

九十二學年度 原子科學 系(所) 丁 組碩士班研究生招生考試

科目 普通生物學 科號 3501 共 8 頁第 1 頁 \*請在試卷【答案卷】內作答

一、Essay (30%)

1. Using clonal selection model to describe the formation of memory B and T cells. (5%)
2. Devise an experimental setup to test whether a urine sample is from pregnant woman or non-pregnant woman. You need to explain the reason for your experiment. (5%).
3. A patient was found to be poisoned by a toxin that specifically block the active transport mechanisms in the kidney, predict how would urine production of this patient be affected? (5%)
4. You are "designing" an animal but can provide it with only one protein-digesting enzyme. Which of protein-digesting enzyme would you choose so that your animal could absorb the maximum amount of amino acids and why? (5%)
5. Dr. Jenner successfully used cowpox virus as a vaccine against a different virus that causes smallpox. Why was he successful even though he used viruses of different kinds? (10%)

二、Multiple choice (only one best answer for each question) (70%).

1. Target cells in an animal that lack receptors for local regulators
  - A) would divide but could never reach full size.
  - B) would not be expected to multiply in response to growth factors from nearby cells.
  - C) could develop normally in response to neurotransmitters instead.
  - D) could compensate by receiving nutrients via an a-factor.
  - E) All of these are expected outcomes of cells missing these receptors.
2. What does transformation involve in bacteria?
  - A) the infection of cells by a phage DNA molecule
  - B) the type of semiconservative replication shown by DNA
  - C) the transfer of DNA from one strain to another
  - D) the creation of a strand of RNA from a DNA molecule
  - E) the creation of a strand of DNA from an RNA molecule

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) a hybrid: tobacco mosaic virus protein and nucleic acid from the DNA virus
- B) tobacco mosaic virus
- C) a hybrid: tobacco mosaic virus RNA and protein from the DNA virus
- D) I would not expect any viruses to result.
- E) a DNA virus

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4. The old saying "one rotten apple spoils the whole barrel" comes from chemical signaling in plants
- A) by an increased uptake of carbon dioxide during respiration in target cells.
  - B) by release of ethylene gas as a plant hormone for ripening.
  - C) None of these explains the saying.
  - D) via an  $\alpha$  cell-signal system in the rotten apple.
  - E) via a local regulator for apple development.
5. A couple who are both carriers for the gene for cystic fibrosis have two children who have cystic fibrosis. What is the probability that their next child will have cystic fibrosis?
- A) 50%
  - B) 25%
  - C) 0%
  - D) 100%
  - E) 75%
6. Skin color in a fish is inherited via a single gene with four different alleles. How many different genotypes would be possible in this system?
- A) 6
  - B) 8
  - C) 16
  - D) 10
  - E) 3
7. PCR could be used to amplify DNA from which of the following?
- A) a fossil
  - B) a fetal cell
  - C) a virus
  - D) Only B and C are correct.
  - E) A, B, and C are correct.
8. The function of reverse transcriptase in retroviruses is to
- A) convert host cell RNA into viral DNA.
  - B) use viral RNA as a template for DNA synthesis.
  - C) hydrolyze the host cell's DNA.
  - D) use viral RNA as a template for making complementary RNA strands.
  - E) translate viral RNA into proteins.

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9. In a hospital, a bacterium is isolated that is resistant to an antibiotic previously used against other kinds of bacteria. This is most likely the result of
- A) reverse transcription.
  - B) transduction.
  - C) insertion.
  - D) transformation.
  - E) transposition.
10. Bacteriophage DNAs that have become integrated into the host cell chromosome are called
- A) T-even bacteriophages.
  - B) transposons.
  - C) prophages.
  - D) intemperate bacteriophages.
  - E) plasmids.
11. A muscle cell is properly referred to as a
- A) sarcomere.
  - B) myofibril.
  - C) belly of the muscle.
  - D) myofilament.
  - E) muscle fiber.
12. A sustained muscle contraction due to a lack of relaxations between successive stimuli is called
- A) tonus.
  - B) an all-or-none response.
  - C) fatigue.
  - D) tetanus.
  - E) a spasm.
13. The perceived pitch of a sound depends partly on
- A) whether it is the round window or the oval window that vibrates.
  - B) which hair cells of the cochlea are stimulated.
  - C) the amplitude of the sound waves.
  - D) which bones of the middle ear move.
  - E) where particles settle in the semicircular canals.

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14. Which of the following does NOT form part of the thin filaments of a muscle cell?
- A) actin
  - B) tropomyosin
  - C) calcium-binding site
  - D) troponin
  - E) myosin
15. During an IPSP, the postsynaptic membrane becomes more permeable to
- A)  $K^+$ .
  - B) GABA.
  - C)  $Ca^{2+}$ .
  - D)  $Na^+$ .
  - E) serotonin.
16. Wernicke's and Broca's regions of the brain affect different aspects of
- A) vision.
  - B) hearing.
  - C) olfaction.
  - D) speech.
  - E) memory.
17. A single inhibitory postsynaptic potential has a magnitude of 0.5 mV at the axon hillock and a single excitatory postsynaptic potential has a magnitude of 0.5 mV. What will be the membrane potential at the hillock after the spatial summation of 6 IPSPs and 2 EPSPs, if the initial membrane potential is -70 mV?
- A) -72 mV
  - B) -71 mV
  - C) -70 mV
  - D) -68 mV
  - E) -69 mV
18. 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
- A) cytotoxic cells.
  - B) macrophages.
  - C) B cells.
  - D) T cells.
  - E) plasma cells.

19. The MHC (major histocompatibility complex) is important in
- A) distinguishing self from nonself.
  - B) recognizing parasitic pathogens.
  - C) identifying bacterial pathogens.
  - D) identifying abnormal cells.
  - E) Both A and D are correct.
20. A person suffering from AIDS would be unlikely to suffer from which of the following diseases?
- A) hepatitis
  - B) cancer
  - C) influenza
  - D) rheumatoid arthritis
  - E) tuberculosis
21. Sponges are limited to feeding on small food particles because
- A) they have no mouth.
  - B) they lack a mechanism for bringing food into their bodies.
  - C) their cell membranes are highly selective.
  - D) they have an incomplete digestive tract.
  - E) their digestion is entirely intracellular.
22. Mushrooms and toadstools are classified as
- A) lichens.
  - B) basidiomycetes.
  - C) deuteromycetes.
  - D) ascomycetes.
  - E) zygomycetes.
23. Lichens are symbiotic communities consisting of fungi and
- A) mosses only.
  - B) cyanobacteria only.
  - C) chlorophytes only.
  - D) Only A and B are correct.
  - E) Only B and C are correct.

24. Muscles and nerves in their simplest forms occur in the

- A) cnidarians.
- B) nematodes.
- C) sponges.
- D) ribbon worms.
- E) flatworms.

25. The best way to describe the brain of a sea anemone would be as

- A) nonexistent.
- B) a series of ganglia at the bases of the tentacles.
- C) a pair of ganglia at the anterior end.
- D) a thick ring around the mouth.
- E) a single ganglion in the body wall.

26. A mycelium is characteristic of most

- A) mosses.
- B) bacteria.
- C) fungi.
- D) protozoa.
- E) sponges.

27. In flowering plants, meiosis occurs specifically in the

- A) megaspore mother cells.
- B) microspore mother cells.
- C) endosperm.
- D) Only A and B are correct.
- E) A, B, and C are correct.

28. A botanist discovers a new species of plant with a dominant sporophyte, chlorophyll a and b, and a cell wall made of cellulose. In assigning this plant to a division, all of the following would provide useful information EXCEPT whether or not the plant has

- A) seeds.
- B) flagellated sperm.
- C) flowers.
- D) starch.
- E) endosperm.

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29. Vascular plant tissue includes all of the following cell types EXCEPT

- A) vessels.
- B) cambium cells.
- C) sieve cells.
- D) companion cells.
- E) tracheids.

30. Which functional plant cells lack a nucleus?

- A) xylem only
- B) sieve tube cells only
- C) companion cells only
- D) both companion and parenchyma cells
- E) both xylem and sieve tube cells

31. What tissue makes up most of the wood of a tree?

- A) secondary phloem
- B) mesophyll cells
- C) vascular cambium
- D) secondary xylem
- E) primary xylem

32. In a frog embryo, gastrulation

- A) occurs along the primitive streak in the animal hemisphere.
- B) occurs within the inner cell mass that is embedded in the large amount of yolk.
- C) proceeds by involution as cells roll over the dorsal lip of the blastopore.
- D) produces a blastocoel displaced into the animal hemisphere.
- E) is impossible because of the large amount of yolk in the ovum.

33. Gastrulation and subsequent development in a chick are very different from these processes in an amphioxus because

- A) the amphioxus is aquatic.
- B) the chick has paired appendages.
- C) chicken eggs have more yolk.
- D) the amphioxus is more primitive.
- E) the chick has more germ layers.

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34. Which of the following is mismatched?

- A) mesoderm-somites
- B) mesoderm-notochord
- C) endoderm-lungs
- D) ectoderm-liver
- E) ectoderm-eye

35. Which developmental sequence is CORRECT?

- A) cleavage, morula, blastula, and gastrula
- B) cleavage, blastula, gastrula, and morula
- C) cleavage, gastrula, morula, and blastula
- D) morula, cleavage, gastrula, and blastula
- E) gastrula, morula, blastula, and cleavage