系所組別：生命科學系
考試科目：普通生物學 考試日期：0714，節次：3

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選擇題: (100 分，每題 2 分)

1. Why do RNA viruses appear to have higher rates of mutation?

A) RNA nucleotides are more unstable than DNA nucleotides.

B) Replication of their genomes does not involve proofreading.

C) RNA viruses replicate faster.

D) RNA viruses can incorporate a variety of nonstandard bases.

2. What is the function of reverse transcriptase in retroviruses?

A) It hydrolyzes the host cell's DNA.

B) It uses viral RNA as a template for DNA synthesis.

C) It converts host cell RNA into viral DNA.

D) It translates viral RNA into proteins.

3. The scientific name of the human beings is Homo sapiens. In this name, sapiens refers to the

A) genus

B) family

C) class

D) species

4. If the end product of a metabolic pathway shuts down the pathway, we say it is

A) feedback inhibition

B) allosteric Regulation

C) cooperativity

D) Competition

5. Which of the following is present in a prokaryotic cell?

A) Mitochondrion

B) Ribosome

C) Nuclear envelope

D) chloroplast

6. Which enzyme catalyzes the elongation of a DNA strand in the 5' → 3' direction?

A) DNA polymerase III

B) helicase

C) primase

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D) topoisomerase

7. In eukaryotes there are several different types of RNA polymerase. Which type is involved in transcription of mRNA for a globin protein?

A) primase

B) RNA polymerase I

C) RNA polymerase II

D) RNA polymerase III

8. What is a ribozyme?

A) an enzyme that synthesizes RNA as part of the transcription process

B) an enzyme that synthesizes RNA primers during DNA replication

C) an enzyme that catalyzes the association between the large and small ribosomal subunits

D) an RNA with enzymatic activity

9. Steroid hormones produce their effects in cells by

A) degrading mRNA.

B) promoting the formation of looped domains in certain regions of DNA.

C) activating translation of certain mRNAs.

D) binding to intracellular receptors and promoting transcription of specific genes.

10. The phenomenon in which RNA molecules in a cell are destroyed if they have a sequence complementary to an introduced double-stranded RNA is called

A) RNA transcription.

B) RNA targeting.

C) RNA translation.

D) RNA interference.

11. Which of the following is used to make complementary DNA (cDNA) from RNA?

A) gel electrophoresis

B) restriction enzymes

C) reverse transcriptase

D) DNA ligase

12. Which of the following describes the transfer of polypeptide sequences to a membrane to analyze gene expression?

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A) Northern blotting

B) Southern blotting

C) Eastern blotting

D) Western blotting

13. A triplet of bases in the template strand of DNA is 5' ACT 3'. The corresponding codon for the mRNA transcribed is

A) 5' ACU 3'.

B) 5' UGA 3'.

C) 3' ACT 5'.

D) 3' ACU 5'.

14. If there are 20 chromatids in a cell, how many centromeres are there?

A) 40

B) 20

C) 10

D) 30

15. If cells in the process of dividing are subjected to colchicine, a drug that interferes with the formation of the spindle apparatus, at which stage will mitosis be arrested?

A) interphase

B) prophase

C) telophase

D) metaphase

16. If there are 20 centromeres in a cell at anaphase, how many chromosomes are there in each daughter cell following cytokinesis?

A) 80

B) 10

C) 40

D) 30

17. Taxol is an anticancer drug extracted from the Pacific yew tree. In animal cells, Taxol disrupts microtubule formation by binding to microtubules and accelerating their assembly from the protein precursor, tubulin. Surprisingly, this stops mitosis. Specifically, Taxol must affect

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A) formation of the centrioles.

B) anaphase.

C) the formation of the mitotic spindle.

D) the S phase of the cell cycle.

18. Measurements of the amount of DNA per nucleus were taken on a large number of cells from a growing fungus. The measured DNA levels ranged from 3 to 6 picograms per nucleus. In which stage of the cell cycle did the nucleus contain 6 picograms of DNA?

A) G2

B) M

C) G1

D) S

19. Which of the following is a protein synthesized at specific times during the cell cycle that associates with a kinase to form a catalytically active complex?

A) cyclin

B) MPF

C) PDGF

D) protein kinase

20. Which of the following are directly associated with photosystem I?

A) generation of molecular oxygen

B) harvesting of light energy by ATP

C) extraction of hydrogen electrons from the splitting of water

D) receiving electrons from the thylakoid membrane electron transport chain

21. Although extinction is a natural process, current extinctions are of concern to environmentalists because

A) the rate of extinction is unusually high.

B) more animals than ever before are going extinct.

C) most current extinctions are caused by introduced species.

D) current extinction is primarily affecting plant diversity.

22. A primary objective of cell fractionation is to

A) sort cells based on their size and weight.

B) determine the size of various organelles.

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C) separate the major organelles so that their particular functions can be determined.

D) view the structure of cell membranes.

23. Hershey and Chase performed an elegant experiment that convinced most biologists that DNA, rather than protein, was the genetic material. This experiment subjected bacteria to the same gene transfer mechanism as occurs in

A) transformation.

B) transduction.

C) conjugation.

D) endosymbiosis.

24. Genomic imprinting, DNA methylation, and histone acetylation are all examples of

A) chromosomal rearrangements.

B) translocation.

C) epigenetic phenomena.

D) genetic mutation.

25. Which of the following is the most direct threat to biodiversity?

A) the depletion of the ozone layer

B) overexploitation of selected species

C) zoned reserves

D) habitat destruction

26. Mitochondria are thought to be the descendants of certain alpha proteobacteria. They are, however, no longer able to lead independent lives because most genes originally present on their chromosome have moved to the nuclear genome. Which phenomenon accounts for the movement of these genes?

A) conjugation

B) plasmolysis

C) translation

D) horizontal gene transfer

27. Which statement about the genomes of prokaryotes is correct?

A) Prokaryotic genomes are composed of circular DNA.

B) Prokaryotic chromosomes are sometimes called plasmids.

C) Prokaryotic genomes are diploid throughout most of the cell cycle.

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D) Prokaryotic cells have multiple chromosomes, "packed" with a relatively large amount of protein.

28. In a bacterium that possesses antibiotic resistance and the potential to persist through very adverse conditions, such as freezing, drying, or high temperatures, DNA should be located within, or be part of, which structures?

1. nucleoid region
2. endospore
3. fimbriae
4. plasmids

A) 1 and 4 only
B) 2 and 4 only
C) 1 and 2 only
D) 1, 2, and 4

29. Paralogous genes that have lost the function of coding for any functional gene product are known as "pseudogenes." Which of these is a valid prediction regarding the fate of pseudogenes over evolutionary time?

A) They will be preserved by natural selection.
B) They will be highly conserved.
C) They will have relatively high mutation rates.
D) They will be transformed into orthologous genes.

30. A phylogenetic tree constructed using sequence differences in mitochondrial DNA would be most valid for discerning the evolutionary relatedness of

A) fungi and animals.
B) mosses and ferns.
C) chimpanzees and humans.
D) archaeans and bacteria.

31. Nucleic acid sequences that undergo few changes over the course of evolutionary time are said to be conserved. Conserved sequences of nucleic acids

A) include all mitochondrial DNA.
B) are abundant in ribosomes.
C) are found in the most crucial portions of proteins.
D) comprise a larger proportion of pre-mRNA (immature mRNA) than of mature mRNA.

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32. A researcher wants to determine the genetic relatedness of several breeds of dog (Canis lupus familiaris). The researcher should compare homologous sequences of this type of biochemical _____ which can be described as _____.

A) amino acids; highly conserved
B) lipids; poorly conserved
C) nucleic acids, poorly conserved
D) fatty acids; highly conserved

33. Concerning growth in genome size over evolutionary time, which of these is least associated with the others?

A) gene duplications
B) gene families
C) paralogous genes
D) orthologous genes

34. What is bioinformatics?
A) a method that uses very large national and international databases to access and work with sequence information
B) a series of search programs that allow a student to identify who in the world is trying to sequence a given species
C) a software program available from NIH to design genes
D) a technique using 3-D images of genes in order to predict how and when they will be expressed

35. In trying to determine whether DNA or protein is the genetic material, Hershey and Chase made use of which of the following facts?

A) RNA includes ribose, whereas DNA includes deoxyribose sugars.
B) DNA contains sulfur, whereas protein does not.
C) DNA contains phosphorus, whereas protein does not.
D) DNA contains purines, whereas protein includes pyrimidines.

36. How is a physical map of the genome of an organism achieved?
A) using recombination frequency

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B) using DNA fingerprinting via electrophoresis

C) using very high-powered microscopy

D) using restriction enzyme cutting sites

37. Which of the following is a representation of gene density?

A) Humans have 27,000 bp in introns.

B) Humans have 2,900 Mb per genome.

C) Humans have ~20,000 genes in 2,900 Mb.

D) Fritillaria has a genome 40 times the size of a human.

38. If you were to observe the activity of methylated DNA, you would expect it to

A) be very actively transcribed and translated.

B) have turned off or slowed down the process of transcription.

C) be unwinding in preparation for protein synthesis.

D) be replicating nearly continuously.

39. What is the term for metabolic pathways that release stored energy by breaking down complex molecules?

A) thermodynamic pathways

B) anabolic pathways

C) catabolic pathways

D) fermentation pathways

40. What is proteomics?

A) the totality of the functional possibilities of a single protein

B) the study of how amino acids are ordered in a protein

C) the study of the full protein set encoded by a genome

D) the study of how a single gene activates many proteins

41. What is metagenomics?

A) sequencing DNA from a group of species from the same ecosystem

B) the sequence of one or two representative genes from several species

C) genomics as applied to a species that most typifies the average phenotype of its genus

D) genomics as applied to an entire phylum

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42. Which of the following most correctly describes a shotgun technique for sequencing a genome?

A) cloning large genome fragments into very large vectors such as YACs, followed by sequencing

B) cloning the whole genome directly, from one end to the other

C) cloning several sizes of fragments into various size vectors, ordering the clones, and then sequencing them

D) physical mapping followed immediately by sequencing

43. What is the difference between a linkage map and a physical map?

A) For a linkage map, markers are spaced by recombination frequency, whereas for a physical map they are spaced by numbers of base pairs (bp).

B) There is no difference between the two except in the type of pictorial representation.

C) For a linkage map, it is shown how each gene is linked to every other gene.

D) For a physical map, the distances must be calculable in units such as nanometers.

44. What is the function of the release factor (RF)?

A) It binds to the stop codon in the A site in place of a tRNA.

B) It releases the ribosome from the ER to allow polypeptides into the cytosol.

C) It releases the amino acid from its tRNA to allow the amino acid to form a peptide bond.

D) It supplies a source of energy for termination of translation.

45. A frameshift mutation could result from

A) a base substitution only.

B) a base insertion only.

C) either an insertion or a deletion of a base.

D) deletion of three consecutive bases.

46. Where does glycolysis take place in eukaryotic cells?

A) cytosol

B) mitochondrial outer membrane

C) mitochondrial matrix

D) mitochondrial intermembrane space

47. What is the effect of a nonsense mutation in a gene?

A) It changes an amino acid in the encoded protein.

B) It has no effect on the amino acid sequence of the encoded protein.

C) It prevents introns from being excised.

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D) It introduces a premature stop codon into the mRNA.

48. Which of the following are products of the light reactions of photosynthesis that are utilized in the Calvin cycle?

A) ATP and NADPH

B) CO2 and glucose

C) electrons and H+

D) H2O and O2

49. In a plant cell, where are the ATP synthase complexes located?

A) thylakoid membrane and plasma membrane

B) thylakoid membrane and inner mitochondrial membrane

C) plasma membrane only

D) inner mitochondrial membrane only

50. Where does the Calvin cycle take place?

A) outer membrane of the chloroplast

B) stroma of the chloroplast

C) cytoplasm surrounding the chloroplast

D) thylakoid membrane

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