

九十一學年度 原子科學 系(所) J 組碩士班研究生招生考試

科目 普通生物學 科號 3501 共 6 頁第 1 頁 *請在試卷【答案卷】內作答

- 一. Compare brightfield light microscope, darkfield light microscope, phase-contrast microscope, and confocal microscope. (8%)
- 二. Define and Compare autocrine, paracrine, cytokine, and hormone. (8%)
- 三. Compare Humoral immunity verse cellular immunity. (12%)
- 四. Use an example to describe how signal information is transduced into cellular responses in the cytoplasm and in the nucleus and how this signal response is amplified in target cells. (12%)
- 五. Multiple choice (select only one best answer for each question; there are total 30 questions in this section; **DO NOT WRITE THE ANSWER ON QUESTION SHEET**; 請將答案寫於答案卷, 勿將答案寫於試卷紙) (60%)
 - 1) Chloramphenicol is a drug that inhibits protein synthesis on prokaryotic ribosomes. Which of the following cells (or parts of cells) would have protein synthesis inhibited if they were grown in the presence of chloramphenicol?
 - A) bacteria
 - B) chloroplasts
 - C) mitochondria
 - D) Only A and C are correct.
 - E) A, B, and C are correct.
 - 2) Which of the following contain the 9 + 2 arrangement of microtubules?
 - A) microfilaments
 - B) cilia
 - C) basal bodies
 - D) nuclei
 - E) centrioles
 - 3) Which of the following is NOT a known function of the cytoskeleton?
 - A) to maintain characteristic shape of the cell
 - B) to provide mechanical support to the cell
 - C) to maintain a critical limit on cell size
 - D) to assist in cell motility by interacting with specialized motor protein
 - E) to hold mitochondria and other organelles in place within the cytosol
 - 4) The extracellular matrix is thought to participate in regulation of animal cell behavior by communicating via
 - A) plasmodesmata.
 - B) the nucleus.
 - C) integrins.
 - D) DNA and RNA.
 - E) lipoproteins in the membrane.

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- 5) Which kind of metabolic poison would most directly interfere with glycolysis?
- an agent that reacts with oxygen and depletes its concentration in the cell
 - an agent that closely mimics the structure of glucose but is nonmetabolic
 - an agent that reacts with NADH and oxidizes it to NAD⁺
 - an agent that binds to pyruvate and inactivates it
 - an agent that inhibits the formation of acetyl coenzyme A
- 6) Plants that fix CO₂ into organic acids at night when the stoma are open and carry out the Calvin cycle during the day when the stoma are closed are called
- C₃ plants.
 - C₄ plants.
 - CAM plants.
 - Only A and B are correct.
 - A, B, and C are correct.
- 7) What causes the rhythmic change in cyclin concentration in the cell cycle?
- the changing ratio of cytoplasm to genome
 - an increase in production once the restriction point is passed
 - the binding of PDGF to receptors on the cell surface
 - the cascade of increased production once its enzyme is phosphorylated by cdc2
 - its destruction by an enzyme phosphorylated by MPF
- 8) Taxol is an anticancer drug extracted from the Pacific yew tree. In animal cells, taxol disrupts microtubule formation by binding to microtubules and accelerating their assembly from the protein precursor, tubulin. Surprisingly, this stops mitosis. Specifically, taxol must affect
- anaphase.
 - formation of the centrioles.
 - the fibers of the mitotic spindle.
 - the S phase of the cell cycle.
 - chromatid assembly.
- 9) The particular position of a gene on a chromosome is known as a(n)
- locus.
 - allele.
 - chiasma.
 - tetrad.
 - map distance.
- 10) The frequency of crossing over between any two linked genes is
- proportional to the distance between them.
 - higher if they are recessive.
 - determined by their relative dominance.
 - difficult to predict.
 - the same as if they were not linked.

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- 11) In the following list of DNA properties, which one would be impossible for a single-stranded DNA molecule?
- A) information storage B) exchange with other organisms
 C) repair of thymine dimers D) mutation
 E) replication
- 12) Tobacco mosaic virus has RNA rather than DNA as its genetic material. If RNA from a tobacco mosaic virus is mixed with proteins from a DNA virus, the result is a mixed virus. If that virus infects a cell and reproduces, what would you expect the resulting viruses to be like?
- A) tobacco mosaic virus
 B) I would not expect any viruses to result.
 C) a DNA virus
 D) a hybrid: tobacco mosaic virus protein and nucleic acid from the DNA virus
 E) a hybrid: tobacco mosaic virus RNA and protein from the DNA virus
- 13) Which of the following help to hold the DNA strands apart while they are being replicated?
- A) ligase B) exonuclease
 C) single-stranded binding proteins D) helicase
 E) DNA polymerase
- 14) Where is the attachment site for RNA polymerase?
- A) operator region B) promoter region
 C) initiation region D) structural gene region
 E) regulator region
- 15) A particular eukaryotic protein is 300 amino acids long. Which of the following could be the number of nucleotides in the DNA that codes for this protein?
- A) 300 B) 3
 C) 100 D) 1800
 E) 900
- 16) Which of the following helps to stabilize mRNA by inhibiting its degradation?
- A) TATA box B) snRNPs
 C) spliceosomes D) introns
 E) poly(A) tail

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- 17) If you discovered a bacterial cell that contained no restriction endonuclease, which of the following would you expect to happen?
- The cell would be unable to replicate its DNA.
 - The cell would create incomplete plasmids.
 - The cell would be easily infected and lysed by bacteriophages.
 - The cell would become an obligate parasite.
 - Both A and D would occur.
- 18) What is a cloning vector?
- the laboratory apparatus used to clone genes
 - a DNA probe used to locate a particular gene in the genome
 - the enzyme that cuts DNA into restriction fragments
 - the sticky end of a DNA fragment
 - an agent, such as a plasmid, used to transfer DNA from an *in vitro* solution into a living cell
- 19) Bacteria containing recombinant plasmids are often identified by which process?
- exposing the bacteria to an antibiotic that kills the cells lacking the plasmid
 - removing the DNA of all cells in a culture to see which cells have plasmids
 - using radioactive tracers to locate the plasmids
 - examining the cells with an electron microscope
 - producing antibodies specific for each bacterium containing a recombinant plasmid
- 20) What are antigens?
- proteins found in the blood that cause foreign blood cells to clump
 - proteins embedded in B-cell membranes
 - proteins that consist of two light and two heavy polypeptide chains
 - antibody-generating foreign macromolecules
 - Both A and C are correct.
- 21) A doctor discovers that her patient can produce antibodies against some bacterial pathogens, but he is unable to protect himself against viral infections. The doctor suspects a disorder in her patient's
- cytotoxic cells.
 - B cells.
 - plasma cells.
 - T cells.
 - macrophages.

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- 22) Which of the following could prevent the appearance of the symptoms of an allergy attack?
- A) blocking the attachment of the IgE antibodies to the mast cells
 - B) blocking the antigenic determinants of the IgM antibodies
 - C) reducing the number of T helper cells in the body
 - D) Only A and B are correct.
 - E) Only B and C are correct.
- 23) A person suffering from AIDS would be unlikely to suffer from which of the following diseases?
- A) tuberculosis
 - B) cancer
 - C) rheumatoid arthritis
 - D) hepatitis
 - E) influenza
- 24) A muscle cell is properly referred to as a
- A) sarcomere.
 - B) myofibril.
 - C) myofilament.
 - D) belly of the muscle.
 - E) muscle fiber.
- 25) The perceived pitch of a sound depends partly on
- A) which hair cells of the cochlea are stimulated.
 - B) whether it is the round window or the oval window that vibrates.
 - C) which bones of the middle ear move.
 - D) the amplitude of the sound waves.
 - E) where particles settle in the semicircular canals.
- 26) Information carried by your optic nerve is perceived as "sight," whereas information carried by your auditory nerve is perceived as "sound." Which of the following statements best explains this?
- A) Different ions enter and leave the axons of the two different nerves.
 - B) Action potentials that carry visual information are of a different amplitude and frequency than those carrying sound information.
 - C) The information is carried to different areas of your brain.
 - D) The structure of neurons in the optic nerve differs from those in the auditory nerve.
 - E) Light energy and sound waves are different from each other.

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- 27) After an action potential, how is the resting potential restored?
- A) the opening of voltage-sensitive potassium channels and the closing of sodium activation gates
 - B) an increase in the membrane's permeability to potassium and chloride ions
 - C) the refractory period in which the membrane is hyperpolarized
 - D) the delay in the action of the sodium-potassium pump
 - E) the opening of sodium activation gates
- 28) Wernicke's and Broca's regions of the brain affect different aspects of
- A) speech.
 - B) memory.
 - C) vision.
 - D) olfaction.
 - E) hearing.
- 29) Which of the following could cause a realized niche to differ from a fundamental niche?
- A) food size and availability
 - B) competition from other species
 - C) suitable habitat
 - D) temperature limitations
 - E) water availability
- 30) Probably the most important factors affecting the distribution of biomes are
- A) species diversity and abundance.
 - B) community succession and climate.
 - C) day length and rainfall.
 - D) climate and topography.
 - E) wind and water current patterns.