科目 普通生物學 類組別 A1 共 11 頁 第 1 頁

＊請在答案卡內作答

參考用

單選題，共 50 題，每題 2 分

1. In order to produce human insulin in bacteria what must be done first?

A. Human insulin protein is purified from the bacteria.
B. The bacterial insulin gene must be cloned.
C. The human insulin gene must be transformed into bacteria.
D. The human insulin gene must be cloned.
E. Bacteria containing the human insulin gene are grown.

2. If a plasmid lacks an origin of replication which of the following will happen when it is transformed into bacteria?

A. Bacteria containing the plasmid will not be able to grow in the presence of antibiotics.
B. As the bacteria divide they will lose the plasmid.
C. There will not be regions to clone genes into the plasmid.
D. The plasmid will not be useful in producing a protein because it lacks an RNA polymerase binding site.
E. The plasmid cannot be cut with restriction enzymes.

3. Which of the following statements is TRUE of restriction enzymes?

A. they are not naturally produced by bacteria, but are bioengineered by humans
B. they cleave DNA only at sites of adjacent thymine bases
C. they cut at random sites within a genome
D. there are less than 10 restriction enzymes known
E. they protect bacterial cells from invasion by foreign DNA

4. In a mouse, the axis that determines the body pattern from the nose to the tip of the tail is

A. dorso-ventral
B. antero-posterior
C. right-left
D. tip-tip
E. radial-medial

5. How is a typical prokaryotic genome similar to a eukaryotic genome?

A. both are composed of DNA packaged in the nucleus
B. both are composed of double-stranded DNA
C. both are composed of circular chromosomes
D. both are composed of multiple, linear chromosomes
E. both contain chromosome with a single origin of replication

注意：背面有試題

6. What is a dominant allele?

A. An allele that has no noticeable affect on an organism's phenotype

B. An allele that totally beats up on a recessive allele

C. An allele that will only have an affect on phenotype in a haploid organism; otherwise its presence will be masked

D. An allele that is very prevalent in a population

E. In a heterozygous individual, the allele that determine's the phenotype

7. The probability of obtaining a dominant phenotype from self-fertilization of a heterozygous individual is

A. 25%

B. 50%

C. 75%

D. 85%

E. 100%

8. Polydactyly is a dominant trait that results in extra fingers and toes in humans. A man with polydactyly marries a woman with 10 fingers and toes. They have a child that has a normal number of digits. The phenotype of the man's father is unknown, but his mother has a normal phenotype. What are the genotypes of the married couple? (*D* = polydactyl allele; *d* = wild type allele)

A. woman *Dd*, man *dd*

B. woman *DD*, man *dd*

C. woman *dd*, man *DD*

D. woman *dd*, man *Dd*

E. woman *DD*, man *Dd* or *dd*

9. Polyploidy in plants

A. is very common.

B. allows for adaptation to diverse environments.

C. may alter the levels of gene expression.

D. allows humans to create plants with unusual flowers.

E. All of these statements are true regarding polyploidy in plants.

10. In mitosis, the main difference between plant and animal cells is that

A. plants do not undergo cytokinesis.

B. plants produce a cell plate to segregate the daughter nuclei, while animals form a cleavage furrow.

C. plants have a central vacuole, while animal cells do not.

D. plants produce a cell membrane in cytokinesis, while animals form a cell plate.

E. in plants, kinetochore microtubules shorten and draw chromosomes toward the poles; in animals, polar microtubules lengthen to push chromatids apart.

11. A species that has three sets of homologous chromosomes can have up to _ different combinations of chromosomes in the gametes.

A. 3

B. 6

C. 8

D. 27

E. 64

12. Chromosomes are replicated during the _____ phase.

A. G_1

B. G_2

C. S

D. M

E. meta-

13. Humans have _____ different types of autosomes.

A. 46

B. 44

C. 23

D. 22

E. 11

14. When cancer cells have the ability to migrate to other parts of the body, they are said to be

A. invasive.

B. benign.

C. metastatic.

D. oncogenic.

E. genetic.

15. A mutation causes a gene to become overactive, contributing to uncontrolled cell growth. Which term best describes this gene?

A. tumor-suppressor gene
B. oncogene
C. spliced gene
D. alternatively spliced gene
E. malignant gene

16. The likely outcome from a mutation in the *lac*O site (lac Operator) of the *lac* operon would be

A. binding of RNA polymerase could be hindered.
B. binding of a repressor protein could be hindered.
C. binding of the activator protein could be hindered.
D. duplication could be affected.
E. the order in which the genes of the *lac* operon are transcribed could be altered.

17. How many distinct aminoacyl-tRNA synthetases does each cell make?

A. ~1
B. ~20
C. ~60
D. ~120
E. ~180

18. Decide which sequence of events is most CORRECT for the initiation and elongation steps of translation in prokaryotic cells?

(1) initiator tRNA binds start codon on mRNA
(2) small ribosomal subunit binds to mRNA
(3) large ribosomal subunit binds
(4) tRNA entry and peptidyl transfer reaction
(5) translocation of ribosome and release of tRNA

A. 1, 2, 3, 4, 5
B. 1, 2, 3, 5, 4
C. 1, 3, 2, 4, 5
D. 2, 3, 1, 5, 4
E. 2, 1, 3, 4, 5

19. The mechanism of DNA replication is

A. conservative.
B. intermediate.
C. semiconservative.
D. dispersive.
E. complementary.

20. Which of the following is NOT a protein involved in DNA replication?

A. replication fork
B. single-stranded binding proteins
C. DNA ligase
D. topoisomerase
E. helicase

21. The protective layer outside of the plasma membrane of the plant cell is called _____

A. chitin
B. pectin
C. proteoglycans
D. cellulose
E. the cell wall

22. When insulin binds to it's G-protein coupled receptor (GPCR) what happens next?

A. The G protein loses GDP and gains GTP becoming inactivated.
B. The G protein loses GTP and gains GDP becoming activated.
C. The G protein loses GTP and gains GDP becoming inactivated.
D. The G protein loses GDP and gains GTP becoming activated.
E. The insulin enters the cell through the GPCR and diffuses to the nucleus where it interacts with transcription factors.

23. Which of the following processes will occur in the presence or absence of oxygen?

A. citric acid cycle
B. oxidative phosphorylation
C. glycolysis
D. cellular respiration
E. electron transport chain

24. Altering the three-dimensional structure of an enzyme might
A. change the type of product produced in the reaction.
B. change the type of substrate that binds the enzyme's active site.
C. change the amount of energy needed for a reaction.
D. prevent the substrate from binding the enzyme's active site.
E. prevent the enzyme from adding energy to a reaction.

25. What are the two major components of cell membranes?
A. glycolipids and phospholipids
B. cholesterol and proteins
C. phospholipids and carbohydrates
D. phospholipids and cholesterol
E. phospholipids and proteins

26. Transfer of a functional domain from one gene to another, creating a novel protein, can occur by _____; this could provide an evolutionary advantage because _____.
A. intron realignment; it shifts protein structure.
B. intron shuffling; it increases genetic variation in a population.
C. exon shuffling; it increases genetic variation in a population.
D. proteomics; it shifts protein structure.
E. both intron shuffling and proteomics; it shifts protein structure and increases genetic variation.

27. To analyze genetic variation in populations, one approach is to consider the frequency of alleles. When calculating an allele frequency for a diploid species, how many copies of an allele are present?
A. 1
B. 2
C. 4
D. 23
E. 46

28. Natural selection is one mechanism to change allele frequency in a gene pool, what is the name of the mechanism that fosters change in allele frequencies due to random chance?
A. Genetic Drift.
B. Natural selection also fosters these changes.
C. Non-Darwinian evolution.
D. Neutral variation.
E. Gene flow from one population to another.

29. If goats are crossed with sheep, embryos will form but cease development and spontaneously abort. This is an example of
A. a prezygotic mechanism.
B. hybrid inviability.
C. hybrid sterility.
D. hybrid breakdown.
E. spermatic behavior.

參考用

30. Two species of salamander have similar ranges, but one breeds from January to March, while the second one breeds from March to May. This is an example of
A. mechanical isolation.
B. temporal isolation.
C. habitat isolation.
D. behavioral isolation.
E. gametic isolation.

31. Which of the following is not considered a plant organ?
A. leaf
B. stem
C. root
D. flower
E. seed

32. If a plant is bending towards the light, one would expect which enzymes to have increased in activity?
A. auxins
B. gibberellins
C. wall-loosening enzymes
D. ethylene
E. None of these is correct

33. Which one of the following is the best explanation for why plants may use active rather than passive transport?
A. The phospholipid bilayer is not formed.
B. Protein channels are plugged.
C. Development of pores has not occurred.
D. Membrane potential is blocked.
E. Solute concentration is a factor.

注意：背面有試題

34. Nervous tissue consists mainly of what two major types of cell?

A. microglia and Schwann cells

B. glial cells and neurons

C. Schwann cells and glial cells

D. neurons and oligodentrocytes

E. sensory neurons and motor neurons

35. What stops the rapid depolarization that occurs as the "upsweep" of membrane potential peaks during the action potential?

A. Closing of the voltage-gated K+ channel inactivation gate.

B. Closing of the voltage-gated Na+ channel inactivation gate.

C. Closing of the Na+ channel inactivation gate and closing of the K+ channel inactivation gate.

D. Opening of the K+ channel gate and closing of the Na+ channel inactivation gate.

E. Opening of the Na+ channel gate and closing of the K+ channel inactivation gate.

36. Damage to the cerebellum could result in which of the following?

A. loss of melatonin secretion and circadian rhythms

B. loss of face cells to recognize the face of same species

C. loss of coordination of body movements

D. loss of taste sensation

E. diminished thermoreceptive sensation

37. Which of the following regions of the human brain is critically important for controlling heart rate and breathing?

A. medulla oblongata

B. cerebellum

C. thalamus

D. amygdala

E. cerebral cortex

38. The vessels that carry blood away from the heart in a closed circulatory system are referred to as

A. arteries.

B. veins.

C. capillaries.

D. sinuses.

E. auxiliary hearts.

39. The spread of an action potential through heart tissue is made possible by
A. gap junctions.
B. tight junctions.
C. a network of neurons in the heart.
D. myogenic junctions.
E. synaptic clefts.

40. Most of the carbon dioxide in the blood of humans is transported
A. as dissolved CO2 in plasma.
B. as bicarbonate ion in plasma.
C. attached to hemoglobin in red blood cells.
D. attached to hemoglobin in plasma.
E. as carbonic acid.

41. Which of the following gives the correct rank order for relative amount of water (most to least) required for excretion of the primary nitrogenous wastes used by different animals?
A. urea → ammonia → uric acid
B. uric acid → ammonia → urea
C. urea → uric acid → ammonia
D. ammonia → uric acid → urea
E. ammonia → urea → uric acid

42. Which of the following does NOT represent a chemical class of hormones?
A. carbohydrates
B. amines
C. peptides
D. proteins
E. steroids

43. Which of the following hormone-effect pairs is mismatched?
A. growth hormone-promote linear growth
B. glucagon-decrease blood glucose level
C. aldosterone-increase blood osmolality
D. thyroid hormone-increase metabolism
E. melatonin-decrease nervous activity in suprachiasmaticnucleus

44. Which factor can be detected in the urine during the early pregnancy of mammals?

A. progesterone

B. estrogen

C. luteinizing hormone

D. chorionic gonadotropin

E. follicle-stimulating hormone

45. Sexual reproduction

A. allows more offspring to be produced per individual.

B. allows a parent to pass on 100% of their genes to offspring.

C. increases genetic variation.

D. results in the formation of a haploid zygote.

E. only occurs in vertebrates.

46. Which of the following represents the proper order of events in embryonic development?

A. fertilization, gastrulation, neurulation, cleavage, organogenesis

B. fertilization, cleavage, gastrulation, organogenesis, neurulation

C. fertilization, cleavage, gastrulation, neurulation, organogenesis

D. fertilization, gastrulation, cleavage, neurulation, organogenesis

E. fertilization, gastrulation, cleavage, organogenesis, neurulation

47. It is well established that developmental biology has impacts on public health. For instance, thalidomide, an anticonvulsive and antiallergic medication, was prescribed to reduce nausea or morning sickness in pregnant women. It was subsequently shown to cause severely deformed limbs (hands and feet, but reduced arms and legs) in children whose mothers took the medication. What might thalidomide do during development?

A. Cause a defect in the fertilization of an egg.

B. Severely alter blastulation in the embryo.

C. Impair neural tube formation.

D. Impair morphogenic fields within the embryo.

E. Block cell division during blastulation.

48. 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. B cells.

B. helper T cells.

C. cytotoxic T cells.

D. suppressor T cells.

E. macrophages.

49. Which of the following knowledge regarding the immune system is not correct?

A. Acquired immunity is thought to be absent in invertebrates

B. Natural killer cells target virus–infected body cells by recognizing oligosaccharide and MHC class I molecules on the cell surface.

C. An antigen can contain many epitopes on it, so it can be recognized by more than one kinds of lymphocytes.

D. IgM is a pentameric structure that contains 10 antigen binding sites.

E. All of these statements are correct.

50. The clonal selection theory is an explanation for

A. how a single type of stem cell can produce both red blood cells and white blood cells.

B. how antibody proteins can be molded to fit antigens after the antigen interacts with the antibody-producing type of cell.

C. how an antigen can activate specific lymphocytes to fight the infection.

D. how HIV can disrupt the immune system.

E. how macrophages can recognize specific pathogens and amplify themselves.