國立成功大學 108 學年度碩士班招生考試試題

系　　所：熱帶植物與微生物科學研究所

考試科目：分子生物學

考試日期：0224，節次：3

※ 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。

一、單選題 (54分，每題3分)

(以 A、B、C、D、E 五種選項作答，其餘一律不計分)

1. Histone acetylation can occur in the

A) nucleus.

B) cytoplasm.

C) ER lumen.

D) nucleus and cytoplasm.

E) nucleus, cytoplasm, and ER lumen.

2. On average, there is one nucleosme per _____bp of DNA.

A) 20

B) 50

C) 200

D) 500

E) 1000

3. Which of the following would be the substance of choice to destroy the DNA in a solution?

A) ribonuclease

B) trypson

C) chymotrypsin

D) deoxyribonuclease

E) none of the choices are correct.

4. RNA interference occurs naturally in human cells during

A) RNA viral replication

B) DNA viral replication

C) RNA viral transcription

D) DNA viral transcription

E) mRNA translation

5. The function of normally occurring mRNA deamination appears to be the proper
A) cleanup of the mRNA
B) mRNA folding
C) mRNA splicing
D) mRNA modification
E) protein synthesis

6. Which of the following is not a technique that can be used to study protein-protein interactions?
A) 2-D gel electrophoresis
B) protein microarrays
C) immunoaffinity chromatography
D) phage display
E) yeast two-hybrid analysis

7. Which of the following enzymes cannot catalyze the formation of a phosphodiester bond?
A) endonuclease
B) RNA polymerase
C) DNA polymerase
D) ligase
E) none of the choices are correct.

8. Select the correct statement about enhancers
A) They are proteins that promote translation.
B) They stimulate the binding of repressor to DNA.
C) They bind protein factors and stimulate transcription.
D) They are nonpromoter protein elements.
E) None of the choices is correct.

9. Restriction enzymes:
A) act at the membrane to restrict the passage of certain molecules into the cell.
B) are highly specialized ribonucleases that degrade mRNA soon after its synthesis.
C) are sequence-specific DNA endonucleases.
D) are very specific proteases that cleave peptides at only certain sequences.
E) catalyze the addition of a certain amino acid to a specific tRNA.

10. In the laboratory, recombinant plasmids are commonly introduced into bacterial cells by:

A) electrophoresis – a gentle low-voltage gradient draws the DNA into the cell.

B) infection with a bacteriophage that carries the plasmid.

C) microinjection.

D) mixing plasmids with an extract of broken cells.

E) transformation – heat shock of the cells incubated with plasmid DNA in the presence of CaCl2.

11. Which of the following statements about the polymerase chain reaction (PCR) is false?

A) DNA amplified by PCR can be cloned.

B) DNA is amplified at many points within a cellular genome.

C) Newly synthesized DNA must be heat-denatured before the next round of DNA synthesis begins.

D) The boundaries of the amplified DNA segment are determined by the synthetic oligonucleotides used to prime DNA synthesis.

E) The technique is sufficiently sensitive that DNA sequences can be amplified from a single animal or human hair.

12. Rank the following organisms in order from smallest genome (number of base pairs of DNA) to largest genome.

A) Human, fruit fly, E. coli bacterium

B) E. coli bacterium, human, fruit fly

C) E. coli bacterium, fruit fly, human

D) fruit fly, E. coli bacterium, human

E) fruit fly, human, E. coli bacterium

13. Which one of the following analytical techniques does not help illuminate a gene's cellular function?

A) DNA microarray analysis

B) Protein chip analysis

C) Southern blotting

D) Two-dimensional gel electrophoresis

E) Two-hybrid analysis

14. A common cloning strategy for introducing foreign genes into plants with Agrobacterium employs all the following features except:

A) a selectable antibiotic marker such as kanamycin resistance.

B) a shuttle vector with 25 bp T-DNA repeats flanking the foreign gene of choice.

C) a Ti plasmid lacking its T-DNA segment.

D) active vir gene products from the altered Ti plasmid.

E) an ability to induce crown gall formation in infected leaves.

15. Which of the following is *not* involved in the *specificity* of signal transduction?
A) Interactions between receptor and signal molecules
B) Location of receptor molecules
C) Structure of receptor molecules
D) Structure of signal molecules
E) Transmembrane transport of signal molecules by receptor molecules

16. Steroid hormones are carried on specific carrier proteins because the hormones:
A) are too unstable to survive in the blood on their own.
B) cannot dissolve readily in the blood because they are too hydrophobic.
C) cannot find their target cells without them.
D) need them in order to pass through the plasma membrane.
E) require subsequent binding to specific receptor proteins in the nucleus.

17. Which one of the following signaling mechanisms is used most predominantly in plants?
A) Cyclic-nucleotide dependent protein kinases
B) DNA-binding nuclear steroid receptors
C) G protein-coupled receptors
D) Protein serine/threonine kinases
E) Protein tyrosine kinases

18. Programmed cell death is called:
A) metastasis.
B) apoptosis.
C) mitotic termination.
D) oncogenic transformation.
E) ubiquitination.

二、解釋名詞 (20 分，每題 4 分)

1. SnRNA
2. symport
3. lncRNA
4. epigenetics
5. post-translational modification

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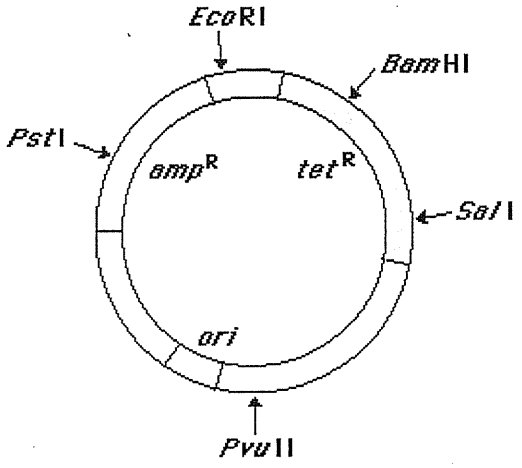
三、配合題 (26 分)

1. Match each feature of the plasmid pBR322 (at left) with *one* appropriate description presented (at right) (see illustration of pBR322 below). Descriptions may be used more than once.
(每個答案 1 分) (5%)



____ *amp*^{R} sequence　(a) permits selection of bacteria containing the plasmid
____ *ori* sequenc　(b) a sequence required for packaging recombinant plasmids into bacteriophage
____ *tet*　(c) origin of replication
____ *Bam*HI sequence　(d) cleavage of the plasmid here does not affect antibiotic sequence resistance genes
____ *Pst*I sequence　(e) insertion of foreign DNA here permits identification of bacteria containing recombinant plasmids

2. Match the protein or structural feature on the left with one appropriate description on the right.
(每個答案 1 分) (5%)

____ activator　(a) a positive regulator
____ helix-turn-helix　(b) a negative regulator
____ leucine zipper　(c) facilitates transcription only when bound to a signal molecule
____ repressor　(d) a DNA-binding structural motif found in many prokaryotic regulatory proteins
____ zinc finger　(e) a structural feature involved in protein-protein interactions between some regulatory protein monomers
(f) a protein that dissociates from DNA when bound to a signal molecule
(g) a DNA-binding structural motif found in many eukaryotic regulatory proteins

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3. Match the left eukaryotic translation initiation factors with their correct function.

(每個答案 1 分) (4%)

_____ eIF1 _____ eIF2 _____ eIF4F _____ eIF6	(a) This initiation factor is involved in binding tRNA to the ribosome. (b) This initiation factor binds to the 40S subunit and inhibits reassociation of the 40S and 60S subunits. (c) This initiation factor is a Cap binding protein. (d) This initiation factor binds to the 60S subunit and inhibits reassociation of the 40S and 60S subunits. (e) This initiation factor aids in ribosome scanning to locate the initiation codon.

4. Match thecorrect tRNA structure in right column.

(每個答案 1 分) (3%)

_____ The three-dimensional shape of tRNA. _____ The "clover-leaf" structure of tRNA. _____ The formation of a stem loop structure by nucleotide base pairing.	(a) Primary structure (b) Secondary structure (c) Tertiary structure (d) Quaternary structure (e) 1-dimensional structure

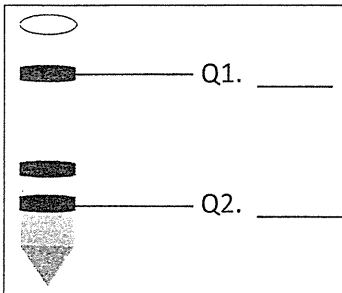
5. Match the major regions found on a tRNA molecule with their correct description.

(每個答案 1 分) (3%)

_____ acceptor stem _____ T loop _____ variable loop	(a) This portion of tRNA contains a number of modified uracils. (b) This portion of tRNA base pairs with mRNA. (c) This portion of tRNA varies in length from 4 to 13 nucleotides. (d) This portion of tRNA has a terminal sequence of 5′-CCA-3′. (e) This portion of tRNA contains the sequence TψC.

6. The following figure is a diagram of a centrifuge tube showing the approximate positions of 5S, 18S, and 28S RNA after ultracentrifugation in a sucrose density gradient. (Please use a, b, or c in the right column to answer Q1 and Q2.)

(每個答案 3 分) (6%)

	(a) 5S (b) 18S (c) 28S