer species. However, when they compare each diverse plot to the best-performing single-species plot, most diverse plots do NOT exceed the productivity of that best monoculture. Which of the following explanation best fits this result? (A) Higher biodiversity always increases ecosystem productivity because every species contributes equally. (B) The ecosystem has no relationship between biodiversity and productivity. (C) The positive effect of diversity is likely due to sampling effects, where diverse plots are more likely to contain a highly productive species. (D) Complementarity must be the only mechanism increasing biomass in diverse plots. (E) The result shows transgressive overyielding, because diverse plots always outperform the best monoculture.			
50. How can climate change contribute to biotic homogenization in ecological communities? (A) It can shift species distributions so that widespread, generalist species expand into new areas, making different communities more similar in species composition. (B) It stops all species from reproducing, causing every ecosystem to disappear. (C) It makes all ecosystems more stable and resilient by increasing local uniqueness. (D) It prevents competition between native and newly arriving species. (E) It causes every local community to become more unique by increasing the number of endemic species.			