

## 一、 選擇題 (每題2分，共40分)

1. When an individual has two different alleles for a given gene, they are \_\_\_\_ for that gene.
  - a. heterozygous
  - b. homozygous
  - c. self-fertilized
  - d. self-pollinated
  - e. recessive
  
2. Mendel crossed true-breeding plants having yellow peas with true-breeding plants having green peas. The resulting plants all had yellow peas. An  $F_1$  cross resulted in  $3/4$  of the plants having yellow peas and  $1/4$  of the plants having green peas. What does this tell you about the alleles for color?
  - a. yellow is usually the dominant color, but sometimes green can be dominant
  - b. green is the dominant color
  - c. yellow is the dominant color
  - d. yellow is the recessive color
  - e. yellow and green are codominant
  
3. A parent has a genotype of  $RrYy$ . What is the probability of this individual producing a gamete with the  $RY$  genotype?
  - a.  $1/2$
  - b.  $1/4$
  - c.  $3/4$
  - d.  $1/8$
  - e. 0
  
4. Your father is heterozygous for the recessive disorder phenylketonuria (PKU). You know your mother has two "good" alleles. You have a \_\_\_\_ chance of having the disorder.
  - a. 0%
  - b. 100%
  - c. 25%
  - d. 50%
  - e. 75%
  
5. If your mother and father are both heterozygous for Huntington's disease, which is caused by a dominant allele, the odds of you having the disorder are \_\_\_\_.
  - a.  $1/4$
  - b.  $1/2$
  - c.  $3/4$
  - d. 1
  - e. 0

見背面

6. A man and woman are each heterozygous for the autosomal recessive gene for albinism. They already have two non-albino children and want to have two more. What is the probability that their next two children will be phenotypically identical to each other with regard to skin color (i.e., either both albino or neither albino)?
- 1/16
  - 3/16
  - 4/16
  - 9/16
  - 10/16
7. Your father has type B blood, and your mother has type O blood. You learn that you also have blood type O. What does this tell you?
- Your father is homozygous for type B blood.
  - Your mother is heterozygous for type O blood.
  - Your father's genotype is  $I^B i$  and your mother's genotype is  $ii$ .
  - Your father's genotype is  $I^B I^B$  and your mother's genotype is  $ii$ .
  - Your father's genotype is  $I^A I^B$  and your mother's genotype is  $ii$ .
8. An individual heterozygous for sickle-cell disease produces both normal and abnormal polypeptides. This is an example of \_\_\_\_.
- epistasis
  - incomplete dominance
  - polygenic inheritance
  - multiple alleles
  - pleiotropy
9. In the Hershey and Chase experiment,  $^{32}\text{P}$  was used to label \_\_\_\_ and  $^{35}\text{S}$  was used to label \_\_\_\_.
- RNA; protein
  - protein; DNA
  - phospholipids; protein
  - protein; phospholipids
  - DNA; protein
10. How are purines distinguished from pyrimidines?
- Purines are derived from a pair of fused C-N rings, while pyrimidines are derived from a single C-N ring.
  - Pyrimidines are derived from a pair of fused C-N rings, while purines are derived from a single C-N ring.
  - Purines have a carbon-containing ring, while pyrimidines have a nitrogenous ring.
  - Pyrimidines have a carbon-containing ring, while purines have a nitrogenous ring.
  - Purines are found only in DNA, while pyrimidines are found only in RNA.
11. DNA replication is said to be semiconservative because \_\_\_\_.
- the number of nucleotides within genes remains constant

- b. half of the DNA in a cell comes from one parent and the other half from the other parent.
- c. the same process of DNA replication is used by all organisms
- d. the total amount of DNA within an individual remains the same
- e. each new DNA molecule is composed of one old strand and one new strand
12. Chromatin consists of \_\_\_\_.
- a. DNA only
- b. DNA, RNA, and protein
- c. DNA and RNA
- d. RNA and protein
- e. DNA and protein
13. Variability in offspring is largely a result of \_\_\_\_.
- a. mutations
- b. nucleosomes
- c. Okazaki fragments
- d. DNA repairs
- e. RNA primers
14. In both prokaryotes and eukaryotes, the start codon (or initiator codon) is \_\_\_\_, which codes for the amino acid \_\_\_\_.
- a. UGA; proline
- b. UUU; phenylalanine
- c. AAA; lysine
- d. ACG; threonine
- e. AUG; methionine
15. In an mRNA transcript, the 3' UTR refers to the region of the mRNA that is \_\_\_\_.
- a. upstream from the start codon
- b. upstream from the site for initiation of transcription
- c. downstream from the stop codon
- d. the coding region
- e. downstream from the site for termination of transcription
16. At the start of translation, the initiator tRNA pairs with the start codon at the \_\_\_\_ of the ribosome.
- a. A (aminoacyl) site
- b. promoter
- c. P (peptidyl) site
- d. ribosomal binding site
- e. E (exit) site
17. A polysome is \_\_\_\_.

- a. the combination of a large and a small ribosomal subunit
- b. the complex where mRNA splicing occurs
- c. the promoter assembly at the site of transcription initiation
- d. an mRNA transcript to which multiple ribosomes are attached
- e. the complex that adds a poly(A) tail onto an mRNA

18. Mutagenesis \_\_\_\_.

- a. is an example of spontaneous mutation
- b. acts directly on proteins by causing them to unfold
- c. occurs due to a single mRNA being translated by too many ribosomes simultaneously
- d. is the production of mutations in a laboratory by exposure of a living organism to a mutagen
- e. occurs when errors made by DNA polymerase are not repaired

19. In eukaryotes, \_\_\_\_ regulation is the first level at which gene expression is controlled.

- a. transcriptional
- b. translational
- c. posttranscriptional
- d. posttranslational
- e. replicative

20. One function of the 3' UTR (untranslated region) of mRNA is to \_\_\_\_.

- a. control the half-life of mRNA
- b. bind RNA polymerase to initiate transcription
- c. help activators bind to the enhancer region
- d. base pair with the translated region of the transcript to mark it for degradation
- e. bind ribosomes to initiate translation

二、 簡要解釋下面的名詞 (每項3分，共30分)

1. locus    2. telomere    3. promoter    4. exon    5. epistasis    6. diploid  
7. PCR    8. RNAi    9. monohybrid    10. *Arabidopsis thaliana*

三、 問答題 (每題10分，共30分)

1. How is Mendel's Principle of Independent Assortment related to meiosis?
2. Missense, nonsense, and silent mutations are all caused by single base changes in the coding region of a gene. How are these three types of mutations different?

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3. Although Watson and Crick are credited with the discovery of the structure of DNA, they based this discovery on the bench work of many other scientists of the time. Name at least three different pieces of knowledge that Watson and Crick used in their discovery that was based on work from other scientists.

試題隨卷繳回