單選題(每題2分，共50題，答案請填於答案卡) 答錯不倒扣

1. _____ is the major constituent of cellular membrane.

A) triglyceride B) phospholipid C) steroids D) fatty acid E) cholesterol

2. Amino acids can be distinguished from one another by _____.

A) the number of R groups found on the amino acid molecules.

B) the chemical properties of their R groups.

C) the type of bond between the R group and the rest of the amino acid molecule.

D) the chemical properties of their amino and carboxyl groups.

E) All of the choices are correct.

3. Every subunit (nucleotide) of a polynucleotide contains _____ negative charge(s).

A) 0 B) 1 C) 2 D) 3 E) 4

4. Considering the following statements about active transport, which of these statements are true?

I. Facilitated diffusion is a special kind of active transport that does not require energy.

II. Active transport requires energy, usually in the form of ATP hydrolysis.

III. Active transport moves substances down their concentration gradients.

IV. All proteins involved in active transport are carrier proteins

V. Ion channels facilitate the active transport of ions

A) II and IV

B) I, II, III and IV

C) II, IV and V

D) I, II and IV

E) All

5. How do the reaction centers of photosystem I, and II differ?

A) chlorophyll α is found in photosystem I, and chlorophyll b in photosystem II.

B) They preferentially absorb slightly different wavelengths of light.

C) One is located in the thylakoid membrane, and the other in the stroma.

D) Only photosystem I is found in the thylakoid membranes.

E) None of the above.

6. Which one of the following statements is **NOT** true?

A) Receptor tyrosine kinases generally activate a single transduction pathway.

B) RTKs transfers a phosphate group from ATP to the tyrosine of a substrate protein.

C) The cytoplasmic tail of an RTK has multiple tyrosines.

D) Dimerization or formation of large clusters of RTKs happen when they are activated.

E) All of the above.

7. Who discovered the citric acid cycle?

A) Albert Einstein

B) Membrane proteins

C) Hans Krebs

D) Albert Lehninger

E) Melvin Calvin

8. Which one of the following statements is **NOT** true for apoptosis?

A) Signals that trigger apoptosis can come from outside or inside the cells.

B) In apoptotic cells, organelles, but not DNA, are fragmented.

C) The cell's parts are packaged up in vesicles that are engulfed and digested by specialized scavenger cells.

D) Cell shrinks and becomes lobed.

E) None of the above.

9. Which one of the following statements is **NOT** true?

A) Intracellular receptors are found in either the cytoplasm or nucleus of target cells.

B) Ligands of intracellular receptors are hydrophobic or small.

C) Most intracellular receptors regulate translation.

D) Intracellular receptors and their ligands form complexes to carry out specific functions.

E) All of the above.

10. In a photosystem, clusters of chlorophyll b, and carotenoid pigments function most like _____.

A) an electrical generator

B) an antenna

C) a propeller on a motorboat

D) a windmill

E) a spring

11. Sex determination in mammals is due to the SRY gene found on the Y chromosome. Which of the following situations could allow a person with an XX karyotype to develop a male phenotype?

A) the loss of the SRY gene from an autosome

B) translocation of SRY to an X chromosome

C) the presence of an extra autosomal chromosome

D) the presence of one normal and one shortened (deleted) X chromosome

E) None of the above.

12. What is the main advantage of the C_4 and CAM photosynthesis strategies over the C_3 strategy?

A) They help the plant conserve water and synthesize glucose efficiently under hot, dry conditions.

B) They allow the plant to fix carbon more efficiently under conditions of low atmospheric CO_2.

C) They allow the plant to fix carbon more efficiently in dim or cool conditions.

D) They make it possible for the plant to use the Calvin cycle at night and during the day.

E) They allow the plant to avoid photorespiration by producing a four-carbon sugar in place of glucose.

13. Which of the following statements regarding gene linkage is correct?

A) The closer two genes are on a chromosome, the lower the probability that a crossover will occur between them.

B) The observed frequency of recombination of two genes that are far apart from each other has a maximum value of 100%.

C) All of the traits that Mendel studied—seed color, pod shape, flower color, and others—are due to genes linked on the same chromosome.

D) Linked genes are found on different chromosomes.

E) All of the above.

14. Albinism is a recessive trait. A man and woman both show normal pigmentation, but both have one parent who has albinism (without melanin pigmentation). What is the probability that their first child will have albinism?

A) 0 B) 1/2 C) 1/4 D) 1 E) 1/16

15. Which one of the following statements is **NOT** true for signal transduction in the cells?

A) The relay molecules in signaling transduction are often proteins.

B) Many of the relay molecules are protein kinases, and they often act on other protein kinases in the pathway.

C) The activity of a protein regulated by phosphorylation depends on the balance in the cell between active kinases and active phosphatases.

D) Cytoplasmic protein kinases phosphorylate serine or glycine.

E) None of the above.

16. Which of the following statements about independent assortment or segregation is correct?

A) The law of independent assortment describes the behavior of two or more genes relative to one another.

B) The law of segregation describes the behavior of two or more genes relative to one another.

C) The law of independent assortment is accounted for by observations of prophase I of meiosis.

D) The law of segregation is accounted for by anaphase of mitosis.

E) None of the above.

17. It has been observed that organisms on islands are different from, but closely related to, similar forms found on the nearest continent. This is taken as evidence that _____.

A) island forms are descended from mainland forms

B) common environments are inhabited by the same organisms

C) island forms and mainland forms have identical gene pools

D) the island forms and mainland forms are converging

E) None of the above.

18. Genes in chromosomes packed into _____ fiber show the highest transcriptional activity.

A) 10 nm B) 30 nm C) supercoiling D) metaphase chromosome E) naked DNA

19. Which factor and mechanism regulates population growth in negative feedback manner typically so that population growth may follow the logistic growth model?

A) earth quakes; density-dependent

B) infectious disease; density-dependent

C) competition for resources; density-independent

D) toxic wastes; density-independent

E) toxic wastes; competition for resources

20. Given a population that contains genetic variation, what is the correct sequence of the following events under the influence of natural selection?

1. Well-adapted individuals leave more offspring than do poorly adapted individuals.
2. A change occurs in the environment.
3. Genetic frequencies within the population change.
4. Poorly adapted individuals have decreased survivorship.

A) 2 → 4 → 1 → 3

B) 4 → 2 → 1 → 3

C) 4 → 2 → 3 → 1

D) 2 → 4 → 3 → 1

E) 3 → 4 → 2 → 1

21. In a comparison of birds and mammals, having four limbs is _____.

A) a shared ancestral character

B) a shared derived character

C) a character useful for distinguishing birds from mammals

D) an example of analogy rather than homology

E) None of the above.

22. Which virus is responsible for causing infectious mononucleosis?

A) Epstein-Barr virus

B) Cytomegalovirus

C) Herpes simplex virus

D) Varicella-zoster virus

E) None of the above.

23. Which is **NOT** the factor contributed to prokaryotes genetic diversity?

A) Rapid reproduction

B) Genetic recombination

C) Mutation

D) Mutualism

E) All of the above.

24. What part of the bacterial cell helps it move?

A) Capsule B) The flagella C) Pili D) Fimbriae E) Cilia

25. The maternal factor _____ define the anterior/head structure of a fly embryo.

A) Torso B) Bicoid C) Nanos D) Antennapedia E) Dorsal

26. Which two joined amino sugars form a peptidoglycan monomer?

A) N-acetylglucosamine and N-acetylmuramic acid

B) N-acetylglucosamine and N-acetyltalosaminuronic

C) N-acetylmuramic acid and pseudomurein

D) Galactosamine and Daunosamine

E) None of the above.

27. Bacterial conjugation is an example of _____.

A) Transduction

B) Vertical gene transfer

C) Horizontal gene transfer

D) Bacterial transformation

E) None of the above.

28. Which enzyme is responsible for reverse transcription in retroviruses?

A) RNA polymerase B) DNA polymerase C) Reverse transcriptase D) Ligase E) Protease

29. Which of the following distinguishes cardiac muscle from both smooth and skeletal muscles?

A) Its cells contract.

B) Its cells are striped.

C) It generally cannot be contracted at will.

D) It generally can be contracted at will.

E) Its cells are branched.

30. Which of the following organs belongs to both the lymphatic and endocrine systems?

A) Pancreas B) Kidney C) Thymus D) Spleen E) Thyroid gland

31. Which one of the following statements is **NOT** true?

A) Not every organism is able to exchange gas, nutrients, and waste with its environment directly.

B) Some small molecules can move between cells and their surroundings by diffusion.

C) Both arthropods and human beings have closed circulatory systems.

D) A circulatory system includes a circulatory fluid, a set of interconnecting vessels, and a muscular pump.

E) All of the above.

32. Which of the following is an example of a tissue?

A) blood B) the heart C) a red blood cell D) the respiratory system E) the spleen

33. _____ produces the alkaline solution to neutralize the acidity of chyme.

A) Pancreas B) Liver C) Gallbladder D) Small intestine E) Stomach

34. The _____ carries nutrient-rich blood from the capillaries of the villi to the liver, then to the heart.

A) hepatic portal artery

B) hepatic portal vein

C) superior vena cava

D) hepatic vein

E) common carotid artery

35. Which one of the following statements is **NOT** true?

A) Fish gills use a countercurrent exchange system to increase blood flow.

B) In fish gills, more than 80% of the O_2 dissolved in the water is removed as water passes over the respiratory surface.

C) In human lungs, cilia and mucus line the epithelium of the air ducts and move particles up to the pharynx.

D) Respiratory surfaces are always thin and moist.

E) All of the above.

36. Which one is secreted by cytotoxic T cells?

A) histamine B) perforin C) IgG D) IL-1β E) None of the above.

37. Which of the following is true of innate behaviors? Innate behaviors _____.

A) are only weakly influenced by genes

B) occur in invertebrates and some vertebrates but not mammals

C) are limited to invertebrate animals

D) are expressed in most individuals in a population

E) None of the above.

38. What is cell mediated immunity?

A) presence of antigen cause B cell to proliferation and differentiate into plasma cells and memory B cells.

B) effector T cells are needed to eliminate intracellular pathogens (within intracellular vesicles of cells following phagocytosis (CD4) or in the cytoplasm of infected cells (CD8)

C) occurs during thymic education, T cells that react with antigens present before birth are deleted to eliminating self-reactivity.

D) heterodimer produced by macrophages and dendritic cells. Major cytokine to induce differentiation. of $CD4^+$ T cells into TH1 cells.

E) All of the above.

39. How do T cell receptor recognize antigen?

A) Antigen receptors of T cell bind to antigens on the surface of a virus.

B) the antigen receptors on the surface of the helper T cell bind to antigen fragments complex with class-I MHC molecules on the antigen-presenting cell.

C) accessory protein CD8 on the helper T cell surface binds to the MHC molecules, helping keep the cell-cells joined.

D) an antigen fragment binds to an MHC molecule and then displayed to the cell surface. The combination of MHC molecule and antigen is recognized by T cell.

E) None of the above.

40. The major function of the colon is the absorption of _____ and _____.

A) minerals; water

B) peptides; minerals

C) water; vitamins

D) minerals; vitamins

E) peptides; vitamins

41. Which one of the following statements is **NOT** true?

A) Most of CO_2 from respiring cells diffuses into the blood and is transported in solution in blood plasma.

B) Nitric oxide (NO) is a major inducer of vasodilation.

C) The medulla regulates the rate and depth of breathing in response to pH changes in the cerebrospinal fluid.

D) Return of blood to the heart can be enhanced by contraction of smooth muscle in venule walls and skeletal muscle contraction.

E) None of the above.

42. Which one of the following statements is **not** true?

A) The development of body organs of a human embryo mainly occurs in the first 3 months of pregnancy.

B) During human pregnancy, the function of mucus plugs in the cervix is to prevent a second fertilization.

C) About 24 hrs after fertilization, the zygote begins to divide by mitosis without changes in embryo size.

D) In human pregnancy, the mother's blood contains DNA from the fetus.

E) All of the above.

43. Sensory transduction of light/dark information in the vertebrate retina is accomplished by _____.

A) rods and cones B) horizontal cells C) amacrine cells D) ganglion cells E) bipolar cells

44. The amnion cells of human embryos are derived from _____.

A) hypoblasts B) epiblasts C) trophoblasts D) allantois E) None of the above.

45. Signals from _____ induce cells above to become cells of neural plate.

A) archenteron B) vegetal pole C) yolk sac D) notochord E) None of the above.

46. What happens when a resting neuron's membrane depolarizes?

A) There is a net diffusion of Na^+ out of the cell.

B) The equilibrium potential for K^+ (E_K) becomes more positive.

C) The neuron's membrane voltage becomes more positive.

D) The cell's inside is more negative than the outside.

E) None of the above.

47. Which of the following statements about action potentials is correct?

A) Action potentials for a given neuron vary in magnitude.

B) Action potentials for a given neuron vary in duration.

C) Action potentials are propagated down the length of the axon.

D) Movement of ions during the action potential occurs mostly through the sodium pump.

E) None of the above.

48. Which of the following is a potential problem associated with genetically engineered plants?

A) Disease resistance genes may escape into the wild.

B) It will be difficult to breed engineered plants with natural types.

C) Engineered plants will be less nutritious.

D) Genetically engineered plants will not be able to reproduce on their own.

E) All of the above.

49. Scientists believe that the direction birds go when migrating is guided in part by _____.

I) the stars in the night sky

II) the sun during the day

III) the magnetic field of the Earth

A) only I B) only II C) only III D) I, II, and III E) None.

50. The correct sequence of sensory processing is _____.

A) sensory perception → stimulus reception → sensory transduction → sensory adaptation.

B) sensory perception → sensory transduction → stimulus reception → sensory adaptation.

C) stimulus reception → sensory perception → sensory adaptation → sensory transduction.

D) sensory adaptation → stimulus reception → sensory transduction → sensory perception.

E) stimulus reception → sensory transduction → sensory perception → sensory adaptation.