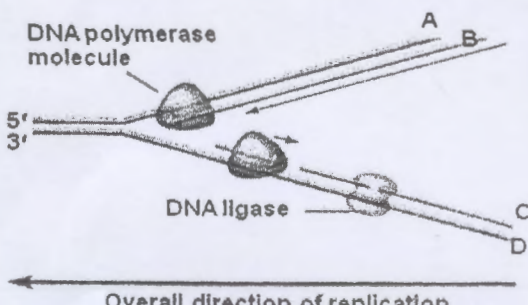


※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Can genetic defects, such as oncogene mutations in somatic cells be maintained in the next generation? Why or why not? (12 points)
2. Please compare the “phenotype” with “genotype” and describe whether a genotype can be readily determined based on a specific phenotype. (12 points)
3. a. Draw the complementary sequence for the following single strand of DNA:
5'-ATGCTCGCCCGCGCCCTGGCTGTG-3' (2 points)
b. Transcribe the double-strand DNA from question 3a into a single-stranded mRNA using the top strand as the template. (2 points)
c. Translate the mRNA from question 3b into protein using the codon chart. (2 points)

		Second Letter																															
		U			C			A			G																						
1st letter	U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U	3rd letter	UUC	UCC	UUA	UUG	UAA	Stop	UGA	Stop	U	UAG	Stop	UGG	Trp	A								
		CUU	Leu	CCU		Pro	CAU	His	CGU	Arg		U	CUC	CCC	CAC	CAG	CAA	Gln	CGA	CGG	C	CUA	CCA	CAA	CCG	CCG	CGC	CGA	CGG	A			
		AUU		Ile			ACU	Thr	AAU			Asn	AGU	Ser	U	AUC	ACC	AAC	AAA	AAA	Lys	AGA	AGG	C	AUA	ACA	AAA	ACG	ACG	AGA	AGG	AGG	A
		AUG					Met		ACG			AAU	Asn		AGU	Ser	U	AUG	Met	ACG	AAA	Lys	AGA	AGG	Arg	A	AUG	Met	ACG	AAA	Lys	AGA	AGG
GUU	Val	GCU	Ala		GAU		Asp		GGU		Gly	U	GUC		GCC	GAC	GAA	GAA	Glu	GGC	GGG	C	GUA	GCA	GAA	GAG	GAG	GGA	GGG	GGG	A		
GUG		GCC		GAC	GAA	GAG	GGA		GGG	G		GUG	GCC		GAC	GAA	GAG	GGA	GGG	Gly	A	GUG	GCC	GAC	GAA	GAG	GGA	GGG	Gly	A			

4. Please compare and describe differences between following methods applied in studying the interaction between protein and DNA: (2 points for each)
 - (a) DNA affinity precipitation assay; (b) chromatin immunoprecipitation assay;
 - (c) electrophoretic mobility shift assay; (d) DNase I footprint analysis
5. Please describe mechanisms involved in control of RNA level in living cells (list at least 3 ways). (12 points)
6. (a) To indicate which strand is a leading strand and which strand is a lagging strand for the replication fork (e.g., A~D). (3 points)
(b) What are functions of DNA polymerase and DNA ligase during the DNA replication? (3 points)



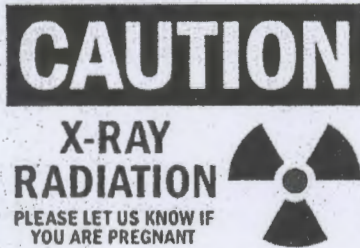
(背面仍有題目，請繼續作答)

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7. Describe functions of following RNAs: (2 points for each)
 - (a) messenger RNA; (b) transfer RNA; (c) ribosomal RNA; (d) microRNA

8. Deregulation of gene expression could be one of excuses for tumor formation. For example, the up-regulation of oncogenes is a major cause of cancer. If you are interested in examining what factors play roles in the regulation of tumorigenesis, what tools will you use to detect the deregulated genes and proteins in tumors? (Please describe the fundamental principles of methods that you chose.) (12 points)

9. The following sign is a significant note before doing medical examination. If patients are exposed to x-ray, leading to DNA damage, how could be DNA repaired? (12 points)



10. (a) Chromosomes contain exons and introns. Which one is responsible for formation of cDNA? (2 points)
 - (b) What is the process of “question mark” indicated in the figure and its effect on the evolution? (10 points)

