

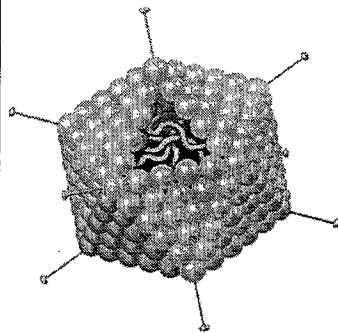
國立中山大學 101 學年度碩士暨碩士專班招生考試試題

科目：分子生物學【海資系碩士班甲組選考】

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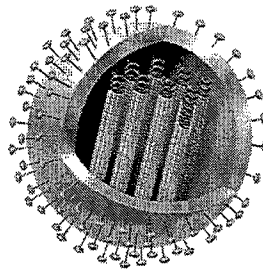
一、簡答題：(每題 5 分；12 題共 60 分)

- (1) After completion of their model that the DNA molecule could carry a vast amount of hereditary information, in which of what became apparent to Watson and Crick?
- (2) What is the structural level of a protein least affected by a disruption in hydrogen bonding?
- (3) Besides the ability of some cancer cells to over-proliferate, what else could logically result in a tumor?
- (4) Use these photos to answer the following question:



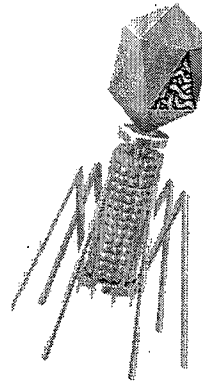
70-90 nm (diameter)

I.



80-200 nm (diameter)

II.



80 x 225 nm

III.

Which of the three types of viruses shown above would you expect to include a capsid(s)?

- (5) Suppose you are provided with an actively dividing culture of *E. coli* bacteria to which radioactive thymine has been added. What would happen if a cell replicates once in the presence of this radioactive base?
- (6) Which functional groups are involved in hydrogen bonds?
- (7) If one strand of a DNA molecule has the sequence of bases 5'ATTGCA3', what is the sequence of the other complementary strand?
- (8) How many molecules of water are needed to completely hydrolyze a polymer that is 11 monomers long?
- (9) Which are nitrogenous bases of the purine type?
- (10) Accuracy in the translation of mRNA into the primary structure of a polypeptide depends on what kind of specificity?

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(11) What is a ribozyme?

(12) In recombinant DNA methods, what does the term “vector” refer to?

二、問答題：(每題 10 分；兩題共 20 分)

(1) RNA polymerase in a prokaryote is composed of several subunits. Most of these subunits are the same for the transcription of any gene, but one, known as sigma, varies considerably. What are the probable advantages for the organism of such sigma switching?

(2) When will be the lactose operon likely to be transcribed?

三、翻譯題(英文翻譯成中文) (20 分)

Recent genetic studies in the budding yeast *S. cerevisiae* have led to the model for how the APC regulates sister chromatid separation to initiate anaphase. Cohesin SMC proteins bind to each sister chromatid; other subunits of cohesin, including *Sccl*, then link the SMC proteins, firmly associating the two chromatids. The cross-linking activity of cohesin depends on *securin*, which is found in all eukaryotes. Prior to anaphase, securin binds to and inhibits separase, a ubiquitous protease related to the caspase proteases that regulate programmed cell death. Once all chromosome kinetochores have attached to spindle microtubules, the APC is directed by a specificity factor called *Cdc20* to polyubiquitinate *securin*, leading to the onset of anaphase. (This specificity factor is distinct from Cdh1, which directs the APC to polyubiquitinate B-type cyclins.) Polyubiquitinated securin is rapidly degraded by proteasomes, thereby releasing separase. Free from its inhibitor, separase cleaves *Sccl*, breaking the protein cross-link between sister chromatids. Once this link is broken, the poleward force exerted on kinetochores can move sister chromatids toward the opposite spindle poles.