Part I. Question 1 to 10, you should choose the answer closest in meaning to the underlined word or phrase. **One answer only.** 2 points for each.

1. When they heard the good news about the court's decision, the angry crowd cheered and then began to disperse.
A. roar B. get upset C. get excited D. scatter E. gather
2. Because their fundamental difference, they would never get to like each other.
A. disparity B. contradictory C. hatred D. delinquency E. intensity
3. No one suspected that Jerry was a spy. On the surface he behaved like any normal citizen. When his covert activity was discovered and announced to the world, we were all shocked.
A. friendly B. helpful C. loud D. stimulating E. hidden
4. Michael is an ardent supporter of his presidential candidate. That became obvious to me when I found out how much time he's donated to the campaign.
A. old B. intelligent C. foolish D. very strong E. stubborn
5. Kathy was looking for a strong but light material to use for making her water jugs. Unfortunately, she chose noodelite. It proved too porous to hold jelly.
A. good for holding things B. protective C. permeable D. necessary E. luscious
6. Based on what is known, the term pulsar is used to describe the phenomenon of short, precisely timed radio bursts that are emitted from somewhere in space.
A. released B. jumped C. revolved D. received E. wandered
7. This replica fooled a lot of experts and was considered a valuable work of art.
A. a dishonest act B. something ugly C. anything that has no value D. a copy E. an evil act
8. The status quo of the country remains a debated issue among people.
A. future B. current situation C. crisis D. benefit E. changing situation
9. These results support the hypothesis that individuals are willing to pay more in order to live in communities that provide high-quality services.
A. angle B. experiment C. theory D. benefit E. evidence
10. The examiners soon realized that this student came to the oral defense for his thesis off the cuff.
A. on time B. in a hurry C. with careful observation D. enthusiastically E. without preparation

Part II. Question 11-15, please choose the answer that best completes the sentence. Question 16-25 you should chose the best answer to fill each of the numbered blanks in the passage. **One answer only.** 2 points for each.

11. They said they had their equipment _____ yesterday.
A. to be shipped B. shipped C. shipping D. ship E. was being shipped.
12. The ability to identify and exploit opportunities is the key ___ business product.
A. to B. of C. for D. toward E. in
13. _____ the size of urban populations in the world is the most urgent problem many countries face.
A. Rising B. Rise with C. The rise of D. Being Risen by E. Rise in
14. _____ incidents of Ebola virus outbreaks have been isolated incidents.
A. The most B. Mostly C. Most D. Most of E. The most of
15. _____ the difficulty and expense of working on an isolated island, construction took nearly a decade.
A. Due to B. Because C. Despite D. Although E. Regarding

Question 16~18

America's 78 million credit cardholders carried an average balance of $7,564 last year. The cost __16__ interest and fees amounted to more than $1,000 for the typical budget. If you just said, "Budget - what budget?," you know what I mean. Truth is, most of us go on spending sprees from time to time.

But, when power shopping creates the illusion of success, even __17__, it has become a weakness. Some obvious

signs that spending is out of control include making minimum payments on your credit cards, late fees, __18__, lack of a budget and loss of sleep over money worries.

16. A. on B. in C. with D. by E. of
17. A. with debts spiral out of control B. which debts spiraled out of control
C. because debts spiraling out of control D. as debts spiral out of control
E. when debts being spiral out of control
18. A. bouncing checks B. bounce checks C. check bounces D. bounce of checks E. bounced checks

Question 19 to 22

Freeze-drying is a technique that can help to provide food for astronauts. But it also has other applications nearer home. Freeze-drying is like suspended animation for food; you can store a __19__ for years, and then, when you're finally ready to eat it, you can completely revitalise it with a little hot water. Even after several years, the original foodstuff will be virtually unchanged.

The technique basically involves completely removing the water from some material, such as food, while __20__. The main reason for doing this is either to preserve the food __21__ reduce its weight. Removing the water from food keeps it from spoiling, because the microorganisms such as bacteria that cause spoiling cannot survive without it. Similarly, the enzymes which occur naturally in food cannot cause ripening without water, so __22__ from food will also stop the ripening process.

19. A. freeze-dried meal B. freeze-drying meal C. meal with freeze dry
D. meal in freeze drying E. frozen dry meal
20. A. it leaves the rest of material virtually being intacted B. leaving the rest of the material virtually intact
C. leave the rest of the material virtually intact D. leave the rest of the material virtually being intacted
E. left the rest of the material virtually intact
21. A. to B. but C. and to D. or to E. also to
22. A. to remove water B. remove water C. have water removed
D. that remove water E. removing water

Question 23 to 25

Dolphins are often the star attractions at zoos, aquariums and aquatic theme parks. They jump on command through fiery hoops and __23__ other dolphins. They seem delighted to perform their tricks and side up to their human handlers, content with the applause of their audience, a pat on the head and a gift of some raw fish now and then __24__, Dolphins have a darker side. Dolphins have an unusual ability: to plot with others, communicate plans and execute them effectively. This indicates intelligence and communicative skills beyond __25__. Dolphins, porpoises and whales are often thought of as fish since they live in the water. However, they are aquatic mammals. They cannot live indefinitely under water and must come to the surface periodically for air. They have "blowholes" at the top of their skulls to exhale air, even under water. Their young are born alive and are suckled by the parents.

23. A. synchronized with B. in synchronization with C. synchronizing with
D. having synchronization with E. that have synchronized
24. A. However B. Therefore C. Consequently D. For example E. Comparatively
25. A. that most other animals are possessing B. other animals possess C. possessed by other animals
D. which other animals have possessed E. what most other animals possess

Part III. Reading Comprehension. In this part, you will read several passages. Each one is followed by one question or a number of questions about it (them). Question 26-40, you should choose the **ONE** best answer to each question. 2 points each.

Turner almost wished that he hadn't listened to the radio. He went to the closet and grabbed his umbrella. He would feel silly carrying it to the bus stop on such a sunny morning.

26. Which probably happened?

A. Turner realized that he had an unnatural fear of falling radio parts.

B. Turner had promised himself to do something silly that morning.

C. Turner had heard a weather forecast that predicted rain.

D. Turner planned to trade his umbrella for a bus ride.

E. Turner planned to take a taxi.

Someday we will all have robots that will be our personal servants. They will look and behave much like real humans. We will be able to talk to these mechanical helpers and they will be able to respond in kind. Amazingly, the robots of the future will be able to learn from experience. They will be smart, strong, and untiring workers whose only goal will be to make our lives easier.

27. Which sentence from the paragraph expresses the main idea?

A. Someday we will all have robots that will be our personal servants.

B. We will be able to talk to these mechanical helpers and they will be able to respond in kind.

C. They will be smart, strong and untiring workers.

D. Amazingly, the robots of the future will be able to learn from experience.

E. They will look and behave much like real humans.

The success of fluoride in combating dental decay is well established and, without a doubt, socially beneficial. However, fluoride's toxic properties have been known for a century. In humans excessive intake (for adults, over 4 milligrams per day) over many years can lead to skeletal fluorosis, a well-defined skeletal disorder, and in some plant species, fluoride is more toxic than ozone, sulfur dioxide, or pesticides.

Some important questions remain. For example, the precise lower limit at which the fluoride content of bone becomes toxic is still undetermined. And while fluoride intake from water and air can be evaluated relatively easily, it is much harder to estimate how much a given population ingests from foodstuffs because of the wide variations in individual eating habits and in fluoride concentrations in foodstuffs. These difficulties suggest that we should by wary of indiscriminately using fluoride, even in the form of fluoride-containing dental products.

28. The passage suggests which of the following about the effect of fluoride on humans?

A. The effect is more easily measured than is the effect of exposure to pesticides.

B. The effect of fluoride intake from water and air is relatively difficult to monitor.

C. In general the effect is not likely to be as harmful as the effect of exposure to sulfur dioxide.

D. An intake of 4 milligrams over a long period of time usually leads to a skeletal disorder in humans.

E. An intake of slightly more than 4 milligrams for only a few months is not likely to be life-threatening.

29. The paragraph following these passages is mostly likely about

A. how to use fluoride carefully.

B. diseases caused by ingesting too much fluoride.

C. interesting results of experiment by some dental scientists.

D. an analysis of fluoride in its use in other industries.

E. scientific evidence provided by orthopedic specialists.

Superconductivity is the ability of certain materials to conduct electrical current with no resistance and extremely low losses. This ability to carry large amounts of current can be applied to electric power devices such as motors and generators, and to electricity transmission in power lines. For example, superconductors can carry as much as 100

times the amount of electricity of ordinary copper or aluminum wires of the same size.

Scientists had been intrigued with the concept of superconductivity since its discovery in the early 1900s, but the extreme low temperatures the phenomenon required was a barrier to practical and low-cost applications. This all changed in 1986, when a new class of ceramic superconductors was discovered that "superconducted" at higher temperatures. The science of high-temperature superconductivity (HTS) was born, and along with it came the prospect for an elegant technology that promises to "supercharge" the way energy is generated, delivered, and used.

30. In which of the following publication types would this article most likely appear in?
A. A scholarly journal read by specialists and scientists who work directly with superconductivity
B. A modern science magazine intended for leisure reading.
C. A book chapter in an advanced chemistry textbook
D. A magazine intended to be dispersed at home craft fair
E. A trade show magazine which focuses on super-cooled refrigeration units

31. What is the barrier to superconductivity at the early stage of its discovery?
A. high resistance B. technology that supercharge the way energy is used C. low-cost application
D. its capacity to carry electricity E. low temperature

Those who criticize the United States government today for not providing health care to all citizens equate health care provision with medical insurance coverage. By this standard, seventeenth- and eighteenth-century America lacked any significant conception of public health law. However, despite the general paucity of bureaucratic organization in pre-industrial America, the vast extent of health regulation and provision stands out as remarkable.

Of course the public role in the protection and regulation of eighteenth-century health was carried out in ways quite different from those today. Organizations responsible for health regulation were less stable than modern bureaucracies, tending to appear in crises and wither away in periods of calm. The focus was on epidemics which were seen as unnatural and warranting a response, not to the many endemic and chronic conditions which were accepted as part and parcel of daily life. Additionally, religious influence was significant, especially in the seventeenth century. Finally, in an era which lacked sharp demarcations between private and governmental bodies, many public responsibilities were carried out by what we would now consider private associations. Nevertheless, the extent of public health regulation long before the dawn of the welfare state is remarkable and suggests that the founding generation's assumptions about the relationship between government and health were more complex than is commonly assumed.

32. Among the following statements about the United States government's role in the provision of health care, which finds the LEAST support in the passage?
A. The government today addresses health concerns that formerly were not considered serious enough to warrant government involvement.
B. What were once public health-care functions are now served by the private sector.
C. Philosophical considerations play a less significant role today in the formulation of public health-care policies than in previous centuries.
D. Public health care today is guided largely by secular rather than religious values.
E. Modern public health-care agencies are typically established not as temporary measures but rather as permanent establishments.

33. Which of the following best expresses the author's point of contention with "those who criticize the United States government for not providing health care to all citizens" (lines 1)?
A. Their standard for measuring such provision is too narrow.
B. They underestimate the role that insurance plays in the provision of health care today.
C. They fail to recognize that government plays a more significant role today in health care than in previous eras.
D. They misunderstand the intent of the founding generation with respect to the proper role of the government in the

area of health care.

E. They lack any significant conception of public health law.

34. Which of the following best expresses the main point of the passage?

A. The government's role in health care has not expanded over time to the extent that many critics have asserted.

B. The government should limit its involvement in health care to epidemiological problems.

C. Health problems plaguing pre-industrial America resulted largely from inadequate public health care.

D. History suggests that the United States government has properly played a significant role in provision of health care.

E. Private insurance is an inadequate solution to the problem of health care.

Graffiti is a general term for wall writing, perhaps humankind's earliest art form. The crude wall writings of prehistoric times and the highly stylized street art of today's inner-city youths share one common feature: Each stems from a basic human need to communicate with others. For youths who may not be able to express themselves through other media, such as prose or music, graffiti represents an easily accessible and effective way to communicate with a large audience. Anyone can obtain a can of spray paint and "make their mark" on a highway overpass or the side of a building.

Modern graffiti generally falls into one of three categories—junk graffiti, gang graffiti, and tagging. Junk graffiti messages are not gang-related but often involve obscene, racist, or threatening themes. The line separating gang graffiti and tagging to more threatening gang activities, is now considered an entry level offense that can lead to more serious crimes, including burglary and assault.

35. According to these two passages, what is the common feature of Graffiti?

A. To threaten others B. To make their mark C. To communicate with others as a human need

D. To vandalize the landscape E. To challenge the public

36. Paragraphs following these passages are most like about

A. detailed description of three categories of graffiti.

B. how to punish those who make graffiti.

C. why youths need to express themselves through such an urban crime.

D. other ways to communicate with people through other art forms.

E. the development of earlier graffiti.

Most cultures set an age at which its young people become adults in the eyes of the law. This age is called the age of majority. When people reach this age, usually 18, they become entitled to certain inalienable rights from which they were precluded as minors, such as the right to vote. Before becoming adults, minors are not able to enter into legal contracts. This is seen as being for their own protection. They are also protected from statutory rape, from being exploited in the labor market, and from having to go through the same penal system as adults.

37. Which of the following would be an example of a protection specifically to minors?

A. The right to vote B. The right to a fair trial C. Child labor laws

D. Separate penal system E. Legal contracts

38. Which of the following would be an example of a right denied to minors?

A. The right to vote B. The right to a fair trial C. Child labor laws

D. Separate penal system E. Going to court

39. The word "statutory" in the passage is closest in meaning to

A. part of a statue B. punishable under the law C. said or stated D. serious E. casual

40. In which of the following publication types would this article most likely appear in?
A. A scholarly journal read by sociologists. B. A modern magazine intended for leisure reading.
C. A book chapter in a textbook about law and life D. A newsletter intended to be dispersed at court
E. A scholarly journal read by lawyers.

Part IV. Essay. 20 points.
The world's climate scientists recently reported unequivocally that the Earth's climate system is increasingly heating up and that it likely has not been this warm for at least 1300 years. We all must begin reducing global warming, and fortunately there is much to do. **Please write an essay in about 150 words about how you can help to reduce global warming.**

一、問答題：

1. 請將 vertebrae 分段並敘述其特色。(12%)
2. 敘述 spinal cord 的結構及其與周邊神經和自主神經間的連結。(12%)
3. Digestive glands 包含哪些器官? 請敘述其位置及解剖構造。(12%)
4. 敘述 lower respiratory tract 包括哪些區域及其解剖結構。(12%)
5. 敘述 synovial joint 的分類與一般動作。(12%)
6. 敘述 coronary circulation。(10%)
7. 敘述 extrinsic eye muscles 的運動及其神經控制。(8%)
8. 敘述任何一種 endocrine gland 的位置、構造及其動脈供應。(7 %)

二、解釋名詞 (每題 3 %)

1. Erector spinae muscles
2. Fibrous skeleton of the heart
3. Dura mater of the brain
4. Pelvic inlet (or superior pelvic aperture)
5. Renal pyramid

選擇題，請選一答案，每題2分。

( ) 1. 細胞內包器何者無膜？ (A) 高爾基體 (B) 核糖體 (C) 顆粒性內質網 (D) 平滑性內質網

( ) 2. 細胞內包器何者具雙層膜？ (A) 平滑性內質網 (B) 高爾基體 (C) 核膜 (D) 溶小體

( ) 3. 細胞內負責分解老舊包器？ (A) 溶小體 (B) 粒線體 (C) 過氧化氫體 (D) 高爾基體

( ) 4. 細胞內骨架何者直徑最大？ (A) 微細絲 (B) 中間細絲 (C) 微小管 (D) A, B, C 3者無差異

( ) 5.下列何者分布於表皮細胞與節締組織之間？ (A) tight junctions (B) hemidesmosome (C) gap junctions (D) microvilli

( ) 6. 基本組織中 何者無血管分布？ (A) 上皮 (B) 節締 (C) 肌肉 (D) 神經

( ) 7. 胸腔壁層是屬於下列何者？ (A) 皮膜 (B) 漿膜 (C) 黏膜 (D) 滑膜

( ) 8. 以下組織中何者其"細胞外物質，非細胞物質"的組成最多？ (A) 上皮 (B) 節締 (C) 肌肉 (D) 骨骼

( ) 9. 位於氣管管腔的上皮？ (A) 假複層柱形 (B) 簡單柱形 (C) 簡單扁形 (D) 移形上皮

( ) 10. 心肌特有的構造？ (A) 明顯橫紋 (B)細胞有多個細胞核 (C) 中間交接盤 (D) A+B

題目#11-12 答案 (A) 內膜 (B) 中膜 (C) 外膜 (D) A+B

( ) 11. 靜脈壁中最厚一層？

( ) 12. 構成靜脈瓣？

( ) 13. 心臟腱索是屬於下列組織？ (A) 上皮 (B) 節締 (C) 肌肉 (D) 神經 組織

( ) 14. 淋巴器官中何者不含皮質、髓質部？ (A) 淋巴結 (B) 脾 (C) 派亞氏腺 (D) 胸腺

( ) 15.不是腎元的構造？ (A) 近曲彎管 (B) 亨爾氏套 (C)入球小動脈 (D) 遠曲彎管

( ) 16. 以邏輯確定激素功能屬於女性但是男性未知？ (A) 濾泡刺激素 (B) 雄性素 (C) 黃體生成素 (D) 催乳激素

( ) 17. 一條神精內，許多 神精纖維 集合成束，外包有？ (A) 神精內膜 (B) 神精中膜 (C) 神精外膜 (D) 被囊

( ) 18. 角質細胞移到皮膚表面： (A) 變成多核 (B) 分裂產生細胞 (C) 逐漸脫落 (D) 進入真皮層

( ) 19. 乳腺是何種分泌方式？ (A) 部分洩出的 (B) 頂端洩出的 (C) 全洩出的 (D) B + C

( ) 20. 脾臟內主要的結締纖維？ (A) 膠原纖維 (B) 彈性纖維 (C)網狀纖維 (D) B + C

( ) 21. 黏著斑 (macula adherens; desmosome) 的細胞膜內側細胞質面，有何種主要細胞骨架附著？ (A) 微細絲 (B) 中間細絲 (C) 微小管 (D) 無細胞骨架

( ) 22. 部份下視丘神經元的軸突進入？ (A) 腦下腺後葉 (B) 腦下腺前葉 (C) 不進入腦下腺 (D) A+B

( ) 23. 排列於微血管管腔的上皮？ (A) 僞複層柱形 (B) 簡單柱形 (C) 簡單扁形 (D) 移形上皮

( ) 24. Fat tissue 與下列何者最類似？ (A) areolar (B) bone (C) nervous (D) gland

( ) 25.下列細胞可分泌 collagen fibril 何者除外？ (A) chondroblast (B) osteoclast (C) osteoblast (D) smooth muscle cell

( ) 26. 平滑肌中 dense bodies 與 striated muscle cell 內構造何者最類似？ (A) myosin (B) actin (C) Z line (D) M line

( ) 27. muscle cell內充滿的 organelle？ (A) intermediate filaments (B) smooth ER (C) peroxisomes (D) microfilaments

( ) 28. 腎上腺中 構造何者最 空泡狀？ (A) zona glomerulosa (B) zona fasciculate (C) zona reticularis (D) Medulla

( ) 29. The mammary glands of the breasts 是屬於下列何者？ (A) endocrine (B) compound alveolar (C) simple acinar (D) simple tubular

( ) 30. 下列細胞可分泌 histamine是？ (A) adipose cell (B) plasma cell (C) mast cell (D) macrophage

( ) 31.下列構造中 何者diameter最小？ (A) primary bronchus (B) respiratory bronchioles (C) alveolar ducts (D) secondary bronchi

( ) 32. 下列構造配對中 何者不正確？ (A) duodenum / Brunner's glands (B) taeniae coli / large intestine (C) esophagus /submucosal glands (D) columns of Morgagni / appendix

( ) 33. Paneth cells are associated with which of the following glands?
(A) pyloric (B) gastric (C) Brunner's (D) intestinal

( ) 34. 固有節緙組織connective tissue proper中 含有sponge-like molecules可儲存 tissue fluid (A) ground substance (B) extracellular matrix (C) reticular fibers (D) capillaries

( ) 35. Ligaments 是屬於下列那一種 節緙組織？ (A) loose areolar (B) dense irregular (C) cartilage (D) dense regular

問答題， 每題15分。

1. 如果細胞分泌 protein hormone 則其細胞內明顯特徵爲何？請繪圖說明包器與其功能。

2. 請繪圖說明肺泡與其功能。

1. Please compare apoptosis and necrosis. (10 分)
2. What is the outcome of acute inflammation? (10 分)
3. Please describe the morphologic change and complication of acute myocardial infarction. (15 分)
4. Please describe the morphologic change and outcome of acute respiratory distress syndrome (ARDS). (15 分
5. Definition of liver cirrhosis. (10 分)
6. Describe the pathogenesis and histologic features of acute poststreptococcal glomerulonephritis. (10 分)
7. Please describe the pathogensis & microscopic pathology of prion diseases. (10 分)
8. List the most important histologic forms of thyroid cancer. (10 分)
9. What is Kaposi's sarcoma? (10 分)

1. 舉出蟲卵形態、大小與中華肝吸蟲 (*Clonorchis sinensis*) 非常相似的腸道及膽道寄生的吸蟲各一種，並說明各自生活史及引起的病害。 (20%)

2. 寫出兩種經由食物媒介的線蟲 (腸道及組織寄生各一種) ，並說明其引起的病害及如何診斷。 (20%)

3. 寫出一種條蟲，人既是其終宿主，也是其中間宿主，並說明 (20%)
   a. 那些因素造成人變成其中間宿主
   b. 完整的生活史
   c. 各別病害及如何鑑別診斷

4. 寫出寄生在人體腸道及生殖泌尿系統的鞭毛蟲各一種，並說明感染後引起的臨床症狀，以及如何鑑別診斷。 (20%)

5. 請解釋下述各小題 (第一小題 2%，其餘各小題 3%，共 20%)
   a. Amebic dysentery
   b. Nocturnal periodicity
   c. Cellophane tape perianal swabs
   d. Swimmer's itch
   e. Sparganosis
   f. Primary amebic meningoencephalitis
   g. River blindness

問答題(共 100 分)

1. 出血性登革熱(Dengue hemorrhage fever)之致病機轉爲何? 當人被帶有登革病毒的病媒蚊叮咬而受到感染後，何時可測得病人血液中有病毒活動,稱之爲病毒血症期（viremia）,此時之病人具傳染力? (15 分)

2. 體液性免疫(humoral-mediated immunity)及細胞性免疫(cell-mediated immunity)於病毒感染所扮演的角色及重要性? (15 分)

3. 那種細菌感染後可能導致腫瘤病變發生?傳染途逕爲何? (10 分)

4. 請敘述利用樹突狀細胞腫瘤疫苗(dendritic cell- tumor vaccine)進行 cancer therapy 之原理 (10 分)

5. 何謂超級抗原(superantigen)?所引起之免疫反應與一般抗原(antigen)有何差別? (10 分)

6. 請敘述革蘭氏陰性菌(Gram(-))感染後造成敗血症之致病機轉? (10 分)

7. 診斷肺結核分枝桿菌(*Mycobacterium tuberculosis*)感染之方法有那些?(10 分)

8. 在台灣,肺膿瘍(liver abscess)疾病主要是由那兩種病原菌引起? (10 分)

9. beta-lactam 藥物殺菌機轉及產生抗藥性的原因爲何? (10 分)

問答題

1. 試述慢性骨髓性白血病 (Chronic myeloid leukemia)之實驗室診斷 (15 分)

2. 試述急性 B 型肝炎(Acute hepatitis B) 之實驗室診斷 (15 分)

3. 試述海洋性貧血 (Thalassemia)之實驗室診斷 (15 分)

4. 試述糖尿病 (Diabetes mellitus)之實驗室診斷 (15 分)

5. 試述白色念珠球菌 (Candida albicans)之實驗室診斷 (15 分)

6. 試述電泳技術在臨床之應用 (15 分)

7. 試述影響生化檢驗正常值之變數 (10 分)

2007 entrance exam

1. What kinds of scientific knowledge can be important for genomic research? Please list all of them and explain why they can contribute to genomic research. For example, you can say biochemistry is important because understanding DNA structure needs biochem training.
2. Please explain what pharmacogenomics is and why pharmacogenomic research can influence future medicine and our daily life.
3. Is a gene or its protein(s) more related to physiology or disease pathogenesis? If your answer is "gene", please tell us why we need to study proteomics. If your answer is "protein", then why we need to study genomics.
4. Please tell us what part of genomic studies you are particularly interested in, and how you plan to do research in your favorite genetic topic. For example, if you are interested in cancer genetics, briefly describe your research direction and plan.
5. Genetics used to be a not popular science. However, it becomes a very hot topic currently. Based on your knowledge, please tell us why genetic sciences become so important.

Multiple Choice Questions (single answer): 40%

1. Melting of DNA can be monitored by the absorption of UV light at ___ nm. As DNA denature, its absorption of UV light will ___. A) 260; decrease B) 260; increase C) 280; decrease D) 280; increase E) 230; decrease
2. A 420-bp covalently closed circular DNA with a linking number of 36 has 4 negative supercoils. When the linking number of this DNA is changed to 39 by a topoisomerase, this DNA will A) have 3 negative supercoils B) have 3 positive supercoils C) have 1 negative supercoil D) have 1 positive supercoils E) be relaxed
3. A major chemical group contributing to the enzymatic activity of ribozymes is A) carbonyl group on uracil B) phosphoryl group C) 2'-hydroxy group on ribose D) 3'-hydroxy group on ribose E) 5'-hydroxy group on ribose
4. Yeast genome is 1.2×10^7 bp and human genome is 3.3×10^9 bp. What is the approximate ratio of the number of genes in yeast genome compared to human genome? A) 1:1 B) 1:5 C) 1:250 D) 1:1000 E) 1:25000
5. You randomly isolate a human genomic DNA fragment of ~3000 bp. It is most likely to include A) a protein-coding gene B) a LINE-1 element C) an Alu element D) a satellite DNA E) a microRNA gene
6. The following are 5 key steps in homologous recombination. Which is the correct order? 1. formation of initial short regions of base pairing between the two recombining DNA molecules, 2. cleavage (or resolution) of Holliday junctions, 3. alignment of 2 homologous chromosomes, 4. movement of Holliday junctions by melting and formation of base pair, 5. introduction of breaks in DNAs. A) 35241 B) 24135 C) 35142 D) 24531 E) 13452
7. Which of the following RNAs is not transcribed by RNA polymerase III? A) tRNA B) 5S rRNA C) 5.8S rRNA D) U6 snRNA E) H1 RNA of RNase P
8. Self-splicing of group II introns is similar to the nuclear pre-mRNA splicing because A) both need guanosine B) both need ATP C) both need snRNPs D) both form lariat structure E) both form spliceosome
9. Isoleucine is larger than valine by only a single methylene group. The isoleucyl-tRNA synthetase contain a catalytic pocket and an editing pocket. A) AMP-valine is too large for the catalytic pocket B) AMP-valine is too large for the editing pocket C) AMP-isoleucine is too large for the catalytic pocket D) AMP-isoleucine is too large for the editing pocket
10. The high-resolution, 3-D structure of the ribosome reveals that no amino acid of ribosomal proteins is located closer than 18 Å from the A) P site B) A site C) decoding center D) factor binding center E) peptidyl transferase center
11. An antibiotic inhibits prokaryotic protein synthesis. In its presence, translation can initiate, but only dipeptides that remain bound to the ribosome are formed. This antibiotic appears to block A) binding of $fMet\text{-}tRNA_i$ to P site B) binding of aminoacyl-tRNA to A site C) peptide bond formation D) translocation E) termination
12. According to the wobble rules, a tRNA with the anticodon 5'-GCA-3' can recognize the codons A) 5'-CGU-3' and 5'-UGU-3' B) 5'-UGC-3' and 5'-UGU-3' C) 5'-CGU-3' and 5'-UGC-3' D) 5'-UGA-3', 5'-UGC-3' and 5'-UGU-3' E) 5'-IGC-3'
13. Glucose represses the expression of *lac* operon. This repression is mediated by A) an activator B) a repressor C) a co-repressor D) attenuation E) a riboswitch
14. Expression of β-galactosidase in a partial diploid *E. coli* with the genotype of $I^- O^c lacZ^- / I^- O^+ lacZ^+$ is A) constitutive B) inducible C) noninducible

15. Which DNA-binding domains combines dimerization and DNA-binding surfaces in a long α helix? A) helix-turn-helix B) zinc finger C) leucine zipper D) helix-loop-helix E) acidic domain
16. Which of the following enzymes is not required for nucleotide excision repair? A) nuclease B) helicase C) DNA glycosidase D) DNA polymerase E) DNA ligase
17. Which is not the feature of processed pseudogenes? A) lack of upstream promoter sequence B) lack of intron sequences C) presence of A-rich sequences at 3' end D) presence of LTR sequences at 5' and 3' ends
18. A $(CA)_{20}$ tandem repetitive DNA is classified as a A) SNP B) microsatellite C) minisatellite D) SINE element E) LINE element
19. After RNA splicing, will the two phosphates at the 5' and 3' splice sites (as shown by the boldfaces in exon-Np/GU-intron-AGp/N-exon) be in the spliced exon or in the excised intron? A) 5' p in the intron, 3' p in the exon B) 5' p in the exon, 3' p in the intron C) both 5' p and 3' p in the intron D) both 5' p and 3' p in the exon
20. Which of the following methods is not used to measure the expression level of mRNA? A) Northern blotting B) cDNA microarray C) real-time RT-PCR D) RNAi E) RNase protection assay

Essay Questions: 60%

1. A) DNA in most cells, including prokaryotes and eukaryotes, is negatively supercoiled. What are the purposes of maintaining DNA in negative supercoiling? (4%)
   B) Negative supercoiling is introduced into prokaryotic and eukaryotic DNA by different mechanisms. What are the mechanisms? (4%)
2. A) Explain why DNA polymerase is unable to complete DNA replication at chromosome ends. (4%)
   B) Describe how telomerase solves this replication problem. (4%)
3. A) Describe how EMSA (electrophoretic mobility shift assay) and ChIP (chromatin immunoprecipitation) are performed. (6%)
   B) What information can be obtained by performing EMSA and ChIP? (4%)
4. A) What is epigenetic inheritance? (4%)
   B) What are the mechanisms for epigenetic inheritance? (6%)
5. Human beta-globin gene contains 3 exons (142 bp, 223 bp and 261 bp) and 2 introns (130 bp and 850 bp). A C→T point mutation within the second intron generates an aberrant mRNA of 699 nucleotides plus poly(A) tail instead of the normal mRNA of 626 nucleotides plus poly(A) tail. Propose a mechanism to explain the effect of this mutation. (5%)
6. What are the functions of mRNA 5' capping and 3' polyadenylation? (6%)
7. A) What is nonsense-mediated mRNA decay? (4%)
   B) What is the mechanism for nonsense-mediated mRNA decay? (4%)
8. Certain genomic regions or nucleotide sequences are especially prone to spontaneous mutation. What are these regions or sequences? Explain why they are prone to spontaneous mutation. (5%)

(每題 10 分共 10 題)

一、 細胞內訊息傳遞中 G-proteins (GTP binding protein)所扮演之角色為何？(10%)

二、 甲狀腺素(thyroid hormone)在作用組織與受體(receptor)反應機制為何(5%)？ 其對醣類、脂肪、蛋白質之新陳代謝之影響各為何(5%)？

三、 粒腺體(mitochondria)中產生 ATP 之機制為何(5%)？粒腺體與細胞存亡之關聯如何(5%)？

四、 基因指揮蛋白質之生成之過程中，哺乳類動物的細胞之管制轉錄(transcription regulation)之分子機制為何？(試舉例說明)(10%)

五、 請簡述幹細胞(stem cell)之定義及據其功能與來源的分類。(10%)

六、 過度換氣(hyperventilation)可能造成體液酸鹼失衡的狀態如何？腎臟可以如何代償(compensation)？(10%)

七、 維他命 D 之生理作用為何？其在人體中活化之機制為何？(10%)

八、 何謂細胞膜主動運輸？試以胃腸吸收葡萄糖(glucose)及腎小管分泌氫離子(H^+)為例說明(10%)

九、 女性生殖週期中，下視丘、腦垂體及卵巢之間如何調控性荷爾蒙之分泌？(10%)

十、 試以體溫之調控說明人體之維持恆定(homeostasis)之運作。(10%)