I. Multiple Choice Questions: Choose only one correct answer to each question　60%

Part A. Vocabulary　20%

_____1.Taiwan today is a _____ democracy with a highly competitive market-oriented economy.
(A) hulking (B) humpy (C) hurly-burly (D) hole-and-corner

_____2. CD sales have been declining year-on-year with the introduction of CD _____ and MP3 files.
(A) burners (B) collectors (C) composers (D) lovers

_____3. We're always in search of _____ in technology development.
(A) trespass (B) straightness (C) crackdown (D) breakthroughs

_____4. Although youthful, vigorous and prosperous, the Taiwanese have become victims of an education system that seeks to produce _____ earners rather than original thinkers.
(A) wholesome (B) high-wage (C) weary (D) high-handed

_____5. John's _____ is bothering him because he lied to his colleagues.
(A) consensus (B) conscience (C) consciousness (D) consentience

_____6. Mary is very _____. She says exactly what she's thinking even if it hurts.
(A) questionable (B) befuddled (C) bashful (D) blunt

_____7. This gourmet restaurant has a most _____ group of patrons, including Catholics, Moslems, Buddhists and Hindus.
(A) elated (B) elective (C) eclectic (D) elastic

_____8. Investors have become more _____ after the recent stock market crash.
(A) circumspect (B) circumfluent (C) circumjacent (D) circumpolar

_____9. In Chinese, there is no _____ at the end of a word to indicate the plural form.
(A) inflection (B) infliction (C) inflation (D) infraction

_____10. The _____ growth in the number of users of the Internet is the most amazing phenomenon in mass communication in recent years.
(A) explorative (B) exponential (C) expiatory (D) explicable

Part B. Grammar　20%

_____11. The music is becoming more diverse that young people _____ complete freedom to access and exchange information.
(A) having (B) being (C) were (D) have had

_____12. Without direct access to information and resources in WHO (World Health

(背面有試題)

Organization), Taiwan _____ to fight diseases on its own.
(A) has had (B) had being (C) has been (D) was

_____13. Tina is so candid that when I'm listening to her, I feel _____ she is my trust friend.
(A) even if (B) as if (C) what if (D) that if

_____14. Nowadays, the television _____ as a babysitter, with nannies particularly.
(A) was used (B) has using (C) is being used (D) is been used

_____15. Susan _____ stupid all in her life.
(A) has been being (B) is been (C) has being (D) was been

_____16. The agency sent us several applicants, the most qualified _____ was the first one.
(A) that (B) whose (C) in whom (D) of whom

_____17. It has been suggested that each member _____ some money for the renovation of the clubhouse.
(A) contributes (B) has contributed (C) contribute (D) has been contributed

_____18. It _____ by many that she had married for money.
(A) is thinking (B) thinks (C) was thought (D) thought

_____19. I haven't gone to that exhibit yet, nor do I have any intention _____.
(A) x (B) to (C) in (D) of

_____20. _____ every effort is being made to improve the financial condition of this company, the term of the loan will be extended.
(A) As much as (B) As well as (C) Since that (D) Inasmuch as

Part C. Cloze Test 20%

The talented Tom Hanks has played many different movie roles. Terminal is the first movie ___21___ he must speak with a European accent. He plays Viktor, a traveler ___22___ small country is destroyed by war when he takes a plane to America. Viktor cannot return home, ___23___ can he enter the U.S. Then he falls in love with a pretty flight attendant and ___24___ plan an escape!

_____21. (A) in which (B) where (C) that (D) which

_____22. (A) that (B) whom (C) who (D) whose

_____23. (A) nor (B) or (C) seldom (D) even

_____24. (A) is (B) have (C) must (D) ought

The roommate situation is the first challenge students face. Learning to tolerate a stranger's idiosyncrasies ___25___ teach flexibility and the art ___26___ compromise. But the learning process is often painful.

_____25. (A) ought (B) may (C) like (D) as
_____26. (A) in (B) at (C) of (D) on

Campus officials say that communicating on the Internet or roaming the huge universe of information ___27___ the World Wide Web holds an especially powerful lure for many college students ___28___ it takes them ___29___ a vast new realm of learning and research, usually ___30___ no cost.

_____27. (A) on (B) in (C) at (D) of
_____28. (A) which (B) whose (C) what (D) because
_____29. (A) for (B) into (C) of (D) at
_____30. (A) of (B) on (C) at (D) in

II. Reading Comprehension: Choose the best one answer to each question 20%

Learning is an active, constructive process whereby the learner strategically manages the available cognitive resources to create new knowledge by extracting information from the environment and integrating it with information already stored in memory. With the rapid development of computer technology and its application in language instruction, many researchers in the past ten years have engaged in the study of this kind of active and constructive learning process in multimedia environment. Researchers have found that a multimedia learning environment provides the means to facilitate the learning process by manipulating the availability of specific information at a given moment, by controlling the duration of that availability, by varying the way information is presented, and by ensuring the ease with which it can be searched.

_____31. What is the main idea of the passage?
(A) Multimedia learning environment organizes the information for learners.
(B) Multimedia learning environment differs from computer technology.
(C) Multimedia learning environment provides the availability in the learning process.
(D) Multimedia learning environment controls the duration of learning.

_____32. Which one of the followings can identify the topic?
(A) Researchers have pointed out the rapid development of learning.
(B) Multimedia environment facilitates the learning process.
(C) The learner extracts information and stores in memory.
(D) Learning is an active and constructive process.

Complimenting is a kind of speech act belonging to the category of expressives.

Complimenting is a positive politeness strategy aiming to praise the addressees for a past or present action. In other words, compliments are prime examples of speech acts that notice and attend to the hearer's interests, wants, and needs. A frequent denotation is Holmes's (1988:446) definition: "A compliment is a polite speech act which explicitly or implicitly attributes credit to someone other than the speaker. Usually, the person addresses for something good which is positively valued by the speaker and hearer." She defines a compliment as a speech act that is accomplished either explicitly or implicitly to express admiration or approval for some good of the addressee. In such a situation, explicit compliments are those whose meaning is understood literally, as in a direct speech act. Similarly, implicit compliments account for indirect speech acts whose meaning can be inferred among participants.

_____33. Which one of the followings expresses the topic of this passage?

(A) The various categories of expressives
(B) The direct and indirect speech acts
(C) The positive politeness strategy of the speakers
(D) The definition and classification of compliments

_____34. Which one of the followings is not correct?

(A) Compliments notice the hearer's interests and needs.
(B) A compliment expresses admiration for something good of the addressee.
(C) A compliment is a polite speech which is valued by the speaker.
(D) Implicit compliments are those whose meaning is understood literally.

Traditionally, sculpture as a genre has not been as powerful of a creative phenomenon in Pacific-rim cultures like China, Japan or Korea. But it has thrived in cultures of the Aegean, like the Cycladic islands and later the mainland of Greece centering on Athens where stone sculpture reached its apogee early, attaining ease and fluidity in the round, as well as becoming a palpable conveyor of motion and emotions. To this day, Europeans walking the streets, let alone going into cathedrals or museums, are profoundly familiar with images of solid forms moving in space.

_____35. The passage is about _____.

(A) Aegean　(B) space　(C) sculpture　(D) genre

After I had been living in Singapore for 18 months, my return to the U.K. was depressing when it came to fish dinners. Having enjoyed my sojourn in Southeast Asia and discovered Asian wet-market culture with the wonderful selection of live seafood and fresh fish including blue-fin tuna, wild sea bass, and coral grouper, going home was a shock. Of course, in the U.K. we have superb cold-water fish such as

halibut, cod, and haddock, but when you buy seafood you'll find yourself gazing in disbelief at the prices and at the sorry-looking half-frozen display of defrosting specimens that an Asian chef would reject immediately.

_____36. Which one of the followings is not listed in the passage?
(A) geographic region (B) restaurants (C) delicious dishes
(D) markets

_____37. What might be a good title for this passage?
(A) Prices of Fish (B) Defrosting Specimens (C) Southeast Asia
(D) Wet-market Culture

If you are a frequent patron of fast-food restaurant in Taipei, you may have discovered that most stores have added some new dishes to their menus. For the first time since it set up shops in Taiwan 19 years ago, KFC has introduced a pork burger. McDonald has also added a pork burger to its offerings, and Japanese-owned Mos Burger has started to serve a shrimp burger and seafood meals.

All of the changes were adopted to make up for declining sales of chicken and beef following the spread of avian influenza across 10 countries in Asia since mad cow disease discovered on December 23, 2003 in Washington State in the United States. Although the bird flu has appeared in Taiwan located as the weaker strain this year, the government's Council of Agriculture reports that at least affected 371,000 chickens and ducks had been put to death in the end of February. With regard to the mad cow disease, the government stipulated that any beef containers packaged after December 24, 2003 would not be allowed to enter Taiwan.

_____38. Which one of the followings is not correct?
(A) The avian flu and mad cow disease have caused consumers to promote seafood.
(B) The bird flu has appeared in Taiwan located as the weaker strain.
(C) The government stipulated a ban on beef imports.
(D) Fast-food restaurants set up in Taiwan nineteen years ago.

_____39. The main idea of this passage is that _____
(A) fast-food restaurants have added new dishes for consumers.
(B) the spread of avian influenza comes across ten countries in Asia.
(C) the owners of the fast-food restaurants acknowledge the great impact on the diseases.
(D) mad cow disease has been discovered in Washington State in the United States.

_____40. It can be inferred from this passage that _____
(A) fast-food restaurant owners welcome beef imports from mad-cow-

（背面有試題）

disease-free countries.

(B) fast-food restaurants have to revise their menus or sources of supply.

(C) the wave of international epidemics has triggered considerable anxiety among government workers.

(D) the sales of chicken and beef have been changed to well-cooked rice.

III. Writing an Essay　20%

Topic: Art is engendered in the genuine creativity and inspiring originality. Some say that genius is liberated only when the artist remains deaf to outside noises, deeply fascinated by, and more than satisfied with, the ever-expanding horizons within. What are your viewpoints and expectations about genius?

I. 選擇題 (單選, 每題 2 分, 共 70 分, 請於答案卷上作答)

1. Which of the following statements regarding peptide bond is incorrect?
(A) The peptide bond is a planar structure
(B) The –CN- bond has a partial double-bond character which makes rotation about the bond axis
(C) Small peptides are common and often have important biological roles
(D) *Linus Pauling* is the first scientist in discovry of regular polypeptde structure

2. Amino acids found in collagen that are formed by post-translational modification of two of the common amino acids including which of the following?
(A) Arg, Lys
(B) Pro, Lys
(C) Thr, Pro
(D) Pro, Tyr

3. Which of the following statements regarding peptide hydrolysis by proteolytic enzymes or chemical reagent is incorrect?
(A) Trypsin with specific cutting sites on C-terminal of basic amino acids
(B) Chymotrypsin with specific cutting sites on C-terminal of some non-polar amino acids
(C) CNBr with specific cutting site on Cys
(D) Bacteria cell wall containing d-form amino aicd may avoid from proteolytic hydrolysis

4. Regarding a serial steps of purification for identifying protein function, which of the following methods are properly applied in order? 1. determine purity 2. fractionate the crude extract 3. affinity chromatography 4. develop an assay to identify and quantify the desired protein
(A) 1 2 3 4
(B) 2 3 4 1
(C) 3 4 1 2
(D) 4 2 3 1

5. Which of the following statements concerning protein structure and function is incorrect?
(A) A given domain type can sometimes be recognized in several differently proteins.
(B) Multiple domains are common in the larger globular proteins.
(C) Herpesvirus is composed of icosahedral symmetry structure under electron micrographic observation
(D) "Domain" is a compact, locally folded region of secondary structure of protein.

(背面有試題)

6. Amino acids considered nonessential for humans are:
(A) those not incorporated into protein.
(B) not necessary in the diet if sufficient amounts of precursors are present.
(C) the same for adults as for children.
(D) the ones made in specific proteins by post-translational modifications.
(E) generally not provided by the ordinary diet.

7. Pyruvate and alanine are components of a shuttle that involves:
(A) hepatic and renal gluconeogenesis.
(B) hepatic gluconeogenesis and transport of muscle nitrogen to liver as alanine.
(C) transport of alanine to muscle to supply pyruvate.
(D) the production of alanine for use in protein synthesis in most peripheral tissues.
(E) transport of alanine between cytosol and mitochondria of liver.

8. Which of the following essential dietary factors is a precursor for a compound that can act as a carrier of one-carbon fragments at different levels of oxidation?
(A) Methionine
(B) Thiamine
(C) Folic acid
(D) Biotin
(E) Pyridoxine

9. Which of the followings is not used in biosynthesis of purine?
(A) Glutamate
(B) CO2
(C) Aspartate
(D) Glycine

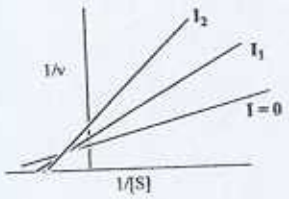
10. The biologic effects of phorbol estes may be traced to their effects on
(A) Adenylate cyclase
(B) Protein kinase A
(C) Protein kinase C
(D) Phospholipase C

11. A single base change in an mRNA may result in:
(A) No observable mutation
(B) A missense mutation
(C) A nonsense mutation
(D) All of the above
(E) None of the above

12. In what condition, enzyme can reach the maximum rate
(A) [S] << Km
(B) [S] = Km
(C) all the enzyme is bound with the substrate
(D) temperature reachs to 100°C.

13. What is the functional role of the oxyanion hole in serine protease catalyzed reaction?
(A) general base catalysis
(B) metal ion binding
(C) proximity and orientation
(D) transition state stability

14. The steady-state kinetic pattern of enzyme with substrate (S) in the varied concentration of inhibitor (I) was shown in the following figures. The concentration of inhibitor $I_2 > I_1 > I_0$. What kind of inhibiton is it?
(A) competitive inhibition
(B) noncompetitive inhibition
(C) uncompetitive inhibition
(D) irreversible inhibition



15. L. Pauling suggested that enzymes should have a much higher affinity for the transition state than for the ground state (reactant). It indicates the enzyme catalyzed reaction through
(A) lower the reactant free energy
(B) lower the energy barrier of a reaction
(C) lower the equilibrium constant
(D) lower the entropy.

16. Fumarase catalyzes the conversion of fumarate to malate and is described as a proficient enzyme or perfect enzyme. In what condition, an enzyme can be called a perfect enzyme.
(A) The reaction is diffusion-limited.
(B) It is an enzyme-substrate complex.
(C) An enzyme has a K_M less than 1 μM.
(D) k_{cat} is a rate-limiting step.

17. An inhibitor which covalently binds with enzyme is classified as
(A) competitive inhibitor
(B) noncompetitive inhibitor
(C) uncompetitive inhibitor
(D) irreversible inhibitors.

（背面有試題）

18. In the hepatic metabolism of ethanol, which one of the following is false?
(A) β-oxidation of fatty acid is increased
(B) the NADH / NAD^+ ratio is increased
(C) hepatic oxidation of lactate is inhibited
(D) gluconeogenesis is impaired

19. Which of the following cannot take place in the human body?
(A) transformation of acetoacetate into glucose
(B) transformation of glycerol into glucose
(C) transformation of alanine into pyruvate
(D) transformation of acetate into glucose
(E) tranasformation of glucose to fatty acid

20. Which of the following fatty acids would yield gluconeogenic precursors ?
(A) palmitic acid (C16:0)
(B) hepadecanoic acid (C17:0)
(C) linolic acid (C18:2)
(D) arachidonic acid (C20:5)

21. The role of the citrate in fatty acid biosynthesis and glucose metabolism is :
(A) to act as a precursor for addition of carbon
(B) to activate fatty acid synthetase
(C) to activate acetyl-CoA carboxylase
(D) to activate phosphofructokinase-1
(E) to activate pyruvate dehydrogenase

22. All of the following are true of the TCA cycle except which one?
(A) It begins with the condensation of acetyl-CoA and oxaloacetate
(B) The cycle is involved in both catabolic and anabolic pathways
(C) The cycle directly requires molecular oxygen in one of its enzymatic reaction
(D) GTP is produced by a substrate-level phosphorylation in the cycle
(E) The cycle participates in the synthesis of glucose from pyruvate

23. During the first week of diet of 1500 calories per day, the oxidation of glucose via glycolysis in the liver of a normal 59-kg (130-lb) woman is inhibited. What is the major mechanism for inhibition of glycolysis in liver during gluconeogenesis?
(A) glucokinase is inhibited by the high concentration of glucose-6-phosphate
(B) Phosphorylation of phosphofructokinase-2/fructose-2,6-bisphosphatase leads to decreased levels of fructose-2,6-bisphosphate,which is an allosteric activator of phosphofructokinase-1
(C) Increased hepatic acetyl-CoA inhibits the activity of pyruvate dehydrogenase
(D) Hydrolysis of glucose-6-phosphate to glucose decreases the availability of glucose-6-phosphate for glycolysis

24. After a well-rounded breakfast, which of the following would be expected to occur?
(A) increased activity of phosphorylase kinase
(B) increased activity of phosphoenolpyruvate carboxykinase
(C) decreased rate of glycogenesis
(D) increased activity of pyruvate dehydrogenase
(E) decreased activity of acetyl CoA carboxylase
(F) increased activity of pyruvate carboxylase

25. Which of the following metabolites is involved in glycogenolysis, glycolysis, and gluconeogenesis
(A) galactose-1-phosphate
(B) glucose-6-phosphate
(C) UDP-glucose
(D) fructose-6-phosphate
(E) glucose-1-phosphate

26. The key regulatory enzyme of the pentose phosphate pathway is positively regulated by
(A) reduced nicotinamide dinucleotide (NADH)
(B) adenosine diphosphate (ADP)
(C) guanosine triphosphate (GTP)
(D) nicotinamide dinucleotide phosphate ($NADP^+$)
(E) reduced flavine adenine dinucleotide (FADH)

27. A child has ingested cyanide from her parents' garage and is rushed to the emergency room. Which of the following components of the citric acid cycle will be depleted first in the child?
(A) NAD^+
(B) oxaloacetate
(C) succinate CoA
(D) citrate

28. A comatose laboratory technician is rushed into the emergency room. She dies while you examining her. Her most dramatic symptom is that her body is literally hot to your touch, indicating an extremely high fever. You learn that her lab has been working on metabolic inhibitors and that there is a high likelihood that she accidentally ingested one. Which one of the following is the most likely culprit?
(A) oligomycin
(B) dinitrophenol
(C) barbiturate
(D) cyanide
(E) antimycin D

(背面有試題)

29. As electrons are received and passed down the transport chain show below, the various carriers are first reduced with acceptance of the electron and then oxidized with loss the electron. A patient poisoned by which of the following compounds has the most highly reduced state of most of the respiratory chain carriers?
(A) antimycin A
(B) rotenone
(C) puromycin
(D) carbon monoxide
(E) chloramphenicol

30. Which of the following correctly describes the intermediate 4-hydroxy-3-methylglutaryl CoA?
(A) It is formed by HMG CoA reductase
(B) It is an intermediate in the synthesis of 3-hydroxybutyrate and acetoacetate
(C) It is formed only in cytosol
(D) It is formed by condensation of two molecules of acetyl CoA
(E) It inhibits the first step in cholesterol synthesis

31. What protein often malfunctions in diseases associated with the symptoms of high blood triacylglycerides levels and steatorrhea?
(A) LDL receptor
(B) Lecithin:cholesterol acyltransferase (LCAT)
(C) phospholipase C
(D) lipoprotein lipase
(E) pancreatic lipase

32. Which one of the following tissues can metabolize glucose, fatty acids, and ketone bodies for ATP production?
(A) adiposes tissue
(B) liver
(C) muscle
(D) brain
(E) red blood cells

33. It has been noted that infants placed on extremely low-fat diets for a variety of reasons often develop skin problems and other symptoms. This is most often due to
(A) deficiency of fatty acid desaturase greater than $\triangle^9$ ($\triangle^{12}$,$\triangle^{15}$)
(B) deficiency of chylomicron and VLDL production
(C) overproduction of prostaglandin E_2
(D) glycogen storage disease
(E) sphingolipidose

34. Which one of the following compounds is a key intermediate in the synthesis of both triacylglycerols and phospholipids?
(A) Phosphatidate
(B) CDP-choline
(C) eicosanoid
(D) CDP-diacylglycerol
(E) Ceramide

35. A teenager girl suffers from hypoglycemia. Inherited defect in all of the following enzymes may be the cause of hypoglycemia except which one?
(A) glucose-6-phosphatase
(B) debranching enzyme
(C) muscle phosphorylase
(D) carnitine acyltransferase I
(E) long-chain 3-hydroxylacyl-CoA dehydrogenase

II. Match proteins in column B with the functions in column A (10 分)
（請於答案卷上作答）

Column A	Column B
1. Remove RNA primer from the Okazaki fragments and copies DNA	A) Topoisimerase
2. Eukaryotic mRNA capping	B) DNA polymerase I
3. Regulates the SOS response in E.Coli	C) DNA polymerase III
4. Joins Okazaki fragments and other disconnected pieces of DNA together	D) DNA ligase
5. Catalyzes supercoiling isomerization	E) Primase
6. Control the lytic pathway in bacteriophage λ	F) Helicase
7. Polymerizes dNTPs	G) Telomerase
8. Uses ATP to unwind double-strand DNA	H) Guanyl transferase
9. Synthesis of RNA primer	I) Lex A
10. Maintenance of the length of chromosomes	J) Cro protein

III. Please explain the following terms or techniques (20 分) (請於答案卷上作答)

1. Reporter gene
2. RFLP
3. Kozak consensus sequence
4. Splicesome
5. Ubiquitin
6. Signal sequence
7. FISH
8. Proliferating cell nuclear antigen
9. Northern blotting
10. Leucine zipper motif

本試卷共七題，每題計分標示於題後，可使用計算機。

1. Please define the following words: (30%)
   a. Gibbs-Duhem relationship
   b. State function
   c. Collision theory
   d. tie line
   e. Elementary reaction
   f. Michaelis-Menten constant

2. Please describe the Joule-Thomson experiment. What is the importance of the experiment? (10%)

3. A solution of hexane and heptane at 30℃ with hexane mole fraction 0.305 has a vapor pressure of 95.0 torr and a vapor-phase hexane mole fraction of 0.555. Find the vapor pressures of pure hexane and heptane at 30℃. State any approximations made. (10%)

4. (a) Derive a relationship between the rate and concentrations of monomer and initiator for a thermal polymerization. Assume bimolecular termination. (10%)
   (b) Assume efficiency of initiator, f=1, and calculate the rate of polymerization when [I] = 0.001, [M] = 1 mol/liter. Calculate the activation energy for the rate of polymerization. (5%)

   $k_p = 2.3 \times 10^3$ liter mol^{-1} s^{-1} (E_a = 26 kJ/mol)
   $k_t = 2.9 \times 10^2$ liter mol^{-1} s^{-1} (E_a = 13 kJ/mol)
   $k_i = 1.07 \times 10^{-5}$ s^{-1} (E_a = 130 kJ/mol)

   (c) Will the rate and the average chain length increase or decrease with temperature. (5%)

5. For the gas-phase reaction at 300℃, the following data on the concentration of C_2F_4 were taken. (10%)

   $C_2F_4 \longrightarrow$ 1/2 cyclo- C_4F_8

Time / min	Concentration / mol L^{-1}
0	0.0500
250	0.0250
750	0.0125
1750	0.00625

Determine the order of the reaction and the rate constant at this temperature.

6. Consider a particle having mass m located in a one-dimensional potential-energy well with infinitely high walls. The wave function describing this system is

$$\psi_n(x) = \begin{cases} K \sin \dfrac{n\pi x}{a} & for\ 0 \le x \le a \\ 0 & \text{otherwise} \end{cases}$$

Where K is a constant and n=1,2,3,---- (Because the potential energy is infinite-an artificial condition-outside the well, it is not possible to make the derivative of Ψ continuous at the walls.) Determine K*K ? (10%)

7. True or False (if false, please correct it) (10%)
   (a) Addition a tiny amount of a soluble impurity to a pure liquid always lowers the freezing point.
   (b) Every process that has $\Delta T = 0$ is an isothermal process
   (c) For every isothermal process in a closed system, $\Delta S = \Delta H / T$.
   (d) For a binary two-phase system, the closer the point on a tie line is to a phase, the more of that phase is present.
   (e) For a closed system, equilibrium has been reached when S has been maximized.

53

master 120393

高雄醫學大學九十三學年度碩士班招生考試　分析化學　試題　第　頁

1.Simplify the following quantities using a unit with an appropriate prefix: e.g. $1.0*10^{-3}$ M → 1.0 mM. (10%)

(a) $3.2*10^{5}$ Hz
(b) $4.56*10^{-8}$ g
(c) $8.43*10^{5}$mmol
(d) $6.5*10^{6}$ s
(e) 72000 g

2. Explain the difference between the following terms. (20%)

(a) differentiating solvent and leveling solvent.
(b) reversible electrochemical cell and irreversible electrochemical cell.
(c) voltammetry and polarography.
(d) absorption photometer and fluorescence photometer.

3. Define the following terms. (18%)

(a) SRM
(b) dark current
(c) isocratic elution
(d) stokes shift
(e) sedimentation FFF
(f) electroosmotic flow

4. Titration of Cu^{2+} and Mg^{2+} in a 50.00-mL sample of hard water required 23.65 mL of 0.01205 M EDTA. (8%)

(a) What is the structure formula of EDTA? (3%)
(b) Calculate the total hardness of the water sample, expressed as ppm $CaCO_3$. (report the answer with appropriate significant figures) (5%)

5. What is the "operational definition of pH"? Why is it used? (5%)

6. What is the advantage and disadvantage of internal standard methods and standard addition methods. (8%)

7. Draw the energy-level diagram showing the processes that occur during (6%)

(a) absorption of incident radiation
(b) fluorescence.

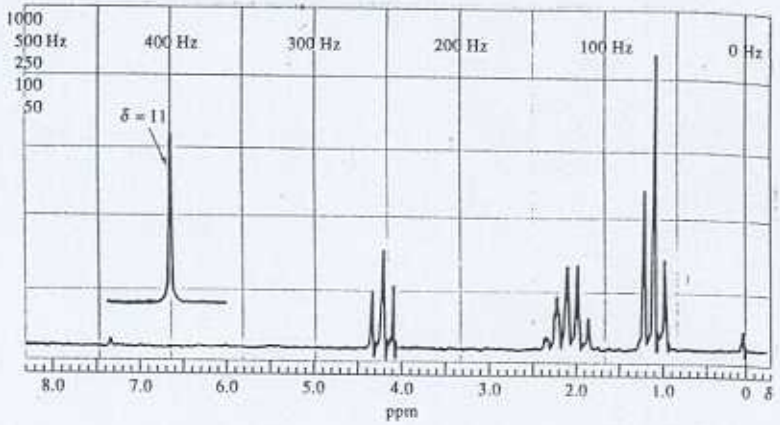
8. Name four characteristics of inductively coupled plasmas that make them suitable for atomic emission and atomic mass spectrometry. (8%)

9. Describe the **van Deemter equation** and explain the parameters in this equation. (7%)

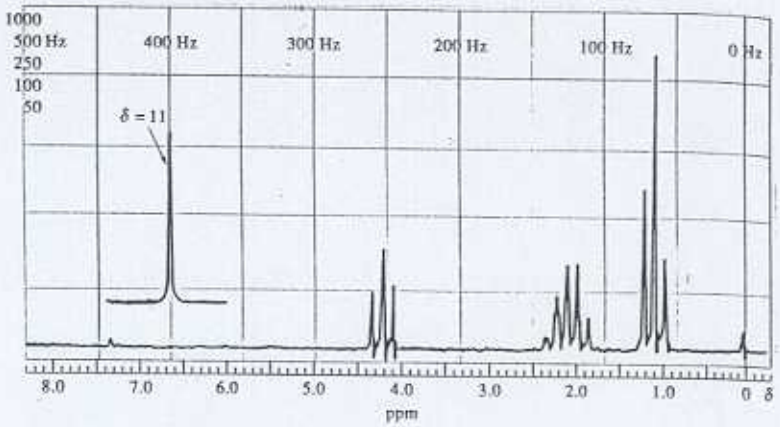
10. List the types of substances to which each of the following chromatographic methods is most applicable. (5%)

(a) gas-liquid
(b) ion-exchange
(c) gel permeation
(d) liquid adsorption
(e) gas-liquid

11. The following proton NMR spectrum is for a compound having an empirical formula $C_4H_7BrO_2$. Identify the compound please. (5%)



1. Simplify the following quantities using a unit with an appropriate prefix: e.g. $1.0*10^{-3}$ M → 1.0 mM. (10%)
   (a) $3.2*10^{5}$ Hz
   (b) $4.56*10^{-8}$ g
   (c) $8.43*10^{5}$mmol
   (d) $6.5*10^{6}$ s
   (e) 72000 g
2. Explain the difference between the following terms. (20%)
   (a) differentiating solvent and leveling solvent.
   (b) reversible electrochemical cell and irreversible electrochemical cell.
   (c) voltammetry and polarography.
   (d) absorption photometer and fluorescence photometer.
3. Define the following terms. (18%)
   (a) SRM
   (b) dark current
   (c) isocratic elution
   (d) stokes shift
   (e) sedimentation FFF
   (f) electroosmotic flow
4. Titration of Cu^{2+} and Mg^{2+} in a 50.00-mL sample of hard water required 23.65 mL of 0.01205 M EDTA. (8%)
   (a) What is the structure formula of EDTA? (3%)
   (b) Calculate the total hardness of the water sample, expressed as ppm $CaCO_3$. (report the answer with appropriate significant figures) (5%)
5. What is the "operational definition of pH"? Why is it used? (5%)
6. What is the advantage and disadvantage of internal standard methods and standard addition methods. (8%)
7. Draw the energy-level diagram showing the processes that occur during (6%)
   (a) absorption of incident radiation
   (b) fluorescence.
8. Name four characteristics of inductively coupled plasmas that make them suitable for atomic emission and atomic mass spectrometry. (8%)
9. Describe the **van Deemter equation** and explain the parameters in this equation. (7%)
10. List the types of substances to which each of the following chromatographic methods is most applicable. (5%)
    (a) gas-liquid
    (b) ion-exchange
    (c) gel permeation
    (d) liquid adsorption
    (e) gas-liquid
11. The following proton NMR spectrum is for a compound having an empirical formula $C_4H_7BrO_2$. Identify the compound please. (5%)



(I) 解釋名詞，每題 4 %

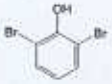
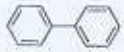
1. pulmonary circuit
2. T-dependent antigen
3. renin-angiotensin-aldosterone system
4. basal metabolic rate
5. corpus callosum
6. rhodopsin
7. generalized transduction
8. proto-oncogene
9. DNA microarray assay
10. smooth endoplasmic reticulum

(II) 問答題

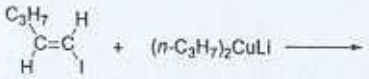
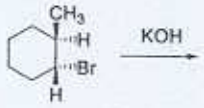
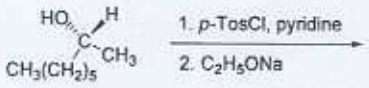
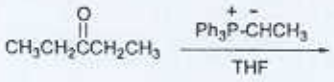
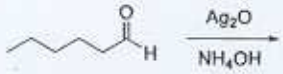
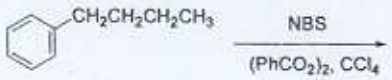
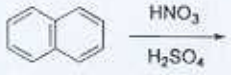
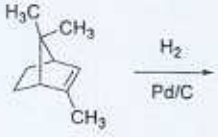
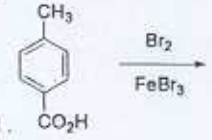
1. 請說明 glycolysis，Krebs cycle，及 electron transport chain 等反應在細胞及胞器上所發生的地點與產物，以及彼此間反應的連接。10%
2. 'Human Genome Project"中， human genome 定序的策略及方式爲何？10%
3. 請分別描述人類 oogenesis 及胚胎早期發育(至 gastrulation)的情形。15%
4. 鈣離子在人體具多樣角色，於不同層級皆有重要影響。請詳述鈣離子在人體細胞及組織的功能，以及人體如何調節血鈣中的濃度。25%

1、請以生物學觀念定義植物(plant)。(15%)
2、今日地球上有 90%以上的生物是無脊椎動物。顯然他對抵抗惡劣環境及其他生物的侵襲，有特別的能力。請說明之，並討論在演化上無脊椎動物的優勢。(25%)
3、人類的食道（esophagus）及氣管(trachea)有一段共用的通道，有時會導致意外的噎死（death by choking)。請依歷史演化面，解釋此一解剖學上的不完美現像。(25%)
4、試以 200 字說明生物之單次生殖（semelparity）與重複生殖（iteroparity)，兩種生殖策略的優劣。(20%)
5、為何果蠅 maternal effect genes 也被稱為 egg-polarity genes?(5%)
6、為何一個單一胚胎的幹細胞（a single embryonic stem cell）不能發育成為一胚胎？（5%）
7、何謂生物多樣性熱點（biodiversity hot spot）?(5%)

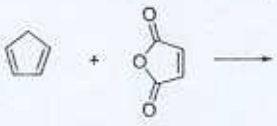
I. Give IUPAC name for the following compounds (10%)

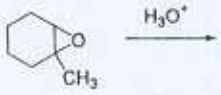
1. 
2. 
3. 
4. 
5. 

II. Give the major product(s) of the following reactions (40%)

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 

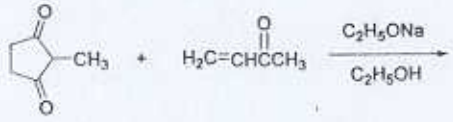
（背面有試題）

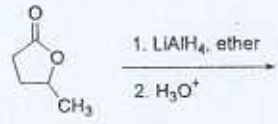
12. 

13. 

14. $CH_3CH_2CH_2CH_2C(=O)OC_2H_5 \xrightarrow[2.\ H_3O^+]{1.\ 2\ CH_3MgBr}$

15. $H_2C{=}C(CH_3)CH{=}CH_2 \xrightarrow[40\ ℃]{HBr}$

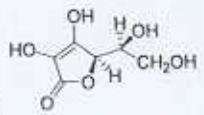
16. 

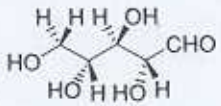
17. 

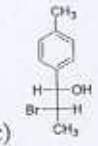
18. $CH_3C(=O)CH_2CH_2C(=O)OCH_2CH_3 \xrightarrow[H^+\ catalyst]{HOCH_2CH_2OH}$

19. 

III. Assign R or S configurations to the chirality centers in the following molecules (6%)

(a) 

(b) 

(c) 

IV. Draw the resonance structures for each of the following species (6%)

(a) 

(b) $H_2C{=}HC{-}HC{=}CH{-}CH{=}CH{-}\dot{C}H{-}CH_3$

V. What are the masses of the charged fragments produced in the following cleavage pathways? (8%)
(a) Alpha cleavage of 2-pentanone (b) McLafferty rearrangement of 4-methyl-2-pentanone

VI. Propose structures for compounds that fit the following ^{1}H NMR data (8%)

(a) $C_5H_{10}O$: δ 0.95 (6 H, doublet, J = 7 Hz), 2.10 (3 H, singlet), 2.43 (1 H, multiplet)
(b) $C_9H_{11}Br$: δ 2.15 (2 H, quintet, J = 7 Hz), 2.75 (2 H, triplet, J = 7 Hz), 3.38 (2 H, triplet, J = 7 Hz), 7.22 (5 H, singlet)

VII. Propose a mechanism for the following reaction (8%)

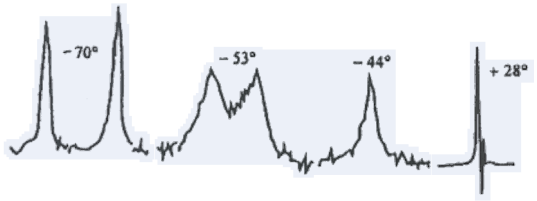
VIII. Propose synthesis of 4-chloro-1-nitro-2-propylbenzene from benzene (6%)

IX. Propose synthesis of *o*-methylbenzoic acid from *o*-methylaniline (8%)

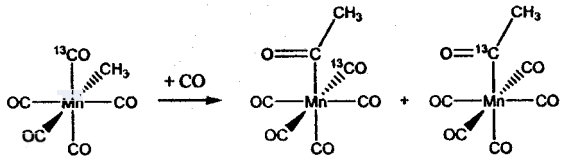
1. Please finish the periodic table by elemental symbol. (10%)

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	[p]	P	S	Cl	Ar
K	[a]	Sc	[b]	V	[c]	[d]	Fe	Co	Ni	Cu	Zn	Ga	[q]	[r]	[s]	Br	[t]
Rb	Sr	Y	Zr	Nb	[e]	[f]	[g]	[h]	[i]	[j]	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	[k]	[l]	[m]	[n]	[o]	Hg	Tl	Pb	Bi	Po	At	Rn

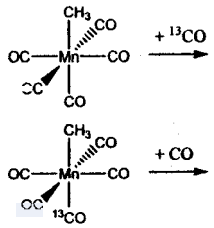
2. The ^{1}H-NMR spectra of the system *cis* and *trans*-$[(\eta^5\text{-}C_5H_5)Fe(CO)_2]_2$ at different temperatures are shown in the figure below. Give the structure for both isomers and assign the spectra to interpret the NMR results. (10%)



3. (a) It has been a long argument about whether the mechanism of forming acetyl complex is through intra-molecular CO insertion or CH_3 migration. Assume a designed experiment was carried out and the results are as shown in the following scheme. (It may not be what really happened in experiment.) Give your answer and explanation about the observed results. Indicate which mechanism fits the observed results better. (6%)



(b) According to your conclusion about the above mechanism, what will be the product of the following reactions? (4%)



4. Please answer the statements and questions below: (10%)
   a. Magnesium oxide exists as $Mg^{2+}O^{2-}$, not as $Mg^{+}O^{-}$. Explain.
   b. What experiment could be done to confirm that magnesium oxide does not exist as $Mg^{+}O^{-}$?

	ΔE(kJ/mol)
$Mg(g) \rightarrow Mg^{+}(g) + e^{-}$	735
$Mg^{+}(g) \rightarrow Mg^{2+}(g) + e^{-}$	1445
$O(g) + e^{-} \rightarrow O^{-}(g)$	-141
$O^{-}(g) + e^{-} \rightarrow O^{2-}(g)$	878

5. For the species O_2, O_2^{+}, O_2^{-}, give the electron configuration and the bond order for each. Which has the strongest bonds? (10%)
6. What is three-center two-electron (3c-2e) bond? Please give an example and explain it. (5%)
7. Dose the complex ion $[Co(en)_2(NH_3)Br]^{+}$ exhibit geometrical isomerism? Dose it exhibit optical isomerism? Draw their structure. (en = ethylenediamine; $H_2NCH_2CH_2NH_2$) (10%)
8. Which is the high spin complex among $[CoF_6]^{3-}$ and $[Co(NH_3)_6]^{3+}$, calculate the CFSE for both complexes. (10%)
9. Draw the three dimensional structure and give the point group of the following species: (a) B_2H_4 (b) $SOCl_2$ (c) $Mn_2(CO)_{10}$ (d) $[Re_2Cl_8]^{2-}$ (e) allene (10%)
10. For which d^n configurations would no Jahn-Teller splitting be expected for the tetrahedral case. (5%)
11. Explain the term "inner sphere mechanism" and "outer sphere mechanism". Give one example for each case. (10%)