

Part I. Question 1 to 10, please choose the answer closest to the underlined word or phrase. One Answer Only. 2 points each.

1. Leaders of the world's largest economies are close to an agreement to tackle the global financial crisis.
(A) fight (B) meditate (C) forbid (D) deal with
2. I think people realize the economy seemingly fell off the cliff.
(A) inclined (B) caught up (C) help up (D) slumped
3. In the future, globalization is going to be increasingly driven quickly to its processes and technologies, and start to march forward.
(A) directed (B) motivated (C) forced (D) manipulated
4. The home team kicked off the season with an easy win.
(A) interrupted (B) commenced (C) avoided (D) complicated
5. The use of stem cells is controversial - opponents object on the grounds that it is unethical to destroy embryos in the name of science.
(A) adversaries (B) allies (C) forerunners (D) associates
6. Slumdog Millionaire is about a Mumbai teen who grew up in the slums, becomes a contestant on the Indian version of "Who Wants To Be A Millionaire?"
(A) asylum seeker (B) gangster (C) youngster (D) homeless
7. Critical listening is a difficult kind of listening because it requires you to both interpret and evaluate the message.
(A) understand (B) integrate (C) intrigue (D) compose
8. He is worried about a potential quiz tomorrow.
(A) possible (B) actual (C) providential (D) surprising
9. These two girls prefer to have intimate conversation one-on-one
(A) personal (B) secret (C) intelligent (D) discreet
10. His position was contrary to that of the teacher's
(A) puzzling (B) opposite (C) compatible (D) foreseeable

Part II. Question 11-15, please choose the answer that best completes the sentence. Question 16-20, please choose the best answer to fill each of the numbered blanks in the passage.

In many countries, it is considered 11 to appear naked or even half-naked on a public beach. However, some places often have a few 12 beaches that are designated as nudist or "clothing optional" beaches, where uninhibited people can fully 13 themselves to the sun. Other countries, especially those where 14 are hot and attitudes are 15, impose no restrictions at all, so people may sunbathe topless or nude even on the public beaches.

11. (A) inappropriate (B) interesting (C) conservative (D) considerate
12. (A) inclusive (B) executive (C) secluded (D) acceptable
13. (A) demonstrate (B) expose (C) lie down (D) externalize
14. (A) seawater (B) cuisine (C) fashion (D) climates
15. (A) strict (B) sincere (C) liberal (D) general

There are many different forms of potential economic stimulus and they work in different ways. Tax cuts for individuals generally encourage short-term spending. Tax cuts for companies encourage both spending and investment. Expenditures on public works create contracts for firms and provide short- to medium-term 16. Investments in research and development take a longer-term approach 17 the theory 18 in the future (and thus provide jobs) if they have the money to make intelligent investments in their operations

now. Finally, some forms of economic stimulus seek to make investments that will pay off in the long run 19 for everybody. An example is investing in the U.S. energy grid. 20, a one-time outlay could make energy costs for both individuals and businesses less expensive for decades to come.

16. (A) opportunities of employment (B) employment opportunities
(C) employing opportunities (D) employment in opportunities
17. (A) under (B) in (C) of (D) on
18. (A) business is going to be thrive (B) which business is going to be thrive
(C) that business will thrive (D) business thrives
19. (A) with cheaper consumption (B) in making cheaper consumption
(C) by consuming cheaply (D) by making consumption cheaper
20. (A) Theoretic concern (B) Theoretical (C) Being theoretic (D) Theoretically

Part III. Reading Comprehension. In this part, you will read several passages. Each one is followed by one question or a number of questions. Question 21 – 40, you should choose the ONE best answer to each question. 2 points Each.

Question 21-25

The importance of strength in many sports is undeniable. It is so important that many university and professional teams now hire a specialized coach who only attends to the development of strength in athletes. It is interesting to note that no such specialist is hired to attend to the other components of physical fitness. We have yet to see a cardiovascular coach, a coach who attends to developing fitness of the heart and blood vessels, hired by universities or professional teams. This situation raises the question of the relative importance of each of these two components, strength training and cardiovascular training, to the other. Does the strength coach develop the cardiovascular system by prescribing a program to increase muscle fiber?

It is theoretically possible to design a weight-lifting program in which the resistance is so low and the repetitions so numerous that it provides the cardiovascular benefits of a running program. Therefore, if you view weights as a way to overload muscles, you can imagine a continuum of programs that emphasize cardiovascular benefits on the one extreme and strength on the other. The practical truth of the matter is that most coaches are primarily concerned with pure strength. Therefore, the athlete has to work on the end of the weight-overload continuum that promotes little, if any, cardiovascular benefit. In fact, one study has found that a high-intensity strength program reduced mitochondrial density (density of the cellular structures that produce energy in the muscle fiber) per unit of muscle. The athletes increased muscle mass, so they did not eliminate mitochondria presumably, but the fact remains that the oxidative capacity, the ability to use oxygen in the synthesis of energy, was not promoted. Oxidative capacity would usually improve in programs that stress cardiovascular conditioning. Neither increased blood flow nor increased mitochondrial density (both indicators of oxygen extraction) occur with strength training.

Obviously, there is nothing wrong with training athletes to gain strength, but in most strength programs cardiovascular improvements are not made. Therefore, for athletes, who require both strength and cardiovascular conditioning, both components must be trained independently.

21. What is the main point of the passage?
- (A) College and professional teams do not need specialized coaches.
(B) Strength training should be replaced by cardiovascular training.
(C) Cardiovascular training is more difficult than strength training.
(D) Athletes need both strength and cardiovascular training.

22. Under which of the following conditions can a weight-lifting program provide cardiovascular benefits?
- (A) When the weights are very heavy
 - (B) When the weights are lifted very slowly
 - (C) When lifting a heavy weight overtires the muscles
 - (D) When light weights are lifted a large number of times
23. Why does the author mention running?
- (A) To give an example of the benefits of strength training
 - (B) To demonstrate what a typical weight program includes
 - (C) To give an example of an activity that provides cardiovascular conditioning
 - (D) To demonstrate the importance of oxygen extraction
24. Which of the following is an important direct result of cardiovascular training?
- (A) Improved oxidative capacity
 - (B) Increased muscle fiber
 - (C) Decreased mitochondrial density
 - (D) Increased body weight
25. Which of the following policies would the author be most likely to support?
- (A) Sports teams should increase their strength-training programs.
 - (B) All athletes should be able to choose the kinds of training they prefer.
 - (C) Sports teams should provide improved cardiovascular training.
 - (D) All athletes should avoid strength training in order to avoid injury.

Question 26-31

It is in search of adequate food supplies that cetaceans, marine mammals such as whales and dolphins, travel the oceans. They live in a world that is largely hidden from humans. Yet their range is three times as large as ours, since oceans occupy about three-quarters of the Earth's surface. They travel through well-marked ocean zones, **each** with its own characteristic marine life. They glide through the water, periodically rising to the surface to breathe. The sea may be raging but cetaceans are untroubled by the greatest storms; indeed they are more at home in rough than in calm seas.

Indirectly, however, their life is greatly influenced by wind. The eastward rotation of the Earth produces the **prevailing** trade winds, blowing east to west at the equator. These winds drag the surface waters and all they contain in a westerly direction. Warmed by its passage through the tropics, the wind-driven water is deflected against the westward continents, turning southwest in the Southern Hemisphere and northwest in the Northern Hemisphere.

In the Southern Hemisphere, the warm flow of tropical water under the west-going equatorial trade wind produces a genial climate along the eastern shores of Australia, South America, and South Africa. But there is open ocean to the south. Here the current is driven eastward unimpeded by land before the almost incessant westerly gales of this zone. The huge mass of water moves fast, chilled by water from the Antarctic Region, but **laden** with masses of plankton.

This cold, swift current is **split** when it strikes the southwestern extremities of the three southern continents. The northern portion of this water is diverted by the southwest coast of South America to sweep northward toward the equator. Known as the Humboldt Current, this current is rich in plankton on which cetaceans feed. Part of this same cool eastward-flowing current, enriched with water from higher latitudes, is similarly diverted north along the southwest coast of South Africa. This is the Benguela Current, where many cetaceans come to feed.

26. The passage answers which of the following questions?
- (A) What is the main difference between cetaceans and other marine life?

- (B) How far do most cetaceans travel in a year?
(C) How often do cetaceans need to breathe?
(D) What winds and ocean currents affect cetaceans?
27. The word **each** in paragraph 1 refers to a
(A) cetacean (B) surface (C) range (D) zone
28. The word **prevailing** in the passage is closest in meaning to
(A) arctic (B) blowing (C) dominant (D) energetic
29. The word **laden** in paragraph 3 is closest in meaning to
(A) balanced (B) filled (C) touched (D) wrapped
30. The word **split** in paragraph 4 is closest in meaning to
(A) stopped (B) divided (C) opened (D) surrounded
31. What do paragraphs 3 and 4 primarily discuss?
(A) The water currents in the Southern Hemisphere
(B) The trade winds in the Southern Hemisphere
(C) The three continents in the Southern Hemisphere
(D) The large area of open ocean in the Southern Hemisphere.

Question 32-36

Doris Lessing received her Nobel Prize in 2007. Her novel *The Golden Notebook* is considered a feminist classic by some scholars, but notably not by the author herself, who later wrote that its theme of mental breakdowns as a means of healing and freeing one's self from illusions had been overlooked by critics. She also regretted that critics failed to appreciate the exceptional structure of the novel. As she explains in *Walking in the Shade*, Lessing modeled Molly, to an extent, on her good friend Joan Rodker, the daughter of the author and publisher John Rodker.

Lessing does not like the idea of being pigeon-holed as a feminist author. When asked why, she replies:

What the feminists want of me is something they haven't examined because it comes from religion. They want me to bear witness. What they would really like me to say is, 'Ha, sisters, I stand with you side by side in your struggle toward the golden dawn where all those beastly men are no more.' Do they really want people to make oversimplified statements about men and women? In fact, they do. I've come with great regret to this conclusion.

- Doris Lessing, *The New York Times*, 25 July, 1982[8]

32. Doris Lessing is a Nobel Prize winner in
(A) Feminism. (B) Literature. (C) Sociology. (D) Peace.
33. According to Doris, what feminists want from her is
(A) exceptional structure. (B) fighting against men.
(C) creative ideas about men and women. (D) healing power from battles between men and women.
34. Doris Lessing does not particularly like the idea of being **pigeon-holed** as a feminist; pigeon-holed here means
(A) categorized (B) wholesale (C) viewed (D) completed
35. Which of the following statements is **FALSE**?
(A) Critics often neglect the theme of mental breakdowns as a self-freeing power.
(B) She models a heroine on her friend in one of her books.
(C) Her book *The Golden Book* is particularly considered a feminist one by Lessing.
(D) Lessing thinks critics understand her work very well.
36. Generally speaking, Lessing's attitude towards being considered a feminist is
(A) accepting (B) disappointed (C) welcomed (D) patient

Question 37-40

In recent years, many Taiwanese have won awards at international film festivals. However, many theater owners don't consider even prize-winning Taiwanese films to have much commercial potential in their home market. Their viewpoint is generally confirmed by the largely empty seats at showings of locally produced movies. The market share for local films is only about two percent, while more than 95 percent of the market is taken by Hollywood blockbusters. The dominance of American-made films in Taiwan has continued for the past ten years, but the government is proposing some solutions. It is hoped that some legal changes and few promotional projects will help Taiwan's struggling film industry.

One proposal is to give individuals or companies a tax deduction for money spent to produce a film. The idea is that the tax deduction would encourage investments in new films. There are also plans to provide financial support not only for film production, but also for marketing.

37. Which of the following could be a title for this passage?

- (A) The international Movie Industry and Taiwanese Films
- (B) Trends in Taiwanese Moviegoing Habits
- (C) Prize-Winning Taiwanese Films
- (D) A Helping Hand for the Taiwanese Film Industry

38. Which of the following statements is true about Taiwanese films in general?

- (A) They have been commercially successful both locally and abroad.
- (B) Most production of local films has been moved to Hollywood.
- (C) They have won many international awards, but little response from local audiences.
- (D) They have found little success anywhere in the world.

39. What does the passage imply is the main reason that Taiwanese films do not have a large local audience?

- (A) Taiwanese audiences dislike prize-winning films, thinking them "arty."
- (B) American films are superior in quality.
- (C) The Taiwanese film industry is not supported well enough financially.
- (D) Ticket prices for local films are too high.

40. How is the government attempting to help the local film industry?

- (A) By limiting the number of foreign films that local theater owners can show.
- (B) By encourage lower ticket prices for local films.
- (C) By establishing schools for training local filmmaking talent.
- (D) By helping to make creating and promoting local films more affordable.

Part IV. Essay. 20 points.

Do you think that technology alienate people from one another? Why or Why not? Please write a well-structured essay in 150 to 200 words discussing your opinions.

一. 選擇題 (80 分) (請在電腦卡上作答)

1. 環境生態保護啓蒙者卡爾森 (Rachel Carson) 於 1962 年出書, 提及人類環境毒物污染, 導致鳥類死亡的原因爲 (1) 戴奧辛 (2) 孔雀石綠 (3) 三聚氰胺 (4) DDT 殺蟲劑
2. 上一題的書名爲 (1) 寂靜的夏天 (2) 寂靜的秋天 (3) 寂靜的春天 (4) 寂寞的冬天
3. 我國勞工安全衛生法第十二條第一項所稱特別危害健康之作業 不包括下列何者
(1) 游離輻射作業 (2) 粉塵作業 (3) 噪音作業 (4) 所有有機溶劑作業。
4. 雇主不得使女工從事危險性或有損性 (1) 鋁 (2) 銅 (3) 鐵 (4) 鉛 散佈場所之工作
5. 發生死亡職業災害時, 雇主應於 (1) 24 小時 (2) 2 天 (3) 3 天 (4) 7 天 內報告檢查機構
6. 我國勞工安全衛生法限定 在高溫場所工作之勞工, 雇主不得使其每日工作時間超過
(1) 四 (2) 六 (3) 八 (4) 十小時
7. 最近每年意外事故死亡數目何者最大 (1) 中毒 (2) 溺水 (3) 槍擊 (4) 交通
8. 我國現場安全管理工作 依法爲下列何者的責任 (1) 安全衛生業務主管 (2) 雇主
(3) 安全管理師 (4) 不太確定
9. 今有 110 V(伏特), 11 A(安培) 的電流, 他的電阻 R 爲多少(歐姆) (1) 0.1 (2) 10 (3) 11 (4) 1210
10. 同上題, 此系統在 1 分鐘內要生成多少焦耳(J)的熱量? (1) 660 (2) 1210 (3) 6600 (4) 72600
11. 台灣近二十年來之勞工保險職業病給付最多者爲下列何者? (1) 噪音 (2) 塵肺症
(3) 有機溶劑中毒 (4) 一氧化碳中毒
12. 進入含氯氣 3% 之室內作業場所, 應配戴下列何種呼吸防護具? (1) 有機溶劑吸收罐
防毒面具 (2) 防塵用呼吸防護具 (3) 供氣式呼吸防護具 (4) 酸性氣體呼吸防護具
13. 下列那一種選樣方式, 其抽樣單位爲群體 (1) 集束取樣 (2) 系統取樣 (3) 分層取樣
(4) 簡單隨機取樣
14. 下列那一種選樣方式, 其選樣架構如含有週期變化的排列, 則易出現選樣誤差
(1) 集束取樣 (2) 系統取樣 (3) 分層取樣 (4) 簡單隨機取樣
15. 乳癌患者手術切除罹病的乳房屬於 (1) 促進健康 (2) 特殊保護 (3) 限制殘障 (4) 復健。
16. 因果時序性亦辨明的研究方法 (1) 橫斷研究法 (2) 病例對照研究法 (3) 世代研究法
(4) 生態研究法
17. 密閉污水槽作業時, 聞到腐爛雞蛋惡臭氣體味可能是 (1) CO (2) CH₄ (3) H₂S (4) N₂O
18. 加油站汽油引起的火災屬於 (1) 甲類 (2) 乙類 (3) 丙類 (4) 丁類 火災
19. 分析災害原因時, 下列何者係屬直接原因 (1) 高壓電 (2) 警報系統不良
(3) 未使用個人防護具 (4) 無漏電斷路系統
20. 下列何者是游離輻射? (1) 微波 (2) 紅外線 (3) 紫外線 (4) 中子射線.
21. 相同厚度之物質, 何者對 X 光機的游離輻射屏蔽最佳 (1) 鋁 (2) 銅 (3) 鉛 (4) 鐵.
22. 我國游離輻射職業曝露限制值規定, 每年有效等效劑量 (Effective Dose) 不得超過
(1) 1 侖目 (2) 2 毫西弗 (3) 500 毫侖目 (4) 以上皆非
23. 依法規規定, 下列特定化學物質禁止使勞工製造、處置、使用 (1) 甲 (2) 乙 (3) 丙 (4) 丁
24. 生物轉化的主要器官 (1) 腎臟 (2) 心臟 (3) 肝臟 (4) 腸胃
25. 一般而言, 白指症 (white-finger syndrome) 主要是因下列何種因素而致病?
(1) 振動 (2) 噪音 (3) 游離輻射 (4) 異常氣壓。

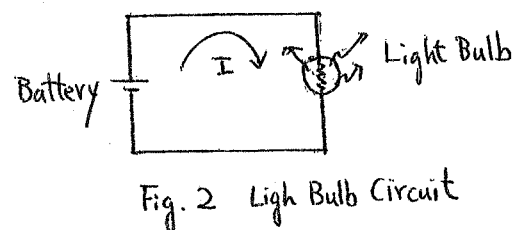
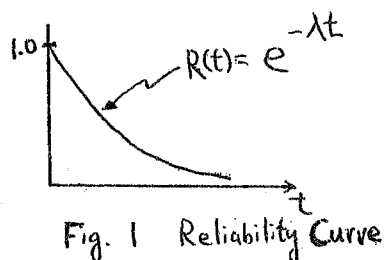
26. 皮膚的那個部分為主要防止外物進入體內(1)表皮 (2)真皮(3)皮下組織 (4)毛囊
27. 我國現階段法令並未規範下列那一種粉塵濃度？(1) 厭惡性粉塵 (2)總粉塵
(3) 可呼吸性粉塵 (4) 可吸入性粉塵
28. 一特定粉塵發生源之特定粉塵作業時間短暫，係指每日作業至少不超過多少小時者
(1)一 (2)二 (3)三 (4)四
29. 欲評估勞工佩戴呼吸防護具之效果，以下列何種採樣方法較佳？(1)生物偵測
(2)個人採樣(3)氣罩外側濃度測定 (4)定點採樣
30. 噪音計在下列哪一個頻率之純音，以 A、B、C 權衡電網測定時結果相同 (1)100
(2)1000 (3) 2000 (4)16000 Hz。
31. 危害物質標示圖中象徵符號為骷髏頭與兩根交叉方腿骨者為下列何物質？
(1)易燃氣體 (2)禁水性物質 (3)腐蝕性物質 (4)毒性物質。

假設某一個社區中攝護腺癌的盛行率為 10% 現在打算以攝護腺特異病原(prostate specific antigen, PSA)檢驗法檢查社區 2000 名 60 歲以上的老人是否有攝護腺癌。檢查結果跟病理切片比較發現真陽性者有 140 名，假陽性者有 180 名。請回答下列問題？(第 32~35 題)

32. 計算 PSA 檢驗法的敏感度 (sensitivity) (1) 43.8% (2)70% (3) 90% (4)96.4 %
33. 計算 PSA 檢驗法的精確度 (specificity) (1) 43.8% (2)70% (3) 90% (4)96.4 %
34. PSA 檢驗法的陽性預測值 (positive predictive value)為 (1) 43.8% (2)70% (3) 90% (4)96.4 %
35. PSA 檢驗法的陰性預測值 (negative predictive value)為 (1) 43.8% (2)70% (3) 90% (4)96.4 %
36. A healthy worker can exchange about how many liters of air in his lung during a normal workday? (1) 10 (2) 100 (3) 1000 (4) 10000 liters
37. Which of the following metals is not a suspected reproductive toxicant?
(1) Lead (2) Cadmium (3) Mercury (4) Arsenic.
38. Minamata Bay disease in Japan during 1950s was caused by eating fishes that were contaminated by industrial waste dumping of (1) Lead (2) Cadmium (3) Mercury (4) Arsenic
39. When you enter an unknown confined space, you should wear a (1) Gas mask (2) Particulate respirator (3) Chemical cartridge respirator (4) SCBA (self-contained breathing apparatus).
40. When OSHA inspectors audit a facility, what is their first priority of inspections?
(1) Investigation of imminent dangers (2) Investigation of employee complaint
(3) Programmed high-hazard inspections (4) Re-inspections.

二. 問答題 (20 分) (請在答案紙上作答)

1. 請例舉任五項作業，我國勞工安全衛生法施行細則所稱的“特別危害健康之作業”？(5 分)
2. 請例舉任五項作業場所，中央主管機關指定應實施“作業環境測定之作業場所”？(5 分)
3. A water pump has a mean time between failures of 1 failure per 25000 hours in running. Please calculate the probability of its failure after 25000 hours in use? (5 分)(reference to Fig. 1)
4. A car uses a 12 volts battery to light its instrument panel up and has a 6-watt light bulb installed. What are the current (in Ampere) and the resistor (in Ohm) values for this light bulb? If we add two more 6-watt light bulbs in parallel with the first one, what is the total current flow in this circuitry? (5 分) (reference to Fig. 2)



※本試題可使用計算機※

一、有 7 名小孩因為感冒發燒而到某診所就診，醫師在讓小孩服用 aspirin 前量了第一次體溫，服藥後一小時再量第二次體溫，資料如下：(單位：攝氏溫度)【20%】

小孩編號	1	2	3	4	5	6	7
服藥前體溫減							
服藥後體溫 d_i	1.2	1.0	0.6	0.8	0.2	0.4	1.4

- (1) 服藥前與服藥後，體溫差之 95% 信賴區間為何？
 (2) 請檢定服用 aspirin 是否確有降低體溫。

Handwritten calculations for Question 1:
 $\bar{d} = 0.8$
 $s_d = 0.284$
 $\frac{1.12}{s/\sqrt{n}} = \frac{0.4}{2.645} = 0.1512$

二、消費卷發放後，某研究者從某校教職員、研究生和大學生中各隨機抽出 11 名 (總共 33 名)，瞭解其花多久時間把消費卷用完，結果如下。試問三種族群用掉消費卷之時間是否相同。【20%】

教職員：40±5 天；研究生：35±10 天；大學生：30±15 天

三、有個馴猴人養了一群猴子，由於經濟不景氣，糧食很快就會被猴子吃光了。因此他對猴子說：「從現在開始，每天早上給你們三顆栗子，晚上給你們四顆栗子。」並做一次滿意度調查。半年後，馴猴人改口對猴子說：「從現在開始，改成每天早上給你們四顆栗子，晚上給你們三顆栗子。」然後再做一次滿意度調查，結果如下。試問，馴猴人餵食方法改變前後，猴子的滿意度是否有改變？(單位：猴子數)【10%】

	朝四暮三	
朝三暮四	滿意	不滿意
不滿意	38	27
滿意	21	14

Handwritten calculations for Question 3:
 21×27
 $65 \times 38 \times 14$
 35

四、請解釋下列名詞【25%】

- healthy worker effect
- ecological fallacy
- current age curve
- standardized rate
- lifetime prevalence

Handwritten calculations for Question 4:
 59
 $0.52 + 0.08 - 0.16 - 0.44$
 $6.76 + 0.16 + 0.64 + 4.84 = 12.4$
 $27 \ 26$
 $23 \ 24$
 $15 \ 25$
 $20 \ 40$

五、某流行病學家為了測試一個新型的篩檢工具，選擇了一個小社區進行先驅試驗。這個小社區共有 500 人，每個人除了進行此新型篩檢工具的檢查外，也進行用來當作黃金標準的病理切片檢查。結果發現，有 280 個居民已經產生了病理變化，其中 250 個產生病理變化居民的篩檢結果為陽性，相反地，只有 40 個沒有病理變化的居民有陽性反應。【25%】

- 請計算此新型篩檢工具的四種效度指標。
- 有哪些方法可以在篩檢時提高效率？

附註：

$$Z_{0.95}=1.645、Z_{0.975}=1.960、Z_{0.975}=1.960$$

$$X^2_{0.90,1}=2.706、X^2_{0.90,2}=4.605、X^2_{0.90,3}=6.251$$

$$X^2_{0.95,1}=3.841、X^2_{0.95,2}=5.991、X^2_{0.95,3}=7.815$$

$$X^2_{0.975,1}=5.024、X^2_{0.975,2}=7.378、X^2_{0.975,3}=9.348$$

$$t_{0.90,5}=1.476、t_{0.90,6}=1.440、t_{0.90,6}=1.415$$

$$t_{0.90,30}=1.310、t_{0.90,31}=1.309、t_{0.90,32}=1.309、t_{0.90,33}=1.308$$

$$t_{0.95,5}=2.015、t_{0.95,6}=1.943、t_{0.95,7}=1.895$$

$$t_{0.95,30}=1.697、t_{0.95,31}=1.696、t_{0.95,32}=1.694、t_{0.95,33}=1.692$$

$$t_{0.975,5}=2.571、t_{0.975,6}=2.447、t_{0.975,7}=2.365$$

$$t_{0.975,30}=2.042、t_{0.975,31}=2.040、t_{0.975,32}=2.037、t_{0.975,33}=2.035$$

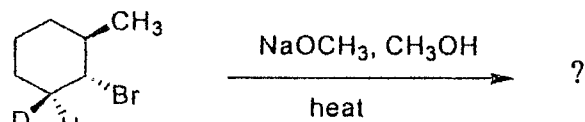
$$F_{0.90,3,30}=2.276、F_{0.90,3,31}=2.270、F_{0.90,3,32}=2.263、F_{0.90,3,33}=2.258$$

$$F_{0.95,3,30}=2.922、F_{0.95,3,31}=2.911、F_{0.95,3,32}=2.901、F_{0.95,3,33}=2.892$$

$$F_{0.975,3,30}=3.589、F_{0.975,3,31}=3.573、F_{0.975,3,32}=3.557、F_{0.975,3,33}=3.543$$

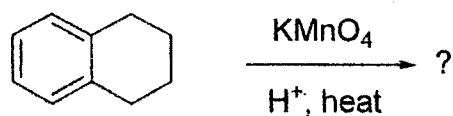
I. 【單選題】每題 3 分，共計 42 分。

1. What is the major product of the following reaction?



- (A) (B) (C) (D) (E)

2. What is the major product of the following reaction?



- (A) (B) (C) (D) (E)

3. Arrange the following substrates in order of their increasing S_N2 reactivity with NaCN:

- (I) 1-bromopentane, (II) 1-chloro-2,2-dimethylpentane, (III) 2-bromo-2-methylpentane, and (IV) 1-chloro-3,3-dimethylpentane.

- (A) IV < II < I < III (B) III < I < IV < II (C) IV < II < III < I (D) III < II < IV < I (E) None of the above

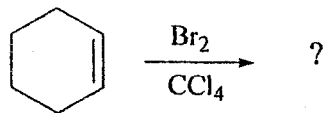
4. (*S*)-2-Methylbutanal _____ upon sitting in an acidic or a basic aqueous solution.

- (A) racemizes (B) esterifies (C) inverts completely to the *R* configuration (D) hydrolyzes (E) irreversibly forms the hydrate.

5. When pent-1-ene is treated with mercury(II) acetate in methanol and the resulting product is reacted with NaBH_4 , what is the primary organic compound which results?

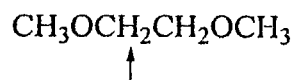
- (A) 3-ethoxypentane (B) 1-methoxypentane (C) 1-ethoxypentane (D) 2-ethoxypentane (E) 2-methoxypentane

6. What configurations are found in the product(s) of the reaction shown below?



- (A) 1*R*, 2*R* only (B) 1*S*, 2*S* only (C) 1*R*, 2*S* only (D) An equal mixture of 1*R*, 2*R* and 1*S*, 2*S* (E) An equal mixture of 1*R*, 2*R* and 1*R*, 2*S*.

7. What splitting pattern is observed in the proton NMR spectrum for the indicated hydrogens?



- (A) Singlet (B) Doublet (C) Triplet (D) Singlet of singlet (E) Multiplet.

8. Which one of the following would NOT be a suitable solvent for Grignard reagents?

- (A) Diethyl ether (B) Tetrahydrofuran (THF) (C) Ethanol (D) Hexane (E) They would all be suitable solvents.

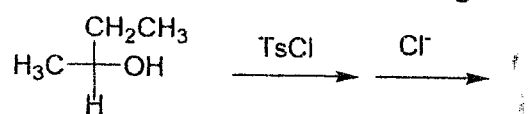
9. Which of the following lists the correct order of reactivity of the substrates in electrophilic aromatic substitution reactions?

- (A) Thiophene > pyrrole > furan > benzene. (B) Benzene > thiophene > furan > pyrrole.
 (C) Furan > pyrrole > benzene > thiophene. (D) Pyrrole > furan > thiophene > benzene.
 (E) Benzene > furan > pyrrole > thiophene

10. Which of the following functional groups would NOT show an IR absorbance above 3000 cm^{-1} ?

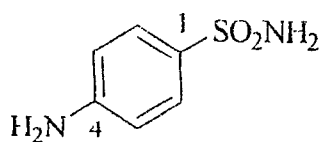
- (A) An amine (NH_2) (B) A carbonyl ($\text{C}=\text{O}$) (C) An alcohol (OH)
 (D) A vinylic carbon-hydrogen bond ($=\text{C}-\text{H}$) (E) A methylene hydrogen ($-\text{CH}_2-$)

11. What is the product of the following reaction



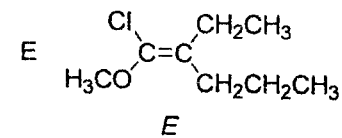
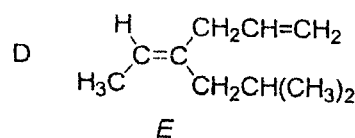
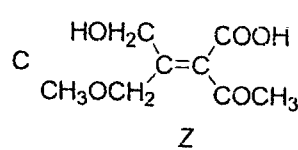
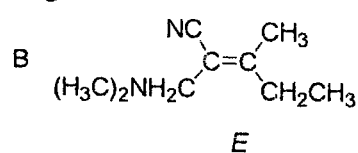
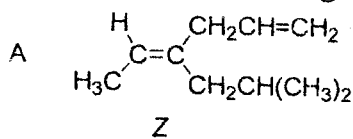
- (A) $\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{H}_3\text{C}-\text{C}-\text{OH} \\ | \\ \text{H} \end{array}$ (B) $\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{H}_3\text{C}-\text{C}-\text{OTs} \\ | \\ \text{H} \end{array}$ (C) $\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{Cl}-\text{C}-\text{CH}_3 \\ | \\ \text{H} \end{array}$ (D) $\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{TsO}-\text{C}-\text{CH}_3 \\ | \\ \text{H} \end{array}$ (E) $\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{H}_3\text{C}-\text{C}-\text{OCl} \\ | \\ \text{H} \end{array}$

12. Which of the following statements correctly describes the molecule shown below?



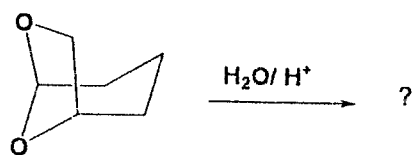
- (A) Its C-4 NH_2 is strongly basic while the C-1 NH_2 is weakly acidic.
 (B) Its C-4 NH_2 is weakly basic while the C-1 NH_2 is strongly acidic.
 (C) Its C-4 NH_2 is weakly basic while the C-1 NH_2 is weakly acidic.
 (D) Its C-4 NH_2 is strongly basic while the C-1 NH_2 is strongly acidic.
 (E) Both C-1 NH_2 and the C-4 NH_2 are weakly basic.

13. Which of the following *E*, *Z* designation are incorrect?



- (A) A,B (B) B,C (C) C,D (D) A,D (E) A,C

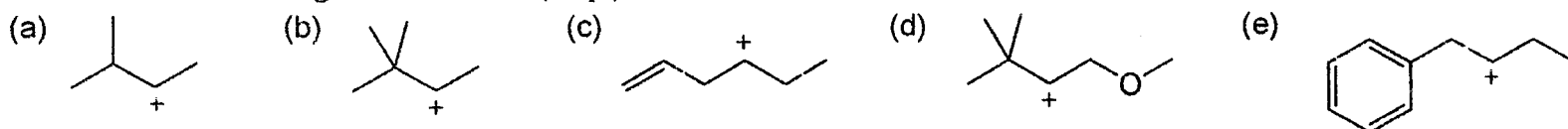
14. What is the product of acid-catalyzed hydrolysis of the ketal shown below?



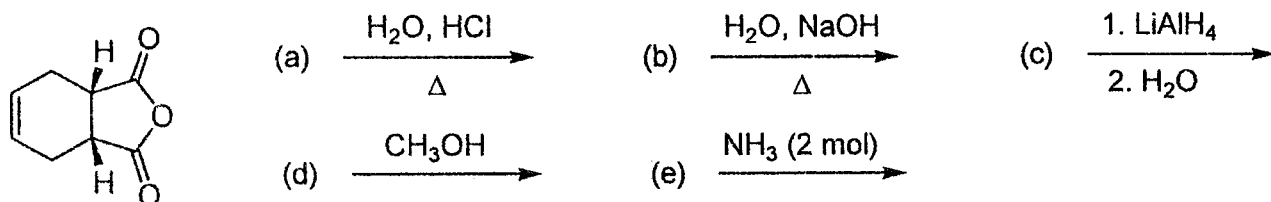
- (A) $\text{HO}-\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_2-\text{C}(=\text{O})-\text{CH}_2-\text{CH}_3$ (B) $\text{HO}-\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{C}(=\text{O})-\text{H}$
 (C) $\text{HO}-\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_2-\text{C}(=\text{O})-\text{H}$ (D) $\text{HO}-\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_2-\text{C}(=\text{O})-\text{CH}_3$ (E) $\text{HO}-\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH}$

II. 【非單選題】共計 58 分。

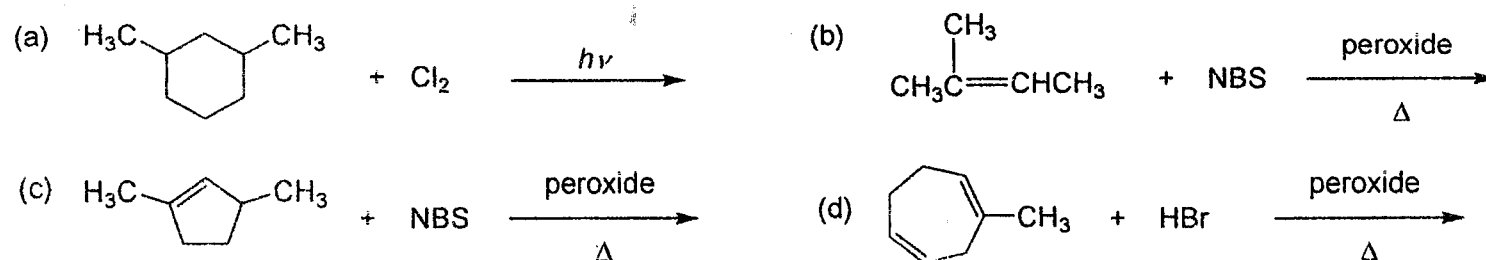
1. Each carbocation is capable of rearranging to a more stable carbocation. Limiting yourself to a single 1,2-shift, suggest a structure for the rearranged carbocation. (10 pt)



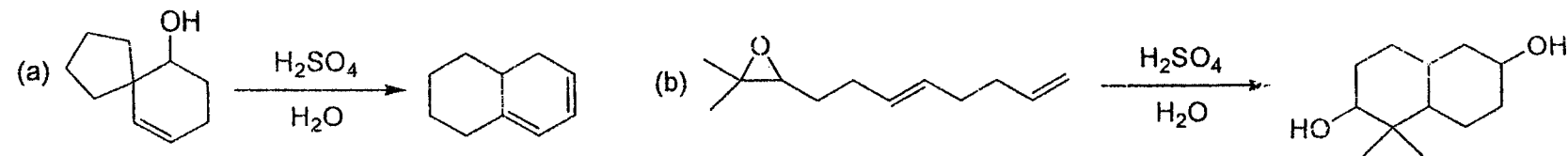
2. Show the product of treating this anhydride with each reagent: (10 pt)



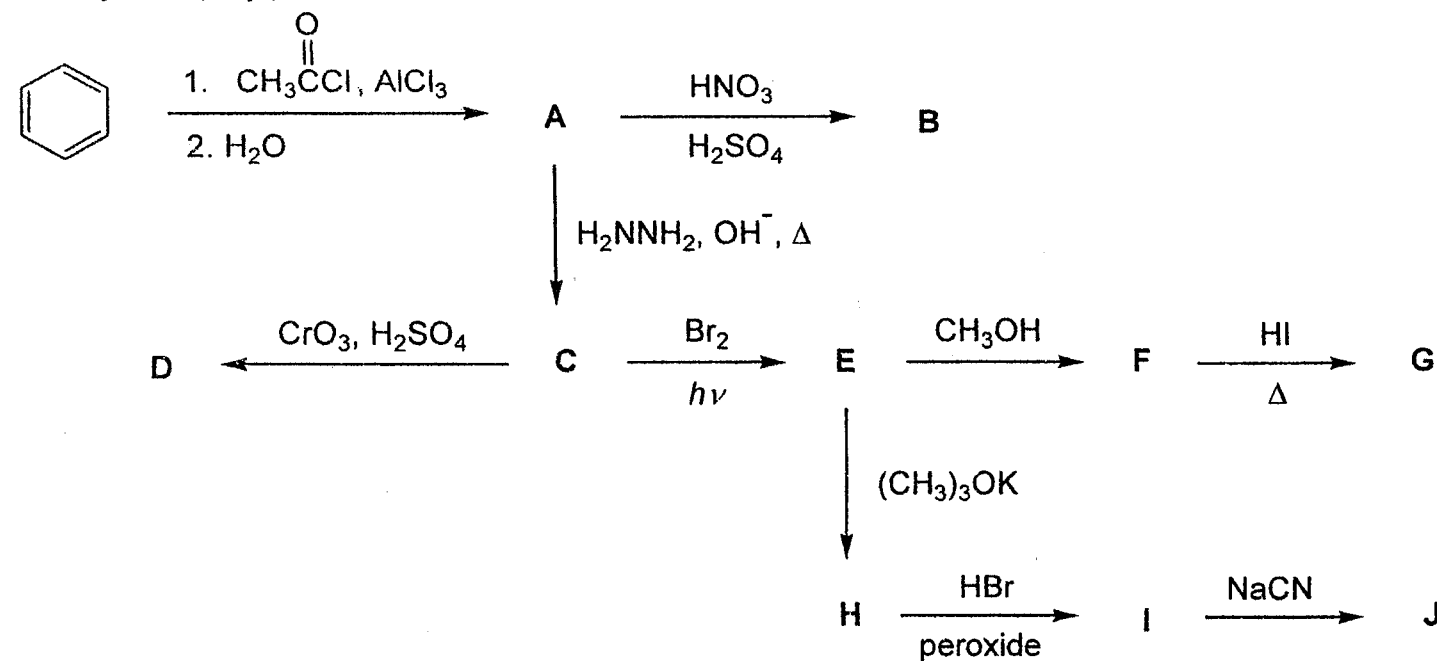
3. Give the major product of each of the following reactions, disregarding stereoisomers: (8 pt)



4. Propose a mechanism for each of the following reactions: (10 pt)



5. Identify A-J. (20 pt)



一、問答題:(每題 10%)

1. 如果某人有長期血糖過高的症狀出現,你覺得有哪些可能的原因?
2. 病人有某種蛋白質(如蛋白激酶)功能的缺失時,他的問題可能出自於哪幾個層面的異常?分別如何做確認?
3. 試舉例說明 ion channel 活化的機制與功能
4. 以骨骼肌受刺激後引起收縮為例,說明 Nerve-Muscle junction 與 muscle contraction 之機制
5. 試舉例說明基因選殖(gene clone), 基因降減(gene knock-down), 及基因過度表現(gene overexpression)在生理及醫學研究的應用
6. 請列舉出你研讀生理學時,一直無法理解的問題
7. 試述人體酸鹼平恆的調節
8. 舉例說明細胞外的刺激如何經由活化 receptor 引起細胞內訊息傳遞,並進而調控 gene transcription

二、根據下列的研究背景與結果,請試著以英文及中文寫出你的 (Conclusion) 結論 (20%)

[Background]: The neuroprotective effects of 17 beta -estradiol have been shown in models of central nervous system injury, including ischemia, brain injury, and more recently, spinal cord injury (SCI). Recent epidemiological trends suggest that SCIs in elderly women are increasing; however, the effects of menopause on estrogen-mediated neuroprotection are poorly understood.

[Objective]: The objective of this study was to evaluate the effects of 17beta-estradiol and reproductive aging on motor function, neuronal death, and white matter sparing after SCI of post- and pre-menopausal rats.

[Materials & Methods]: Two-month-old or 1- year-old female rats were ovariectomized and implanted with a silastic capsule containing 180 microg/mL of 17beta-estradiol or vehicle. Complete crush SCI at T8-9 was performed 1 week later. Additional animals of each age group were left ovary-intact but were spinal cord injured. Locomotor test was performed. Spinal cords were collected on post-SCI days 1, 7, and 21, and processed for histological markers.

[Result]: Administration of 17beta-estradiol to ovariectomized rats improved recovery of hind-limb locomotion, increased white matter sparing, and decreased apoptosis in both the post- and pre-menopausal rats. Also, ovary-intact 1-year-old rats did worse than ovary-intact 2-month-old rats.

[Conclusion]:

[結論]:

衛生研究所

一、解釋名詞：(20%)

1. Loss of heterozygosity
2. Wobble hypothesis
3. Complementation test
4. Crossing-over
5. Cistron
6. Satellite DNA
7. Heterochromatin vs. euchromatin
8. Chaperone
9. Imprinting
10. Operon

二、選擇題：(單、複選皆有，複選者有註明)：(20%)

1. 請問下列哪一條 PCR primer 的 annealing 溫度最高? 1) TACCTTAAGCAATGTCA
2) AGCCTGCCACAGCGTCG 3) TTATGACTTGAATACTG 4)
GACCTCATATGACATAG
2. (複選)請問下列哪幾種 DNA 的突變會造成蛋白質序列的改變? 1) silent mutation 2)
frameshift mutation 3) nonsense mutation 4) missense mutation
3. (複選)請問下列哪些物種有細胞核? 1) *Saccharomyces cerevisiae* 2) *Escherichia coli*
3) *Homo sapiens* 4) Viroid 5) Prion
4. (複選)真核細胞的遺傳物質會存在於哪些位置? 1) centrosome 2) chloroplast 3)
mitochondria 4) nucleus 5) ribosome
5. (複選)分光光度計(spectrophotometer)可用來作核酸定量，其原理何者為真? 1)
DNA 可吸收 260 nm 波長 2) RNA 可吸收 260 nm 波長 3) DNA 可吸收 280 nm 波
長 4) RNA 可吸收 280 nm 波長 5) protein 可吸收 280 nm 波長
6. 下列分子由大到小排列應為：1) cosmid > phagemid > BAC > YAC 2) BAC > YAC
> cosmid > phagemid 3) YAC > BAC > cosmid > phagemid 4) phagemid > cosmid >
YAC > BAC
7. (複選)下列哪些為蛋白質轉譯(translation)時會使用的序列 1) Shine-Dalgarno
sequence 2) Kozak sequence 3) IRES 4) Okazaki fragment
8. 在人類細胞中，下列哪一個不是 termination codon? 1) UAG 2) UUG 3) UAA 4)
UGA
9. 下列哪一個分子不是 DNA 複製時所需? 1) DNA polymerase 2) helicase 3) DNA
ligase 4) primase 5) TBP
10. DNA 複製時的正確性主要由何分子控制? 1) DNA polymerase 2) helicase 3)
DNA ligase 4) primase 5) TBP

三、配合題：(10%)

各種代表性物種的基因組(genome)大小。請從右列(in base pair)中選擇適合的答案。

- | | |
|--|-----------------------|
| _____ A. <i>Caenorhabditis elegans</i> | (1) 1.0×10^6 |
| _____ B. <i>Drosophila melanogaster</i> | (2) 4.2×10^6 |
| _____ C. <i>Escherichia coli</i> | (3) 1.3×10^7 |
| _____ D. <i>Homo sapiens</i> | (4) 8.0×10^7 |
| _____ E. <i>Saccharomyces cerevisiae</i> | (5) 1.4×10^8 |
| | (6) 1.2×10^9 |
| | (7) 3.3×10^9 |

四、問答題：(50%)

1. 請說明 gene, allele, genotype, phenotype 間之關係為何? (8%)
2. 請說明 siRNA, shRNA, microRNA, antisense RNA 在功能、構造、作用方式、及來源方面的異同。(10%)
3. 請畫出 gene structure in human genome, 和其所轉錄(transcription)出之 RNA structure, 以及蛋白質產物間之結構與序列對應關係。(接下題)(8%)
4. 接續上題, 請自基因開始到其產物功能, 闡述真核細胞基因表現有哪些不同層次的調控方式。(兩題可同時作答, 也可分開作答)(12%)
5. 配置 0.5 M 之氯化鈉(NaCl, molecular weight: 58.5)溶液 1 公升, 請問 1) 需用多少公克氯化鈉? 2) 此氯化鈉溶液以重量體積比表示應為? 3) 此溶液含有多少莫耳數(mole)之氯化鈉? (6%)
6. 試管內有 3.3 μg 之 5 kilo-base pair 的 plasmid, 請列式計算出試管內共有多少個 plasmid 分子? (assuming the average molecular weight of nucleotide: 330) (6%)