单项选择题（共50题）

1) Compared with a smaller cell, a larger cell of the same shape has \_\_\_\_\_.

A) less surface area

B) less surface area per unit of volume

C) a smaller average distance between its mitochondria and the external source of oxygen

D) a smaller cytoplasm-to-nucleus ratio

2) Connective tissues typically have \_\_\_\_\_.

A) little space between the membranes of adjacent cells

B) relatively few cells and a large amount of extracellular matrix

C) the ability to shorten upon stimulation

D) the ability to transmit electrochemical impulses

3) Blood is best classified as connective tissue because \_\_\_\_\_.

A) it contains more than one type of cell

B) its cells are separated from each other by an extracellular matrix

C) its cells can move from place to place

D) it is found within all the organs of the body

4) The type of muscle tissue surrounding the intestines and blood vessels is \_\_\_\_\_.

A) skeletal muscle

B) cardiac muscle

C) smooth muscle

D) intercalated cells

5) Food moves along the digestive tract as the result of contractions by \_\_\_\_\_.

A) cardiac muscle

B) striated muscle

C) smooth muscle

D) skeletal muscle

6) You are looking through a microscope at a slide of animal tissue and see a single layer of flat, closely packed cells that cover a surface. This specific tissue is most likely \_\_\_\_\_.

A) epithelial

B) a tendon

C) adipose

D) a neuron

7) An elephant and a mouse are running in full sunlight, and both overheat by the same amount above their normal body temperatures. When they move into the shade and rest, which animal will cool down faster?

A) The elephant will because it has the higher surface-area-to-volume ratio.

B) The elephant will because it has the lower surface-area-to-volume ratio.

C) They will cool at the same rate because they overheated by the same amount.

D) The mouse will because it has the higher surface-area-to-volume ratio.

8) When the body's blood glucose level rises, the pancreas secretes insulin and, as a result, the blood glucose level declines. When the blood glucose level is low, the pancreas secretes glucagon and, as a result, the blood glucose level rises. Such regulation of the blood glucose level is the result of \_\_\_\_\_.

A) catalytic feedback

B) negative feedback

C) positive feedback

D) protein-protein interactions

9) The body's automatic tendency to maintain a constant and optimal internal environment is termed \_\_\_\_\_.

A) homeostasis

B) physiological chance

C) balanced equilibrium

D) static equilibrium

10) The temperature-regulating center of vertebrate animals is located in the \_\_\_\_\_.

A) hypothalamus

B) thyroid gland

C) subcutaneous layer of the skin

D) liver

11) The formation of the fertilization envelope requires an increase in the availability of \_\_\_\_\_.

A) hydrogen ions

B) calcium ions

C) potassium ions

D) sodium ions

12) The plasma membrane of the sea urchin egg \_\_\_\_\_.

A) has receptor molecules that are specific for binding acrosomal proteins

B) releases calcium, which initiates the cortical reaction

C) is outside of the fertilization membrane

D) is a mesh of proteins crossing through the cytosol of the egg

13) During fertilization, the acrosomal contents \_\_\_\_\_.

A) block polyspermy

B) help propel more sperm toward the egg

C) trigger the completion of meiosis by the sperm

D) digest the protective jelly coat on the surface of the egg

14) In a newly fertilized egg, the vitelline layer \_\_\_\_\_.

A) reduces the loss of water from the egg and prevents desiccation

B) secretes hormones that enhance steroidogenesis by the ovary

C) lifts away from the egg and hardens to form a fertilization envelope

D) provides most of the nutrients used by the zygote

15) In a developing frog embryo, most of the yolk is \_\_\_\_\_.

A) located near the vegetal pole

B) located near the animal pole

C) found within the cleavage furrow

D) distributed equally throughout the embryo

16) The vegetal pole of a frog zygote differs from the animal pole in that \_\_\_\_\_.

A) the blastomeres originate only in the vegetal pole

B) the vegetal pole has a higher concentration of yolk

C) the vegetal pole cells undergo mitosis, but not cytokinesis

D) the polar bodies bud from this region

17) Which of the following correctly displays the sequence of developmental milestones?

A) blastula → gastrula → cleavage

B) cleavage → blastula → gastrula

C) cleavage → gastrula → blastula

D) gastrula → blastula → cleavage

18) The cortical reaction of sea urchin eggs functions directly in \_\_\_\_\_.

A) the production of a fast block to polyspermy

B) the formation of a fertilization envelope

C) the release of hydrolytic enzymes from the sperm

D) the generation of an electrical impulse by the egg

19) From earliest to latest, the overall sequence of early development proceeds in which of the following sequences?

A) acrosomal reaction → cortical reaction → synthesis of embryo's DNA begins → first cell division

B) cortical reaction → synthesis of embryo's DNA begins → acrosomal reaction → first cell division

C) cortical reaction → acrosomal reaction → first cell division → synthesis of embryo's DNA begins

D) first cell division → synthesis of embryo's DNA begins → acrosomal reaction → cortical reaction

20) Cells move to new positions as an embryo establishes its three germ-tissue layers during \_\_\_\_\_.

A) determination

B) cleavage

C) gastrulation

D) induction

21) The outer-to-inner sequence of tissue layers in a post-gastrulation vertebrate embryo is \_\_\_\_\_.

A) endoderm → ectoderm → mesoderm

B) mesoderm → endoderm → ectoderm

C) ectoderm → endoderm → mesoderm

D) ectoderm → mesoderm → endoderm

22) In all vertebrate animals, development requires \_\_\_\_\_.

A) a large supply of yolk

B) a primitive streak

C) extraembryonic membranes

D) an aqueous environment

23) At the time of implantation, the human embryo is called a \_\_\_\_\_.

A) fetus

B) gastrula

C) blastocyst

D) zygote

24) From earliest to latest, the overall sequence of early development proceeds in which of the following sequences?

A) cleavage → gastrulation → organogenesis

B) gastrulation → organogenesis → cleavage

C) gastrulation → blastulation → neurulation

D) preformation → morphogenesis → neurulation

25) Changes in the shape of a cell usually involve a reorganization of the \_\_\_\_\_.

A) cytoskeleton

B) nucleus

C) extracellular matrix

D) transport proteins

26) During metamorphosis, a tadpoles tail is reduced in size by the process of \_\_\_\_\_.

A) apoptosis

B) regeneration

C) oxidative phosphorylation

D) re-differentiation

27) What structural adaptation in chickens allows them to lay their eggs in arid environments rather than in water?

A) yolk

B) amnion

C) gastrulation

D) development of the brain from ectoderm

28) If an amphibian zygote is manipulated so that the first cleavage plane fails to divide the gray crescent, then \_\_\_\_\_.

A) the daughter cell with the entire gray crescent will die

B) both daughter cells will develop normally, because amphibians are totipotent at this stage

C) both daughter cells will develop abnormally

D) only the daughter cell with the gray crescent will develop normally

29) In humans, identical twins are possible because \_\_\_\_\_.

A) cytoplasmic determinants are distributed unevenly in unfertilized eggs

B) extraembryonic cells interact with the zygote nucleus

C) the gray crescent divides the dorsal-ventral axis into new cells

D) early blastomeres can form a complete embryo if isolated

30) What is the most logical sequence of steps for splicing foreign DNA into a plasmid and inserting the plasmid into a bacterium?

I. Transform bacteria with a recombinant DNA molecule.

II. Cut the plasmid DNA using restriction enzymes (endonucleases).

III. Extract plasmid DNA from bacterial cells.

IV. Hydrogen-bond the plasmid DNA to nonplasmid DNA fragments.

V. Use ligase to seal plasmid DNA to nonplasmid DNA.

A) II, III, V, IV, I

B) III, II, IV, V, I

C) III, IV, V, I, II

D) IV, V, I, II, III

31) A principal problem with inserting an unmodified mammalian gene into a plasmid and then getting that gene expressed in bacteria is that \_\_\_\_\_.

A) prokaryotes use a different genetic code from that of eukaryotes

B) bacteria cannot remove eukaryotic introns

C) bacteria translate only mRNAs that have multiple messages

D) bacterial RNA polymerase cannot make RNA complementary to mammalian DNA

32) Why is it so important to be able to amplify DNA fragments when studying genes?

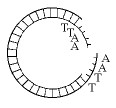
A) Before amplification, DNA fragments are likely to bind to RNA and no longer be able to be analyzed.

B) Restriction enzymes (endonucleases) cut DNA into fragments that are too small.

C) A gene may represent only a millionth of the cell's DNA.

D) A clone requires multiple copies of each gene per clone.

Use the figure below to answer the following question.



33) Which enzyme was used to produce the molecule in the figure above?

A) a restriction enzyme (endonuclease)

B) ligase

C) RNA polymerase

D) DNA polymerase

Use the figure below to answer the following question.



34) The segment of DNA shown in the figure above has restriction sites I and II, which create restriction fragments A, B, and C. Which of the gels produced by electrophoresis shown below best represents the separation and identity of these fragments?

A)



B)



C)



D)



35) A laboratory might use dideoxyribonucleotides to \_\_\_\_\_.

A) sequence a DNA fragment

B) produce cDNA from mRNA

C) separate DNA fragments

D) visualize DNA expression

36) Many identical copies of genes cloned in bacteria are produced as a result of \_\_\_\_\_.

A) plasmid replication

B) bacterial cell replication

C) transformation

D) plasmid and bacterial cell replication

37) Which of the following is in the correct order for one cycle of polymerase chain reaction (PCR)?

A) Denature DNA; add fresh enzyme; anneal primers; add dNTPs; extend primers.

B) Denature DNA; anneal primers; extend primers.

C) Extend primers; anneal primers; denature DNA.

D) Anneal primers; denature DNA; extend primers.

38) The final step in a Sanger DNA sequencing reaction is to run the DNA fragments on a gel. What purpose does this serve?

A) It adds ddNTP to the end of each DNA fragment.

B) It changes the length of the DNA fragments.

C) It separates DNA fragments based on their charge.

D) It separates DNA fragments generated during the sequencing reaction based on one-nucleotide differences in their size.

39) DNA sequencing has transformed our understanding of genes, genomes and evolution. Which of the following statements comparing two common sequencing techniques, the chain termination method and next generation sequencing is TRUE?

A) The chain termination method is faster and more efficient, so it is used to generate large-scale sequences, while next generation synthesis is used for routine, small-scale jobs.

B) The chain termination method employs the polymerase chain reaction, but next generation sequencing does not.

C) .Next generation sequencing employs electrophoresis, but the chain termination method does not.

D) In the chain termination method, the order of bases is detected by fluorescently labeling each dideoxy-nucleotide in a different color, while next generation sequencing determines the order of bases by detecting the release of PPi during the formation of the phosphodiester bond

40) A gene that contains introns can be made shorter (but remain functional) for genetic engineering purposes by using \_\_\_\_\_.

A) reverse transcriptase to reconstruct the gene from its mRNA

B) a restriction enzyme (endonuclease) to cut the gene into shorter pieces

C) DNA polymerase to reconstruct the gene from its polypeptide product

D) DNA ligase to put together fragments of the DNA that code for a particular polypeptide

41) DNA microarrays have made a huge impact on genomic studies because they \_\_\_\_\_.

A) can be used to eliminate the function of any gene in the genome

B) can be used to introduce entire genomes into bacterial cells

C) allow physical maps of the genome to be assembled in a very short time

D) allow the expression of many or even all of the genes in the genome to be compared at once

42) RNAi methodology uses double-stranded pieces of RNA to trigger breakdown of a specific mRNA or inhibit its translation. For which of the following might this technique be useful?

A) to destroy an unwanted allele in a homozygous individual

B) to decrease the production from a harmful mutated gene

C) to form a knockout organism that will not pass the deleted sequence to its progeny

D) to raise the concentration of a desired protein

43) A researcher has used *in vitro* mutagenesis to mutate a cloned gene and then has reinserted the mutated gene into a cell. To have the mutated sequence disable the function of the gene, what must then occur?

A) replication of the cloned gene using a bacterial plasmid

B) use of a microarray to verify continued expression of the original gene

C) recombination resulting in replacement of the wild type with the mutated gene

D) transcription of the cloned gene using a BAC

44) For a particular microarray assay (DNA chip), cDNA has been made from the mRNAs of a dozen patients' breast tumor biopsies. The researchers will be looking for \_\_\_\_\_.

A) a particular gene that is amplified in all or most of the patient samples

B) a pattern shared among some or all of the samples that indicates gene expression differing from control samples

C) a pattern of fluorescence that indicates which cells are over proliferating

D) a group of cDNAs that match those in non-breast cancer control samples from the same population

45) Which of the following uses labeled probes to visualize the expression of genes in whole tissues and organisms?

A) in situ hybridization

B) RT-PCR

C) DNA microarrays

D) RNA interference

46) In 1997, Dolly the sheep was cloned. Which of the following processes was used?

A) replication and dedifferentiation of adult stem cells from sheep bone marrow

B) separation of an early stage sheep blastula into separate cells, one of which was incubated in a surrogate ewe

C) isolation of stem cells from a lamb embryo and production of a zygote equivalent

D) fusion of an adult cell's nucleus with an enucleated sheep egg, followed by incubation in a surrogate

47) Which of the following is true of embryonic stem cells but not of adult stem cells?

A) They normally differentiate into only eggs and sperm.

B) They can continue to reproduce for an indefinite period.

C) They can give rise to all cell types in the organism.

D) One aim of using them is to provide cells for repair of diseased tissue.

48) In recent times, it has been shown that adult cells can be induced to become pluripotent stem cells (iPS). To make this conversion, what has been done to the adult cells?

A) The nucleus of an embryonic cell is used to replace the nucleus of an adult cell.

B) The adult stem cells must be fused with embryonic cells.

C) Cytoplasm from embryonic cells is injected into the adult cells.

D) A retrovirus is used to introduce four specific regulatory genes.

49) For applications in gene therapy, what is the most favorable characteristic of retroviruses?

A) Retroviruses have an RNA genome.

B) Retroviruses possess reverse transcriptase.

C) Retroviruses mutate often.

D) DNA copies of retroviral genomes become integrated into the genome of the infected cell.

50) In the form of gene therapy used successfully for severe combined immunodeficiency syndrome (SCID)-X1, the genetic engineering of human cells is done by \_\_\_\_\_.

A) injecting engineered viruses into the patient's bloodstream

B) injecting engineered viruses into the patient's bone marrow

C) isolating the patient's bone marrow cells, infecting them with genetically engineered viruses, and injecting them back into the patient's bone marrow

D) treating a relative's cultured bone marrow cells with genetically engineered viruses and then injecting these cells into the patient's bone marrow