

選擇題 40%

1. There are two strands of DNA which have exactly the same length. The first one has a very high G + C/A + T ratio of 3.6. The second DNA strand has a more moderate G + C/A + T ratio of 2.0. Which of the two strands will have the highest melting temperature and why?
 - (a) the first strand because it contains more H bonds
 - (b) the second strand because it contains more H bonds
 - (c) the first strand because it contains fewer H bonds
 - (d) the second strand because it contains fewer H bonds
 - (e) neither since their melting temperatures are the same
2. What is the name of the site where RNA polymerase binds to the DNA prior to the beginning of transcription?
 - (a) the operator
 - (b) the terminator
 - (c) the promoter
 - (d) the repressor
 - (e) the structural genes
3. The 3' end of most eukaryotic mRNAs contains a _____, while the 5' end has a _____.
 - (a) poly(A) tail, methylated guanosine cap
 - (b) poly(U) tail, methylated guanosine cap
 - (c) methylated guanosine cap, poly(A) tail
 - (d) poly(A) tail, sulfonated guanosine cap
 - (e) methylated guanosine cap, poly(U) tail
4. Which nucleotides have the greatest similarities among codons specifying the same amino acid?
 - (a) in the first two nucleotides of the triplet
 - (b) in the last two nucleotides of the triplet
 - (c) in the first and third nucleotides of the triplet
 - (d) in the third nucleotide of the triplet
 - (e) in the middle nucleotide of the triplet
5. What enzyme is required for movement of transposable elements that involve an RNA intermediate?
 - (a) RNA polymerase
 - (b) DNA polymerase
 - (c) reverse transcriptase
 - (d) polyA polymerase
 - (e) peptidyltransferase

6. What happens if the gene for one of the snoRNAs is deleted?
- (a) Nothing happens
 - (b) An extra pre-rRNA nucleotide is modified.
 - (c) One pre-rRNA nucleotide (the corresponding one) is not modified enzymatically as it normally is.
 - (d) None of the ribose moieties are methylated.
 - (e) None of the nucleotides are pseudouridylated.
7. How do exon-junction complexes mark messages as having a nonsense mutation?
- (a) After the initial translation, EJC's should be removed if translation of the whole mRNA has occurred.
 - (b) EJC's bind tightly to nonsense mutations.
 - (c) EJC's fall off of a messenger if a nonsense mutation is present.
 - (d) EJC's bind to the gene itself only if a nonsense mutation is present.
 - (e) EJC's do not bind to nonsense mutations.
8. Which enzyme, also responsible for siRNA formation, carves miRNAs from their double-stranded, fold-back RNA precursor (pre-miRNA)?
- (a) riboendonuclease
 - (b) Dicer ribonuclease
 - (c) deoxyribonuclease
 - (d) RNA helicase
 - (e) reverse transcriptase
9. What are sites in the genome that vary among different individuals and they usually refers to a genetic variant that occurs in at least 1% of a species population.
- (a) Genetic variances
 - (b) Genetic anomalies
 - (c) Genetic polymorphisms
 - (d) Genetic polyploidisms
 - (e) Genetic polydactyly
10. What may serve as the epigenetic mechanism by which inactive euchromatic regions are perpetuated in daughter cells?
- (a) phosphorylated histone H2A tails
 - (b) acetylated histone H2A tails
 - (c) acetylated histone H3 tails
 - (d) acetylated H4 tails
 - (e) methylated modified DNA
11. What is defined as the complete collection of proteins present in a particular cell type?
- (a) proteome
 - (b) repressome
 - (c) transcriptome

(d) translatome

(e) replicon

12. What enzyme is responsible for maintaining the length of the DNA sequences on the ends of chromosomes?

(a) DNA polymerase

(b) telomerase

(c) telomere synthase

(d) telomere disruptase

(e) telomere phosphodiesterase

13. What do all of the environmental agents that can cause cancer have in common?

(a) They can all alter the genome

(b) They are all soluble in water

(c) They are all made of nucleic acids

(d) They are all made of amino acids

(e) They all can alter proteins present in the cell cytoplasm that are responsible for the onset of cancer

14. Which antibodies are the first to be secreted by B cells after antigen stimulation? They appear in the blood after a lag of a few days and have a relatively short half-life?

(a) IgD

(b) IgA

(c) IgM

(d) IgK

15. Which genes are most strongly linked to increased susceptibility to autoimmune diseases?

(a) genes encoding MHC class I polypeptides

(b) genes encoding MHC class II polypeptides

(c) genes encoding Ras polypeptides

(d) genes encoding glucocorticoid receptors

(e) genes encoding microglobulin

16. What method can be used to functionally inactivate a gene without altering its sequence?

(a) gene knockout

(b) RNA interference

(c) dominant negative mutation

(d) b and c

(e) all of the above

17. Indicate the order in which the following steps occur in the production of a mature mRNA.

(a) initiation of transcription, splicing, addition of 5' cap, addition of poly(A) tail, transport to cytoplasm

(b) initiation of transcription, addition of 5' cap, splicing, addition of poly(A) tail, transport to cytoplasm

(c) initiation of transcription, addition of poly(A) tail, addition of 5' cap, splicing, transport to cytoplasm

(d) initiation of transcription, addition of 5' cap, addition of poly(A) tail, splicing, transport to cytoplasm

18. Transcriptionally inactive genes

(a) are always located within euchromatin.

(b) are not located within nucleosomes.

(c) often are methylated.

(d) are not resistant to DNase I.

19. microRNAs play a key role in which of the following?

(a) translational repression

(b) viral RNA degradation

(c) RNA interference

(d) all of the above

20. Autoimmune diseases are associated with particular alleles of genes for

(a) cytokines.

(b) immunoglobulins.

(c) MHC proteins.

(d) T cell receptors.

配合題 30%

專有名詞	簡易名詞解釋
1. Clone	A. The formation of a phosphodiester bond to link two adjacent bases separated by a nick in one strand of a double helix of DNA.
2. Enhancer	B. A group of closely related immunoglobulin chains.
3. Epigenetic	C. A large number of cells or molecules identical with a single ancestral cell or molecule.
4. Exon	D. A macromolecular complex containing a variety of proteins and a number of distinct ribonucleoprotein particles that functions in removal of introns from a primary transcript.
5. Hairpin	E. The any segment of an interrupted gene that is represented in the mature RNA product.
6. Inducer	F. A cis-acting sequence that increases the utilization of eukaryotic promoters, and can function in either orientation and in any location relative to the promoter.
7. Intron	G. The short stretches of 1000~2000 bases produced during discontinuous replication in prokaryotes.
8. Isotype	H. A segment of DNA that transcribed, but removed from within the transcript by splicing together the sequences on either side of it.
9. Ligation	I. A sequence of DNA at which replication is initiated.
10. Spliceosome	J. A change influences the phenotype without altering the genotype.
11. Okazaki fragments	K. A DNA substance included in the cytoplasm of bacteria.
12. Origin	L. A double-helical region formed by base pairing between adjacent complementary sequences in a single strand of DNA or RNA.
13. Plasmid	M. A region of DNA involved in binding of RNA polymerase to initiate transcription.
14. Promoter	N. A small molecule that triggers gene transcription by binding to a regulator protein.
15. TATA box	O. A DNA sequence (cis-regulatory element) found in the promoter region of genes in archaea and eukaryotes.

問答題 30%

1. Please list 3 elements of plasmid and explain their functions. (10%)
2. Please describe the principle of Real-Time quantitative PCR (qPCR). (20%)