

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

單選題：(100 分，每題 4 分)

- Which of the following contains hydrolytic enzymes?
 - peroxisome
 - vacuole
 - lysosome
 - Golgi apparatus
 - mitochondrion
- What are the major structural components of the cell membrane?
 - phospholipids and proteins
 - nucleic acids and proteins
 - proteins and cellulose
 - glycoproteins and cholesterol
 - phospholipids and cellulose
- How does a noncompetitive inhibitor decrease the rate of an enzyme reaction?
 - by binding at the active site of the enzyme
 - by decreasing the activation energy of the reaction
 - by acting as a coenzyme for the reaction
 - by changing the shape of the enzyme's active site
 - by changing the free-energy change of the reaction
- When an individual is exercising heavily and when the muscle becomes oxygen-deprived, muscle cells convert pyruvate to lactate. What happens to the lactate in skeletal muscle cells?
 - It is converted to NAD^+ .
 - It produces CO_2 and water.
 - It reduces FADH_2 to FAD^+ .
 - It is converted to alcohol.
 - It is taken to the liver and converted back to pyruvate.
- Which of the following are products of the light reactions of photosynthesis that are utilized in the Calvin cycle?
 - H_2O and O_2
 - ADP , P_i , and NADP^+
 - electrons and H^+
 - ATP and NADPH
 - CO_2 and glucose

6. Which of the following triggers the cell's passage past the G₂ checkpoint into mitosis?
- A) Cyclin-dependent kinases (Cdk)
 - B) mitosis-promoting factor (MPF)
 - C) cyclin
 - D) Platelet-derived growth factor (PDGF)
 - E) protein kinase
7. When homologous chromosomes cross over, what occurs?
- A) Each of the four DNA strands of a homologous pair is broken, and the pieces are mixed.
 - B) Two chromatids get tangled, resulting in one re-sequencing its DNA.
 - C) Maternal alleles are "corrected" to be like paternal alleles, and vice versa.
 - D) Two sister chromatids exchange identical pieces of DNA.
 - E) Specific proteins break the two strands of nonsister chromatids and re-join them.
8. Which of the following provides an example of epistasis?
- A) In rabbits and many other mammals, one genotype (*ee*) prevents any fur color from developing.
 - B) Recessive genotypes for each of two genes (*aabb*) result in an albino corn snake.
 - C) In cacti, there are several genes for the type of spines.
 - D) The allele *b17* produces a dominant phenotype, although *b1* through *b16* do not.
 - E) In *Drosophila* (fruit flies), white eyes can be due to an X-linked gene or to a combination of other genes.
9. What is the source of the extra chromosome 21 in an individual with Down syndrome?
- A) nondisjunction or translocation in either parent
 - B) nondisjunction in the mother only
 - C) It is impossible to detect with current technology.
 - D) nondisjunction in the father only
 - E) duplication of the chromosome
10. Which of the following sets of materials is required by both eukaryotes and prokaryotes for replication?
- A) nucleosome loosening, four dNTPs, four rNTPs
 - B) topoisomerases, telomerases, polymerases
 - C) ligase, primers, nucleases
 - D) double-stranded DNA, four kinds of dNTPs, primers, origins of replication
 - E) G-C rich regions, polymerases, chromosome nicks
11. When translating secretory or membrane proteins, ribosomes are directed to the ER membrane by
- A) moving through a specialized channel of the nucleus.

- B) a signal sequence of RNA that precedes the start codon of the message.
 - C) a signal-recognition particle that brings ribosomes to a receptor protein in the ER membrane.
 - D) a specific characteristic of the ribosome itself, which distinguishes free ribosomes from bound ribosomes.
 - E) a chemical signal given off by the ER.
12. Among the newly discovered small noncoding RNAs, one type reestablishes methylation patterns during gamete formation and blocks expression of some transposons. These are known as
- A) siRNA.
 - B) piRNA.
 - C) RNAi.
 - D) miRNA.
 - E) snRNA.
13. Genomic imprinting, DNA methylation, and histone acetylation are all examples of
- A) genetic mutation.
 - B) chromosomal rearrangements.
 - C) epigenetic phenomena.
 - D) translocation.
 - E) karyotypes.
14. What is considered to be the first evidence of differentiation in the cells of an embryo?
- A) determination of specific cells for certain functions
 - B) changes resulting from induction
 - C) the occurrence of mRNAs for the production of tissue-specific proteins
 - D) changes in the size and shape of the cell
 - E) cell division occurring after fertilization
15. Antiviral drugs that have become useful are usually associated with which of the following properties?
- A) interference with viral replication
 - B) ability to remove all viruses from the infected host
 - C) prevention of the host from becoming infected
 - D) removal of viral proteins
 - E) removal of viral mRNAs
16. A multigene family is composed of
- A) the many tandem repeats such as those found in centromeres and telomeres.
 - B) multiple genes whose products must be coordinately expressed.

- C) a highly conserved gene found in a number of different species.
D) a gene whose exons can be spliced in a number of different ways.
E) genes whose sequences are very similar and that probably arose by duplication.
17. Two plant species live in the same biome but on different continents. Although the two species are not at all closely related, they may appear quite similar as a result of
- A) parallel evolution.
B) allopatric speciation.
C) convergent evolution.
D) gene flow.
E) introgression.
18. The most important feature that permits a gene to act as a molecular clock is
- A) having a large number of base pairs.
B) its recent origin by a gene-duplication event.
C) having a larger proportion of exonic DNA than of intronic DNA.
D) its being acted upon by natural selection.
E) having a reliable average rate of mutation.
19. Sexual dimorphism is most often a result of
- A) intrasexual selection.
B) intersexual selection.
C) artificial selection.
D) pansexual selection.
E) stabilizing selection.
20. If the sex ratio in a population is significantly different from 50:50, then which of the following will always be true?
- A) The effective population size will be less than the actual population size.
B) The population will enter the extinction vortex.
C) The genetic variation in the population will decrease over time.
D) The effective population size will be greater than the actual population size.
E) The genetic variation in the population will increase over time.
21. Coral reefs can be found on the southeast coast of the United States but not at similar latitudes on the southwest coast. Differences in which of the following most likely account for this?
- A) precipitation

B) sunlight intensity

C) day length

D) ocean currents

E) salinity

22. Skeletal muscle contraction begins when calcium ions bind to

A) troponin.

B) myosin.

C) actin.

D) tropomyosin.

E) energized cross-bridges.

23. Most of the neurons in the human brain are

A) peripheral neurons.

B) sensory neurons.

C) auditory neurons.

D) interneurons.

E) motor neurons.

24. If you wanted more loosely packed clusters of grapes, you would most likely spray the immature bunches with

A) cytokinins.

B) gibberellins.

C) auxin.

D) ethylene.

E) abscisic acid.

25. Fruits develop from

A) microsporangia..

B) ovaries

C) ovules.

D) fertilized eggs.

E) receptacles.