高雄醫學大學 101 學年度研究所招生考試

系所：醫學系生理學科、醫學系基因體醫學科、醫研所基礎組（共同基礎）碩士班

科目：分子生物學

I. Multiple choices (45%, each item is one point)

1. The molecular weight of glucose is 180, which of the followings are true ?

A. 1 mole of glucose is 180 g

B. 1 mole of glucose contains 6×10^{23} glucose molecules

C. 1 g of glucose contains 6×10^{23} glucose molecules

D. 1 L of 1 M glucose solution contains 6×10^{23} glucose molecules

E. 1 mL of 1 M glucose solution contains 180 g of glucose

2. Shuttle vector is a plasmid that is widely used for modern genetic engineering. Which elements are essential for a shuttle vector to propagate, generation by generation, in bacteria ?

A. Multiple cloning sites

B. Poly A signal

C. Prokaryotic replication origin

D. Eukaryotic replication origin

E. Antibiotics resistant gene

3. The principle of “nucleic acid hybridization” is applied in:

A. Southern blot

B. Northern blot

C. Western blot

D. Polymerase chain reaction

E. cDNA microarry

4. For “wobble position”, which of the followings are true?

A. The first base on a codon

B. The third base on a codon

C. The first base on an anticodon

D. The third base on an anticodon

E. The reason for fewer numbers of transfer RNA than those of codon

5. Which are true for DNA replication in a human cell?

A. DNA replicates in 5’ to 3’on leading strands

B. DNA replicates in 3’ to 5’on lagging strands

C. Bidirectional replication means that DNA replicates in both directions of 5’ to 3’ and 3’ to 5’

D. Okazaki fragment is synthesized during lagging strand replication

E. Each chromosome replicates from single origin

6. What kinds of gene mutation will change the resulted protein sequence?

A. Frameshift mutation

B. Missense mutation

C. Neutral mutation

D. Nonsense mutation

E. Silent mutation

7. Which of the followings can regulate gene transcription?
   A. Enhancer
   B. MicroRNA
   C. Promoter
   D. RNA polymerase
   E. Transcription factor

8. The human “X” protein consists of 1000 amino acids, which are NOT possible for the “X” gene?
   A. The gene length is 3000 base pairs
   B. The total exon length is 3000 base pairs
   C. The length of coding sequence is 3000 base pairs
   D. The initiation codon locates on the second exon
   E. The initiation codon locates on the second intron

9. Which sequences/elements can be recognized by ribosomes during translation?
   A. Shine-Dalgarno sequence
   B. Kozak sequence
   C. IRES
   D. Okazaki fragment
   E. TATA box

II. Matching (29%, choose the most suitable one for each molecule or species)

1. Please choose the most appropriate item from the right panel for each RNA (12%)

RNA	Function
1. Messenger RNA	A. Chromosome end elongation
2. Micro RNA	B. Messenger RNA splicing
3. Ribosomal RNA	C. Protein secretion
4. Ssmall nuclear RNA	D. Protein synthesis
5. Telomerase RNA	E. Regulation of gene expression
6. Transfer RNA	F. DNA replication

2. The following proteins are involved in DNA replication, please chose the corresponding function from the table below for each protein (12%)
   1. Helicase
   2. Primase
   3. RPA
   4. PCNA
   5. DNA polymerase α
   6. DNA polymerase δ

	Function
A.	Catalyzing the formation of phosphodiester bonds
B.	Single-strand DNA binding protein
C.	Unwinding double-strand DNA
D.	An accessory & stabilizing factor of DNA polymerization complex
E.	Oligo-ribonucleotide synthesis
F.	Initial DNA synthesis
G.	Proceeding DNA synthesis
H.	Breaking DNA, dispelling the tension, and resealing the strand ahead of a DNA replication growing fork

3. Please choose the correct genome size for each species (5%)

Species	Genome size
1. *Caenorhabitis elegans*	A. 1.0 x 10^6
2. *Drosophila melanogaster*	B. 4.2 x 10^6
3. *Escheriachia coli*	C. 1.3 x 10^7
4. *Homo sapiens*	D. 8.0 x 10^7
5. *Saccharomyces cerevisia*	E. 1.4 x 10^8
	F. 1.2 x 10^9
	G. 3.3 x 10^9

III. Definition (26%, briefly explain the following terms, 2 points each)

1. Melting temperature
2. Complementation
3. Euchromatin and heterochromatin
4. Nucleosome
5. TATA box
6. RNA interference
7. Operon
8. Transposon
9. Cistron
10. Crossing-over
11. Allele
12. Poly A signal
13. Imprinting