**现代生命科学导论C**

**课后习题三**

一、单项选择题（共30题）

1) The individual with genotype *AaBbCCDdEE* can make many kinds of gametes. Which of the following is the major reason?

A) recurrent mutations forming new alleles

B) crossing over during prophase I

C) the tendency for dominant alleles to segregate together

D) different possible assortment of chromosomes into gametes

2) The fact that all seven of the pea plant traits studied by Mendel obeyed the principle of independent assortment most probably indicates which of the following?

A) None of the traits obeyed the law of segregation.

B) The diploid number of chromosomes in the pea plants was 7.

C) All of the genes controlling the traits were located on the same chromosome.

D) All of the genes controlling the traits behaved as if they were on different chromosomes.

3) Albinism is an autosomal (not sex-linked) recessive trait. A man and woman are both of normal pigmentation and have one child out of three who is albino (without melanin pigmentation). What are the genotypes of the albino's parents?

A) One parent must be homozygous for the recessive allele; the other parent can be homozygous dominant, homozygous recessive, or heterozygous.

B) One parent must be heterozygous; the other parent can be homozygous dominant, homozygous recessive, or heterozygous.

C) One parent must be homozygous dominant; the other parent must be heterozygous.

D) Both parents must be heterozygous.

4) The pattern of inheritance (monohybrid, dihybrid, sex-linked, and genes linked on the same chromosomes) can be predicted from data if one is given the parent or offspring genotypes or phenotypes. Two organisms, with genotypes BbDD and BBDd, are mated. Assuming independent assortment of the B/b and D/d genes, determine the genotypic ratios in offspring that would occur.

A) 1/2 BBDD 1/2 bbdd

B) 9/16 BBDD 3/16 BbDD 3/16 BBDd 1/16 bbdd

C) 1/4 BBDD 1/4 BbDD 1/4 BBDd 1/4 BbDd

D) 1/4 BBDD 1/2 BbDd 1/4 bbdd

5) Red-green color blindness is a sex-linked recessive trait in humans. Two people with normal color vision have a color-blind son. What are the genotypes of the parents?

A) *XNXn* and *XNY*

B) *XNXN* and *XnY*

C) *XNXN* and *XNY*

D) *XnXn* and *XnY*

6) A man who carries an allele of an X-linked gene will pass it on to \_\_\_\_\_.

A) half of his daughters

B) all of his daughters

C) all of his sons

D) all of his children



7) In a *Drosophila* experiment, a cross was made between homozygous wild-type females and yellow-bodied males. All of the resulting F1s were phenotypically wild type. However, adult flies of the F2 generation (resulting from matings of the F1s) had the characteristics shown in the figure above. Consider the following questions:

(a) Is the mutant allele for yellow body recessive or dominant?

(b) Is the yellow locus autosomal (not X-linked) or X-linked?

A) (a) recessive; (b) not X-linked

B) (a) recessive; (b) X-linked

C) (a) dominant; (b) not X-linked

D) (a) dominant; (b) X-linked

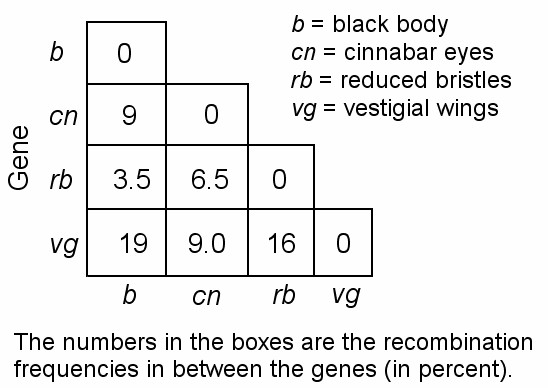
8) How would one explain a testcross involving F1 dihybrid flies in which more parental-type offspring than recombinant-type offspring are produced?

A) The two genes are closely linked on the same chromosome.

B) The two genes are linked but on different chromosomes.

C) Recombination did not occur in the cell during meiosis.

D) Both of the characters are controlled by more than one gene.



9) In a series of mapping experiments, the recombination frequencies for four different linked genes of *Drosophila* were determined as shown in the figure above. What is the order of these genes on a chromosome map?

A) *rb-cn-vg-b*

B) *b-rb-cn-vg*

C) *cn-rb-b-vg*

D) *vg-cn-b-rb*

10) Inheritance patterns cannot always be explained by Mendel’s models of inheritance. If a pair of homologous chromosomes fails to separate during meiosis I, select the choice that shows the chromosome number of the four resulting gametes with respect to the normal haploid number (n)?

A) n+1; n-1; n-1; n-1

B) n+1; n-1; n; n

C) n+1; n+1; n-1; n-1

D) n+1; n+1; n; n

11) In an analysis of the nucleotide composition of DNA, which of the following will be found?

A) A = C

B) A = G and C = T

C) G + C = T + A

D) A + C = G + T

12) What is meant by the description "antiparallel" regarding the strands that make up DNA?

A) The twisting nature of DNA creates nonparallel strands.

B) One strand contains only purines and the other contains only pyrimidines.

C) Base pairings create unequal spacing between the two DNA strands.

D) The 5' to 3' direction of one strand runs counter to the  to  direction of the other strand.

13) At a specific area of a chromosome, the sequence of nucleotides below is present where the chain opens to form a replication fork:

 C C T A G G C T G C A A T C C 

An RNA primer is formed starting at the underlined T (T) of the template. Which of the following represents the primer sequence?

A)  G C C T A G G 

B)  A C G U U A G G 

C)  A C G T T A G G 

D)  G C C U A G G 

14) Which of the following help(s) to hold the DNA strands apart while they are being replicated?

A) primase

B) single-strand DNA binding proteins

C) DNA polymerase

D) ligase

15) DNA is synthesized through a process known as \_\_\_\_\_.

A) transcription

B) translation

C) conservative replication

D) semiconservative replication

16) Which of the following statements describes a eukaryotic chromosome?

A) a single strand of DNA

B) a single linear molecule of double-stranded DNA plus proteins

C) a chromosome with different numbers of genes in different cell types of an organism

D) a series of nucleosomes wrapped around two DNA molecules

17) Which of the following statements describes chromatin?

A) Heterochromatin is composed of DNA, whereas euchromatin is made of DNA and RNA.

B) Heterochromatin is highly condensed, whereas euchromatin is less compact.

C) Both heterochromatin and euchromatin are found in the cytoplasm.

D) Euchromatin is not transcribed, whereas heterochromatin is transcribed.

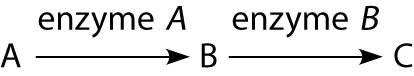
18) A particular triplet of bases in the template strand of DNA is 5' AGT 3'. The corresponding codon for the mRNA transcribed is \_\_\_\_\_.

A)  UGA 

B)  UCA 

C)  TCA 

D)  ACU 



19) Refer to the metabolic pathway illustrated above. If A, B, and C are all required for growth, a strain that is mutant for the gene-encoding enzyme A would be able to grow on medium supplemented with \_\_\_\_\_.

A) nutrient A only

B) nutrient B only

C) nutrient C only

D) nutrients A and C

20) What does it mean when we say the genetic code is redundant?

A) A single codon can specify the addition of more than one amino acid.

B) The genetic code is different for different domains of organisms.

C) The genetic code is universal (the same for all organisms).

D) More than one codon can specify the addition of the same amino acid.

21) Codons are three-base sequences that specify the addition of a single amino acid. How do eukaryotic codons and prokaryotic codons compare?

A) Prokaryotic codons usually contain different bases than those of eukaryotes.

B) Prokaryotic codons usually specify different amino acids than those of eukaryotes.

C) Codons are a nearly universal language among all organisms.

D) The translation of codons is mediated by tRNAs in eukaryotes, but translation requires no intermediate molecules such as tRNAs in prokaryotes.

22) Which of the following statements best describes the termination of transcription in prokaryotes?

A) RNA polymerase transcribes through the terminator sequence, causing the polymerase to separate from the DNA and release the transcript.

B) RNA polymerase transcribes through the polyadenylation signal, causing proteins to associate with the transcript and cut it free from the polymerase.

C) Once transcription has initiated, RNA polymerase transcribes until it reaches the end of the chromosome.

D) RNA polymerase transcribes through a stop codon, causing the polymerase to stop advancing through the gene and release the mRNA.

23) Which of the following does not occur in prokaryotic gene expression, but does occur in eukaryotic gene expression?

A) A cap is added to the  end of the mRNA.

B) RNA polymerase binds to the promoter.

C) mRNA, tRNA, and rRNA are transcribed.

D) RNA polymerase requires a primer to elongate the molecule.

24) There are sixty-one mRNA codons that specify an amino acid, but only forty-five tRNAs. This is best explained by the fact that \_\_\_\_\_.

A) some tRNAs have anticodons that recognize four or more different codons

B) many codons are never used, so the tRNAs that recognize them are dispensable

C) the rules for base pairing between the third base of a codon and tRNA are flexible

D) the DNA codes for all sixty-one tRNAs, but some are then destroyed

25) The release factor (RF) \_\_\_\_\_.

A) supplies a source of energy for termination of translation

B) releases the amino acid from its tRNA to allow the amino acid to form a peptide bond

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

D) releases the ribosome from the ER to allow polypeptides into the cytosol

26) Translation requires \_\_\_\_\_.

A) mRNA, tRNA, and rRNA

B) mRNA, DNA, and rRNA

C) mRNA, tRNA, DNA, and rRNA

D) mRNA, tRNA, and DNA

27) Of the following, which is the most current description of a gene?

A) a unit of heredity that causes formation of a phenotypic characteristic

B) a DNA subunit that codes for a single complete protein

C) a discrete unit of hereditary information that consists of a sequence of amino acids

D) a DNA sequence that is expressed to form a functional product: either RNA or polypeptide

28) DNA methylation and histone acetylation are examples of \_\_\_\_\_.

A) genetic mutation

B) chromosomal rearrangements

C) translocation

D) epigenetic phenomena

29) Which method is utilized by eukaryotes to control their gene expression that is NOT used in bacteria?

A) control of chromatin remodeling

B) control of RNA splicing

C) control of both RNA splicing and chromatin remodeling

D) transcriptional control

30) Which of the following best describes siRNA?

A) a portion of rRNA that allows it to bind to several ribosomal proteins in forming large or small subunits

B) a single-stranded RNA that can, where it has internal complementary base pairs, fold into cloverleaf patterns

C) a double-stranded RNA that is formed by cleavage of hairpin loops in a larger precursor

D) a double-stranded RNA, one of whose strands can complement and inactivate a sequence of mRNA

二、填空题（共10题）

31) Mendel's observation of the segregation of alleles in gamete formation has its basis in what phase of cell division? \_\_\_\_\_.

32) Albinism is an autosomal (not sex-linked) recessive trait. A man and woman are both of normal pigmentation, but both have one parent who is albino (without melanin pigmentation). What is the probability that their first child will be an albino? \_\_\_\_\_.

33) Black fur in mice (*B*) is dominant to brown fur (*b*). Short tails (*T*) are dominant to long tails (*t*). What fraction of the progeny of crosses *BbTt* × *BBtt* will be expected to have black fur and long tails? \_\_\_\_\_.

34) Phenylketonuria is an inherited disease caused by a recessive autosomal allele. If a woman and her husband are both carriers, what is the probability that their first child will be a phenotypically normal girl? \_\_\_\_\_.

35) In birds, sex is determined by a *ZW* chromosome scheme. Males are *ZZ* and females are *ZW*. A recessive lethal allele that causes death of the embryo is sometimes present on the Z chromosome in pigeons. What would be the sex ratio in the offspring of a cross between a male that is heterozygous for the lethal allele and a normal female? \_\_\_\_\_.

36) A man who is an achondroplastic dwarf with normal vision marries a color-blind woman of normal height. The man's father was six feet tall, and both the woman's parents were of average height. Achondroplastic dwarfism is autosomal dominant, and red-green color blindness is X-linked recessive. What proportion of their sons would be color-blind and of normal height? \_\_\_\_\_.

37) A homozygous tomato plant with red fruit and yellow flowers was crossed with a homozygous tomato plant with golden fruit and white flowers. The F1 all had red fruit and yellow flowers. The F1 were testcrossed by crossing them to homozygous recessive individuals and the following offspring were obtained:

Red fruit and yellow flowers—41

Red fruit and white flowers—7

Golden fruit and yellow flowers—8

Golden fruit and white flowers—44

How many map units separate these genes? \_\_\_\_\_.

38) Codons are part of the molecular structure of \_\_\_\_\_.

39) Once a peptide has been formed between the amino acid attached to the tRNA in the P site and the amino acid associated with the tRNA in the A site, what occurs next? \_\_\_\_\_.

40) 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 \_\_\_\_\_.

三、简答题（共6题）

41) What is the definition of one map unit?

42) Map units on a linkage map cannot be relied upon to calculate physical distances on a chromosome, why?

43) What are the differences between DNA replication in prokaryotes and DNA replication in eukaryotes?

44) What are the differences between ATP and the nucleoside triphosphates used during DNA synthesis?

45) A new DNA strand elongates only in the  to  direction, why?

46) What is the role of DNA ligase in the elongation of the lagging strand during DNA replication?