CHEM 431C TEST #2 KEY

Average = 69/90; (77%) highest= 91/90. A≥ 80/90; B≥70; C≥55; D ≥45

Part I

1 **D**	5 **A**	9 **A**	13 **E**
2 **E**	6 **C**	10 **C**	14 **A**
3 **D**	7 **D**	11 **E**	15 **D**
4 **D**	8 **C**	12 **B**	16 **C**

Part II.

(1) Among the distinguishing characteristics: RNA polymerase does *not* require a primer, but DNA polymerase does; RNA polymerase lacks the 3' 5' proofreading exonuclease activity present in DNA polymerase. Among the shared properties: both enzymes use nucleoside triphosphates as substrates, require Mg^{2+} and Zn^{2+}, produce an antiparallel complement to the template, and synthesize nucleic acids in the direction 5' 3'.

(2) Because A=T base pairs are stabilized by only two hydrogen bonds (compared with three for G C pairs), double-stranded regions rich in A=T pairs are easier for RNA polymerase to bind and unwind in preparation for the transcription of one of the DNA strands.

(3). When spontaneous deamination converts cytosine in DNA to uracil, or adenine to hypoxanthine, DNA glycosylase breaks the *N*-glycosidic bond to the defective base, creating an "abasic" or "AP" site. The region containing the AP site is then excised by AP endonuclease, and the resulting gap is closed by DNA polymerase I and sealed by DNA ligase. (See Fig. 25-23, p. 972.) Other DNA glycosylases recognize other types of modified bases.

(4) Base excision involves removing only the defective base from the DNA by cleavage of the *N*glycosidic linkage of the base to deoxyribose. This leaves an apurinic or apyrimidinic site, which must then undergo additional repair processes. Nucleotide excision involves removing the defective base together with its deoxyribose and phosphate (as well as some neighboring nucleotides) by cleavage of phosphodiester bonds in the DNA chain.

(5)	**Reverse Transcription**	**Transcription**
(a)	5' 3' synthesis	5' 3' synthesis
(b)	RNA or DNA Template	DNA Template only
(c)	tRNA	none
(d)	dNTPs	NTPs

Part III

(1) The genes for immunoglobin polypeptide chains are divided into segments, with multiple versions of each segment (which code for slightly different amino acid sequences). Recombination results in the joining of individual versions of each segment to generate a complete gene. Antibody diversity results from the very large number of different combinations that are possible. (See Fig. 25-44, p. 990.)

(2) The existence of ribozymes proved that small RNA molecules could carry out catalytic functions, and have the potential capacity for self-replication. Since ribonucleotides can arise from prebiotic chemistry, once they form short polymers the conceptual link to biochemical catalysis, which is essential for life, is complete. The finding that the ribosome has catalytic RNA to carry out amino acid polymerization into peptides and proteins (see Chapter 27) strengthens the case for catalytic RNA molecules to have preceded catalytic proteins (i.e. enzymes) in evolution.