一、 選擇題（每題2分，共50分）※ 注意：請於試卷內之「選擇題作答區」依序作答。

1. How many pairs of autosomes are in a typical human karyotype?
   a. 1
   b. 22
   c. 23
   d. 46
   e. 92

2. The significance of Fred Griffith's experiment in which he used two strains of *Streptococcus pneumoniae* is that
   a. pathogenic bacteria function differently in mice than in other organisms.
   b. it demonstrated that harmless bacteria can become transformed into disease-causing bacteria by bacteria a transformation factor.
   c. it established that pure DNA extracted from disease-causing bacteria transformed harmless strains into killer strains.
   d. dead cells lose their genetic information.
   e. the genetic material is DNA, not protein.

3. DNA contains all of the following nitrogen-containing bases EXCEPT
   a. adenine.
   b. uracil.
   c. guanine.
   d. adenine.
   e. thymine.

4. DNA polymerase assembles new strands
   a. in a 5' to 3' direction only.
   b. in a 5' to 3' direction building one strand and a 3' to 5' direction building the other stand.
   c. in a 5' to 3' direction building the first half of a strand and a 3' to 5' direction building the second half of a strand.
   d. in a 3' to 5' direction building the first half of a strand and a 5' to 3' direction building the second half of a strand.
   e. in a 3' to 5' direction on the "old" 3' to 5' strand.

見背面

5. ____ molecules carry protein-assembly instructions from the nucleus to the cytoplasm.
   a. Template DNA
   b. Messenger RNA
   c. Transfer RNA
   d. Ribosomal RNA
   e. All of these

6. The genetic code is made up of units consisting of how many nucleotides?
   a. 2
   b. 3
   c. 5
   d. 6
   e. 9

7. In correct order, the three stages of translation are
   a. initiation, replication, and termination.
   b. elongation, peptide bond formation, and codon-anticodon pairing.
   c. initiation, chain elongation, and termination.
   d. termination, initiation, and replication.
   e. none of these.

8. Which of the following statements is true?
   a. Gene mutations occur independently of each other.
   b. Gene mutations are relatively rare.
   c. Ionizing radiation causes chromosomal damage and free radical formation.
   d. Mutations are random; that is, it is impossible to predict exactly when a specific gene will mutate, but an expected frequency can be assigned.
   e. All of these are true.

9. The difference between normal and sickle-cell hemoglobin is based upon
   a. the number of amino acids in the molecule.
   b. the substitution of one amino acid for another.
   c. the number and orientation of the amino acid chains attached to the heme portion of the molecule.
   d. the number of oxygen molecules that can be carried.
   e. the type of bone marrow that produces it.

接次頁

10. The significance of the Hershey and Chase experiments in which ^{32}P and ^{35}S were used is that
    a. DNA labeled with ^{35}S and proteins labeled with ^{32}P can be traced in the course of an experiment.
    b. they demonstrated that DNA labeled with ^{32}P is transferred from the bacteriophage to the virus.
    c. they established that proteins labeled with ^{35}S become deactivated and unable to be transferred.
    d. they demonstrated that bacteriophages transfer their DNA, not their protein coats, into their hosts.
    e. DNA may be the hereditary material; although, bacteriophages transfer both DNA and proteins into their hosts.

11. Differentiation is the process by which cells
    a. mature into larger cells.
    b. change from one type of muscle to another.
    c. allows cells to change to fix injuries.
    d. turn on all the genomic genes.
    e. become specialized by turning on some genes and turning off others.

12. X chromosome inactivation results in the
    a. total inactivation of both X chromosomes.
    b. inactivation of only the paternal X chromosome.
    c. inactivation of only the maternal X chromosome.
    d. inactivation of either the paternal X chromosome or the maternal X chromosome.
    e. nonrandom inactivation of X chromosomes in the initial cells of tissues.

13. In prokaryotes, most of the control of gene expression is at the ____ level.
    a. transcriptional
    b. transcript processing
    c. transport
    d. translational
    e. post-translational

見背面

14. The rate at which mRNA is processed by ribosomes is an example of
    a. transcriptional control.
    b. transcript processing control.
    c. transport control.
    d. translational control.
    e. post-translational control.

15. Which process is absolutely necessary for asexual cellular reproduction to occur in eukaryotes?
    a. prokaryotic fission
    b. Mitosis
    c. Meiosis
    d. Cytokinesis
    e. growth factor activation

16. Chromosomes and genes are replicated during
    a. anaphase.
    b. metaphase.
    c. interphase.
    d. prophase.
    e. telophase.

17. Sexual reproduction
    a. leads to uniform characteristics within a population.
    b. results in new combinations of genetic traits.
    c. creates genetic clones.
    d. requires less tissue differentiation than asexual reproduction.
    e. produces genetic clones and requires less tissue differentiation than asexual reproduction.

18. The pea plant was an excellent choice for Mendel's experiments because
    a. true-breeding varieties were available.
    b. the plant can self-fertilize.
    c. it can be cross-fertilized.
    d. true-breeding varieties were available, and it can be cross-fertilized.
    e. true-breeding varieties were available, the plant can self-fertilize, and it can be cross-fertilized.

接次頁

19. The most accurate description of an organism with genotype *AaBb* is
    a. homozygous dominant.
    b. heterozygous.
    c. heterozygous dominant.
    d. homozygous recessive.
    e. heterozygous recessive.

20. Mendel's dihybrid crosses, but not his monohybrid crosses, show that
    a. some genes are linked together.
    b. the two alleles controlling a trait are divided equally among the gametes.
    c. alleles for different traits are inherited independently.
    d. one of the pair of alleles is dominant to the other.
    e. the crossing of two different homozygous forms will not produce any offspring in the first generation that will look like either of the parents.

21. The ABO blood types are controlled by
    a. pleiotropy.
    b. multiple alleles.
    c. incomplete dominance.
    d. codominance.
    e. multiple alleles and codominance.

22. Multiple effects of a single gene is
    a. expressivity.
    b. penetrance.
    c. codominance.
    d. pleiotropy.
    e. multiple alleles.

23. For Mendel's explanation of inheritance to be correct,
    a. the genes for the traits he studied have to be located on the same chromosome.
    b. the combination of gametes at fertilization has to be due to chance.
    c. genes cannot be transmitted independently of each other.
    d. only diploid organisms demonstrate inheritance patterns.
    e. none of these apply.

見背面

24. James Watson and Francis Crick
    a. were both English researchers working at Cambridge University.
    b. performed elegant experiments in DNA chemistry.
    c. constructed an accurate model of the DNA molecule illustrating its structural simplicity.
    d. performed experiments that convinced scientists that DNA is a double-stranded molecule.
    e. did all of these

25. An individual with a genetic makeup of *aa BB* is called
    a. true-breeding.
    b. recessive.
    c. hybrid.
    d. dihybrid.
    e. heterozygous.

二、 簡要解釋下面的名詞（每項3分，共30分）

1. allele　2. centromere　3. genome　4. intron　5. test cross　6. polyploid
7. transcriptome　8. microRNA (miRNA)　9. phenotype　10. *Drosophila melanogaster*

三、 問答題（每題10分，共20分）

1. 簡要說明在真核生物中不同層次的基因表達調控。
2. 簡要說明PCR技術的工作原理並舉幾例說明該技術在分子生物學中的應用。

試題隨卷繳回