

※ 注意：選擇題請於答案卷之「選擇題作答區」依序作答。

A. Multiple choice questions 2 pts /each, total: 80pts

- 1) Which of the following statements regarding animal digestive systems is *false*?
- A) We expect that an herbivore will have a longer alimentary canal than a carnivore of similar body size.
 - B) Meat is more difficult to digest than vegetable matter because of its protein content.
 - C) Many herbivorous animals have cellulose-digesting microbes in their colon and cecum.
 - D) When cows chew their cud, it helps to soften and break down plant fibers, making these more accessible to digestion by microbes.
- 2) In the countercurrent exchange system of fish gills,
- A) blood and water flow in the same direction.
 - B) blood and water flow in opposite directions.
 - C) blood and water are separated by a thick polysaccharide barrier.
 - D) blood flow in the gills reverses direction with every heartbeat.
- 3) Medullary breathing centers directly sense and respond to
- A) blood pH and CO₂ concentration.
 - B) blood O₂ concentration.
 - C) alveolar O₂ concentration.
 - D) blood pH and O₂ concentration.
- 4) The main function of the AV node is to
- A) initiate the heartbeat.
 - B) set the rhythm of the heartbeat.
 - C) relay the signal for the heart to contract from the right ventricle to the right atrium.
 - D) relay a signal for the ventricles to contract.
- 5) Blood flow through capillaries is controlled by
- A) one-way valves.
 - B) precapillary sphincters only.
 - C) smooth muscle in the walls of arterioles only.
 - D) precapillary sphincters and smooth muscle in the walls of arterioles.
- 6) One way that substances move between blood and interstitial fluid is by
- A) alternatively breaking and regenerating membranes of cells lining capillaries.
 - B) osmosis.
 - C) pressure-driven flow through clefts between the epithelial cells of the capillary wall.
 - D) active transport utilizing ATP.
- 7) The two main functions of the lymphatic system are
- A) coagulating blood and fighting infections.
 - B) producing hormones that regulate the immune system and coagulating blood.
 - C) producing hormones that regulate the immune system and fighting infections.
 - D) returning tissue fluid to the circulatory system and fighting infections.
- 8) The major result of the inflammatory response is to
- A) initiate the production of antibodies.
 - B) remove contaminating microorganisms and initiate repair of damaged tissues.
 - C) initiate cell-mediated immune responses.
 - D) initiate the production of killer cells.
- 9) The adaptive immune system is capable of mounting specific responses to particular microorganisms because
- A) lymphocytes are able to change their antigen specificity as required to fight infection.
 - B) stem cells determine which type of B and T cells to make.
 - C) the body contains an enormous diversity of lymphocytes, each with the ability to respond to a different antigen.
 - D) stem cells make different antigen receptors depending on the invading microorganism.

10) Clonal selection

- A) determines the pool of mature leukocytes that will be stimulated by macrophages.
- B) requires the activation of natural killer cells.
- C) describes the proliferation of B and T lymphocytes after they have been activated by an antigen.
- D) requires the presence and activation of complement.

11) Antibody molecules may function by causing the

- A) destruction of complement proteins.
- B) agglutination of viruses or bacteria.
- C) solubilization of viruses or bacteria.
- D) crystallization of antigenic particles.

12) After binding to an infected cell, the cytotoxic T cell

- A) releases interleukin-1.
- B) becomes a phagocytic cell.
- C) neutralizes the infecting bacteria or viruses.
- D) releases a protein called perforin.

13) If the epithelium that lines the air sacs of your lungs were to gain a layer of cells, which of the following would likely occur?

- A) Oxygen will enter the lungs more quickly.
- B) Oxygen will enter the lungs more slowly.
- C) Secretion of mucus will increase.
- D) Oxygen will enter at the same rate, because it is only the shape of the cells that matter.

14) When body temperature is too high, which of the following occurs?

- A) The brain sends out distress signals.
- B) Blood vessels in the skin dilate.
- C) Capillaries contract.
- D) The internal lining of the intestine increases in surface area.

15) Which of the following is *not* an example of negative feedback?

- A) After eating a meal containing high glucose levels, the pancreas secretes more insulin, a hormone that lowers blood glucose levels.
- B) After cutting your finger, the injured tissue releases chemicals that activate platelets in the blood. These activated platelets release chemicals to activate more platelets, leading to the formation of a blood clot.
- C) An elevation in blood pressure causes heart rate to decrease, thereby causing blood pressure to decrease.
- D) The secretion of the hormone TSH stimulates the thyroid gland to secrete thyroxine. Thyroxine, in turn, inhibits the secretion of TSH.

After reading the paragraph below, answer the questions that follow.

Most fishes can live either in freshwater or in saltwater habitats, but not in both. If you move a marine fish from the ocean to a lake, it will quickly die, and vice versa. However, a small number of fish species are capable of moving between the two environments. Salmon are osmoregulators that hatch in rivers, spend most of their lives in the ocean, and return to the river where they were born in order to breed.

16) When a salmon moves from the ocean to a freshwater environment, you would expect its urine volume to _____ and its rate of salt absorption to _____.

- A) increase; remain the same
- B) increase; increase
- C) decrease; decrease
- D) decrease; increase

17) When a salmon leaves the river and moves out to sea, you would expect _____ to leave its body by osmosis and that excess _____ would need to be pumped out.

- A) salt; water
- B) water; salt
- C) salt; salt
- D) water; water

18) Like humans, cats can experience kidney failure. Unlike humans, however, cat kidney dialysis as a treatment option is not widely available and used. Rather, efforts are made to treat any complications that arise from failing kidneys such as low potassium or high phosphate levels. When low potassium levels are identified, potassium supplements are given to return cells to a balanced potassium-water level. This is an example of an effort to maintain

- A) osmoregulation.
- B) thermoregulation.
- C) convection.
- D) evaporation.

19) Which of the following options correctly lists the order of the four main processes that occur in the urinary system?

- A) filtration, excretion, reabsorption, secretion
- B) excretion, filtration, reabsorption, secretion
- C) filtration, reabsorption and secretion occurring simultaneously, excretion
- D) reabsorption and secretion occurring simultaneously, excretion, filtration

20) A woman running a marathon collapses at the finish line and is rushed to the hospital. The physicians determine that she has lost a large amount of water and salts from excessive sweating. Which of the following would be an appropriate course of action?

- A) Determine the woman's intracellular fluid levels so that they can provide a fluid replacement therapy that will regain isotonic conditions of salt and water.
- B) Determine the woman's intracellular fluid levels so that they can provide a fluid replacement therapy that will regain hypertonic conditions of salt and water.
- C) Determine the woman's intracellular fluid levels so that they can provide a fluid replacement therapy that will regain hypotonic conditions of salt and water.
- D) Determine the woman's intracellular fluid levels so that they can provide a fluid replacement therapy that will provide a measure of metabolic heat production.

21) Which of the following statements regarding endocrine glands is true?

- A) Some endocrine glands, like the pituitary, have other endocrine glands as their targets.
- B) The sex organs and the thyroid gland produce steroid hormones.
- C) The pancreas has only nonendocrine functions.
- D) Most of the endocrine glands produce steroid hormones.

22) Which of the following endocrine glands synthesizes melatonin?

- A) pineal
- B) adrenal cortex
- C) thyroid
- D) parathyroid

23) An excess of T₃ and T₄ in the blood is hyperthyroidism, which in its most common form is called

- A) goiter.
- B) sterility.
- C) Graves' disease.
- D) botulism.

- 24) The body cells of a turkey have 80 chromosomes each. How many chromosomes would be found in a male turkey's sperm cells?
A) 160
B) 80
C) 40
D) 20
- 25) After being produced in the testes, sperm mature further in a structure called the
A) vas deferens.
B) epididymis.
C) prostate.
D) seminal vesicle.
- 26) Which of the following generates the ATP that is required for movement of the sperm's tail?
A) a mitochondrion in the neck and middle piece
B) mitochondria in the sperm tail
C) the sperm plasma membrane
D) the acrosome
- 27) Which of the following events occurs first during embryonic development?
A) gastrulation
B) neurulation
C) cleavage
D) organ formation
- 28) Which of the following structures develops from mesodermal tissue?
A) muscles
B) lining of the digestive tract
C) skin
D) nervous system
- 29) What would happen if the chorion failed to secrete human chorionic gonadotropin?
A) The maternal elements of the placenta would fail to develop.
B) The fetal elements of the placenta would fail to develop.
C) Neural tube formation would not occur, and the embryo would have no central nervous system.
D) The embryo would be aborted.
- 30) Multiple sclerosis results from an autoimmune disease that primarily involves
A) destruction of the hippocampus.
B) destruction of the myelin sheath.
C) destruction of regions of the motor cortex.
D) deterioration of parts of the spinal cord.
- 31) Which of the following results from stimulation by the sympathetic nervous system?
A) release of glucose from the liver
B) decreased heart rate
C) stimulation of the digestive organs
D) constriction of the bronchi

32) Which of the following correctly lists the order in which structures within the ear transfer a sound wave during hearing?

- A) eardrum, hammer, anvil, stirrup, oval window, auditory canal
- B) eardrum, stirrup, hammer, anvil, oval window, auditory canal
- C) auditory canal, eardrum, hammer, anvil, stirrup, oval window
- D) auditory canal, eardrum, stirrup, hammer, anvil, oval window

33) Which of the following statements regarding rods and cones is true?

- A) Rods are more sensitive to light than cones.
- B) Cones are responsible for night vision.
- C) Rods are found at the greatest density at the fovea, the retina's center of focus.
- D) Rods contain the visual pigment called photopsin.

34) One hypothesis explaining animals' abilities to detect a magnetic field and use it to navigate is that sensory cells detect electrical fluctuations influenced by Earth's magnetic field. Which of the following pieces of evidence, if it were true, would support this hypothesis?

- A) Sensory cells of an organism known to use magnetic fields to navigate show an increase in action potential firing when in the presence of electrical fluctuations.
- B) Sensory cells of an organism known to use magnetic fields to navigate show a decrease in action potential firing when in the presence of electrical fluctuations.
- C) Sensory cells of an organism known to use magnetic fields to navigate show a greater density of negative ions on the outside of its plasma membrane.
- D) Sensory cells of an organism known to use magnetic fields to navigate produce greater amounts of enzymes sensitive to electrical fluctuations.

35) Osteoporosis is characterized by

- A) hairline cracks in long bones, such as the femur.
- B) low bone mass and structural deterioration of bone tissue.
- C) low phosphate levels in bone.
- D) lack of vitamin E in bone tissue.

36) Functionally, the muscle fiber's fundamental unit of contraction is the

- A) thick filament.
- B) myofibril.
- C) sarcomere.
- D) Z line.

37) Acetylcholine (ACh) is released by motor neurons and binds to receptors on muscle cells to initiate action potentials. Some snake venom contains specific toxins that bind irreversibly to these receptors and block acetylcholine's ability to bind. If an animal is bitten by a snake with these toxins in its venom, what do you predict would happen?

- A) The animal's muscles would not use stored ATP for energy.
- B) The animal's muscles would contract uncontrollably.
- C) The animal's muscles would not be able to contract.
- D) The animal's muscles would use lactic acid fermentation for energy.

After reading the paragraphs below, answer the questions that follow.

Recent studies have shown that the onset of puberty in American girls has decreased from an average of 12-13 years of age to as young as 8-10. Many scientists who study premature puberty suggest that steroids in our food and in the environment may be contributing factors, since steroids are known to cross cell membranes and bind to receptors inside cells.

Why are hormones present in our foods? Synthetic testosterone compounds (similar to

those used by some athletes) make young animals gain weight faster so they are ready for market sooner. Female animals receive synthetic estrogen to inhibit the reproductive cycle and divert all energy into weight gain. In the United States, up to two-thirds of meat animals are raised using hormones. In addition, hormones are used to increase milk production in dairy cattle.

Scientific investigation of the exact effects of environmental steroids on humans is extremely difficult since there are multiple sources of hormones in the environment. A valid study would require a control group who hasn't been exposed to the chemicals being studied. Since everyone has had some exposure to environmental hormones, no control group is available to use as a reference.

38) When environmental estrogens trigger premature puberty in girls, the main organs affected are the

- A) ovaries and uterus.
- B) thyroid gland and pituitary gland.
- C) adrenal cortex.
- D) pituitary gland and parathyroid glands.

39) How are steroids able to cross cell membranes and enter cells?

- A) Steroids and cell membranes both contain receptor proteins.
- B) Steroids are able to pass through the phospholipid bilayer and bind to receptors inside the cell.
- C) Steroids can diffuse through open channel proteins in the membrane.
- D) Steroids move through cell membranes, such as water, by osmosis.

40) Fission is an asexual process

- A) that allows regeneration of lost body parts.
- B) that occurs in individuals that live in isolated areas.
- C) in which a parent separates into two individuals of approximately equal size.
- D) in which a parent fragments into several pieces.

※本大題請於答案卷內之「非選擇題作答區」標明題號依序作答。

B. Essay questions 5 pts /each, total: 20pts

1. What is the relationship of Golgi apparatus to the Endoplasmic reticulum in a protein-secreting cells?
2. Describe the cell cycle?
3. Compare and contrast DNA and RNA polynucleotides.
4. Why dose PCR amplify only one specific region of DNA rather than all of it?

試題隨卷繳回