

**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 each.

- Regarding the presidential campaign, he does not see eye to eye with his wife.  
(A) have any affection for (B) have any interest (C) agree with (D) show any passion as
- He suffered a massive hemorrhage and was immediately sent to the hospital.  
(A) severe (B) compact (C) critical (D) immense
- A novel idea suddenly came to her mind, she immediately went to see her boss.  
(A) imaginary (B) new (C) developed (D) realistic
- The voters opted for this presidential candidate because he promised to reduce taxes.  
(A) chose (B) forgave (C) opposed (D) advocated
- He was put through university with money left by his grandfather.  
(A) was admitted to (B) successfully finished (C) gave a mission to (D) carried a responsibility for
- The lectures in our university are quite liberal and broad minded.  
(A) preeminent (B) obsessed (C) renowned (D) permissive
- In *Sense and Sensibility*, one sister ends up in a happy marriage while the other loses her first suitor and must fall back on a boring alternative suitor.  
(A) fail to accomplish (B) slip and hit the ground (C) change seasons (D) accept a second choice
- University of California report warns that unless China radically changes its energy policies, its increases in greenhouse gases will be several times larger than the cuts in emissions being made by rich nations under the Kyoto Protocol.  
(A) oil consumption (B) discharge of smoke (C) production of coal (D) energy saving
- As a spectator, it's quite easy to pick holes in other people's work.  
(A) come up with (B) keep pace with (C) get even with (D) find fault with
- The students in our school are predominantly from the South.  
(A) mostly (B) scarcely (C) particularly (D) partially

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

The media [of an increasing number of surgical makeovers] says a lot about Korea's own 11 makeover. Not long ago, many people saw the country as a decidedly uncool industrial park pumping out cheap cars and appliances. But that started to change in the late 1990s, when the Korean government decided that entertainment could be an export industry. The film business in particular 12 government help and a big influx of private capital...

The popularity of Korean stars is 13 Korean 14 features as a standard of beauty across the region. Some sociologists see a subtext in the craze: a rebellion by Asian people against the images of Caucasian good looks that 15 much of the international trend.

- (A) country (B) image (C) race (D) medicine
- (A) benefitted from (B) inherited (C) messed up with (D) suffered from
- (A) naturalizing (B) blurring (C) establishing (D) diminishing
- (A) ethnic (B) export (C) prominent (D) legendary
- (A) export (B) in charge (C) take over (D) dominate

### Question 16 -18

The topic of thought is one area of psychology, and many observers have considered this aspect in connection with robots and computers: Some of the old worries about AI (artificial intelligence) 16 the question of

whether computers could think. The first massive electronic computers, capable of rapid (if often unreliable) computation and little or no creative activity, were soon dubbed 'electronic brains.' A reaction to this terminology quickly followed. 17, computers were called 'high-speed idiots,' and effort to protect human vanity. In such a climate, the possibility of computers actually 18 was rarely considered: It was bad enough that computers might be capable of thought.

16. (A) link closely to (B) is linking closely to (C) have close linked (D) be closely linked  
 17. (A) Putting them in their place (B) They are in their place  
 (C) To put them in their place (D) With putting them in their place  
 18. (A) being alive (B) could be alive (C) which alive (D) are alive

#### Question 19-20

The average American produces about 20 tons of the major greenhouse gas carbon dioxide (CO<sub>2</sub>) every year. That might sound like a lot — and Americans do have among the biggest carbon footprints in the world — but the entire world emits around 27 billion tons of CO<sub>2</sub> each year, 19 transportation, electricity use, deforestation. Look at those numbers for a moment, and you'll realize there's very little that any of us can do on an individual level to stop climate change. Live like a monk, take away your 20 tons — stop breathing if you'd like — and you'll 20 scratch the surface.

19. (A) by (B) in (C) through (D) with  
 20. (A) often (B) barely (C) strongly (D) constantly

#### Question 21-25

Why do Mickey Mouse, Ronald McDonald, and Superman have 21? They are all easily identified and powerful symbols of what some people call American 'cultural imperialism.' Most Americans would be surprised that these beloved cultural icons are often unwelcome by many overseas.

The cries of cultural imperialism are a 22 phenomenon. 23 western colonial empires in Asia, Africa and South America, nationalists in the newly independent countries often became outraged over the staying power of colonial cultures. These nationalists named the presence and domination of Western culture as 'cultural imperialism.' Paul Harrison in his book, 24, described it this way, "And so there grew up, alongside political and economic imperialism, that more insidious form of control --- cultural imperialism. It conquered not just the bodies, 25 the souls of its victims."

21. (A) in general (B) in this respect (C) in common (D) in short  
 22. (A) relatively recent (B) recently relative (C) relative recent (D) recent relative  
 23. (A) In order shrink of (B) Shrinking of (C) Upon shrinking of (D) With the shrinking of  
 24. (A) is called *Inside the Third World* (B) *Inside the Third World*  
 (C) who writes *Inside the Third World* (D) that names *Inside the Third World*  
 25. (A) and (B) so (C) as (D) but

**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.

Why don't people consult an herbalist and take his advice instead? One reason is that only a few herbalists have made a thorough analysis of herbal medicine. Most of the time, some herbalists don't know what makes up the herbal medicine they are prescribing. It is not uncommon that some people, especially young children, may suffer great pain because the herbal medicine qualifications of some herbalists are sometimes called into question. Some

of them have never received enough formal medical education. At best, they have just passed a test, which is given to make sure that they know the names of certain herbal drugs and their composition; at worst, they are no more than quacks. Finally, few large-scale experiments with herbal drugs are conducted.

Yet some people still ask herbalists for advice. They do so when doctors declare that no chemical medicine can treat a certain disease. Under the circumstances, people may gamble with their own lives, acting human guinea pigs for herbalists.

26. According to this passage, people may take herbs like ginger for several reasons. Which of the following is NOT one of them?

- (A) The herbs are cheap and easy to come by.      (B) Their illness may not be serious enough  
(C) The herbs may taste good                      (D) The herbs may really help them recover

27. In this passage, three reasons are given to explain why people won't go to see an herbalist. Which of the following is NOT one of them?

- (A) Qualification tests are not credible.              (B) Herbalists are poorly educated  
(C) Experiments are not widely conducted.          (D) The components of herbal medicine are poisonous.

28. By saying "people may gamble with their own lives," the author suggests that it is \_\_\_\_\_ to ask an herbalist for advice.

- (A) sensitive      (B) inevitable      (C) risky      (D) expensive

29. According to this passage, people may go to see an herbalist when their illness is \_\_\_\_\_.

- (A) unknown      (B) incurable      (C) infectious      (D) serious

In the past, writing was considered exclusive and time-consuming. The advent of the printing press popularized the written word and ushered in the gradual rise in global literacy. The speed and legibility of writing was greatly improved by the typewriter. But all of these were eclipsed when the personal computer came of age as the standard tool for writing. But what new dimensions and drawbacks, if any, does it offer?

30. The expression 'ushered in' is closest in meaning to \_\_\_\_\_.

- (A) hindered      (B) instigated      (C) procured      (D) harmonized

31. Which of the following could best replace the word 'eclipsed'?

- (A) taken over      (B) redeemed      (C) outshined      (D) reproached

The rules of etiquette in American restaurants depend upon a number of factors: the physical location of the restaurant, e.g., rural or urban; the type of restaurant, e.g., informal or formal; and certain standards that are more universal. In other words, some standards of etiquette vary significantly while other standards apply almost everywhere. Learning the proper etiquette in a particular type of restaurant in a particular area may sometimes require instruction, but more commonly it simply requires sensitivity and experience. For example, while it is acceptable to read a magazine in a coffee shop, it is inappropriate to do the same in a more luxurious setting. And, if you are eating in a very rustic setting, it may be fine to tuck your napkin into your shirt, but if you are eating in a very rustic setting it may be fine to demonstrate a lack of manners. It is safe to say, however, that in virtually every restaurant it is unacceptable to indiscriminately throw your food on the floor. The conclusion we can most likely draw from the above is that while the types and locations of restaurants determine etiquette appropriate to them, some rules apply to all restaurants.

32. With what topic is this passage primarily concerned?  
(A) rules of etiquette (B) instructions in proper etiquette  
(C) the importance of good manners (D) variable and universal standards of etiquette
33. According to the passage, which of the following is a universal rule of etiquette?  
(A) tucking a napkin in your shirt (B) not throwing food on the floor  
(C) reading a magazine at a coffee shop (D) eating in rustic settings

Now scientists are beginning to find that the most sexual part of the human body is the brain and it is inherently different in men and women. Scientific literature contains abundant evidence that males and females, even when little boys and girls, fall into distinct behavioral stereotypes. But with the advent of ever more powerful brain scanners, it seems these distinctions are the result of physical differences in the chemistry and neural circuitry of the brain that are laid down at birth.

34. This passage might be from an article on  
(A) Human Revolution (B) Men and Women: Minds Apart  
(C) Difference in Sexuality between Men and Women (D) The Newly developed brain scanner
35. "That men are better in target-directed motor skills, whereas women are stronger in precision manual tasks" would be a good example of \_\_\_\_\_.  
(A) behavioral distinctions between males and females.  
(B) the fact that brain is inherently different in men and women.  
(C) cultural influences (D) men being more capable than women

British people have mixed opinions about the Americans, reflecting the close but sometimes troubled relationship between the two nations. When people get to know Americans as individuals they have a lot more respect and affections for them than the popular, rather negative stereotype based on a casual meeting or on television programs might suggest. For many British people the US is associated with power in international politics, Hollywood, money and violence. Although Americans believe they rule the world, few of them know much about anything outside the US. The British think that money matters more than anything else to Americans, and they also think the US is a dangerous place where cannot walk in the streets or subways without fear of being attacked. Despite this, many want to go there for their holidays. And Young people generally have a much more positive attitude and love everything that comes out of America.

On the other hand, the US once belonged to Britain, and many Americans have British ancestors, so when Americans think of Britain, they think of a place that seems very familiar. Americans watch British television programs, especially period dramas, see James Bond films, and read detective stories by Agatha Christie. On the basis of these experiences, which are common even to people who are not of British origin, most Americans know more about Britain than about any other county. However, many Americans would have difficulty drawing map of Britain. They think the country consists of London and a village in Scotland where one of their ancestors came from. Every British has a servant and has great respect to the Queen. Americans admire the behavior of the British believing that they are quaint, although they themselves would never want all their social rules. British people, to them, are perfectly polite and proper, always knowing which knife and fork to use, saying "please" and "Excuse me." However, they are often conceived as being snobbish and do not seem friendly. The famous British reserve seems cold to Americans who are more used to an open enthusiastic way of communicating. Thus a result, when British say: "That's no problem" when they know that it will be a big problem, it confuses the Americans.

36. What might be a proper title for this reading?  
(A) What British people think of Americans. (B) What Americans think of British people.  
(C) Great Britain, the ancestors of the Americans. (D) Cultural stereotypes.

37. What do British usually think of Americans?

- (A) They have mixed feelings.      (B) They feel indifferent.  
(C) They never want to have any association with American.      (D) They admire everything that is American.

38. Which of the following is true about the US from British perspective?

- (A) Most Americans know a lot about the world outside the US.  
(B) Few Americans know a lot about the world outside the US.  
(C) Americans value power more than anything else.  
(D) The US subway is the only public transportation available.

39. When Americans think of Britain, what do they usually feel?

- (A) They feel indifferent.      (B) They feel annoyed.  
(C) They feel familiar.      (D) They never want to be associated with Britain.

40. According to the reading, which of the following is true?

- (A) American can easily draw a British map.  
(B) Many Americans watch British television programs.  
(C) Americans never wanted to be associated with Britain because they once belonged to Britain.  
(D) Americans think only the British movie stars can have servants.

**Part IV. Essay. 20 points.**

Please write a well-structured essay in 150 to 200 words on the following topic:

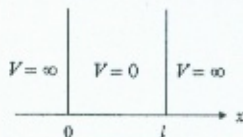
**As a global citizen, what do you think your responsibilities and rights are supposed to be? Please use examples to support your statements.**

1. The one dimensional Schrödinger equation for a particle is

$$-\frac{\hbar^2}{2m} \frac{d^2\psi(x)}{dx^2} + V(x)\psi(x) = E\psi(x)$$

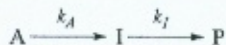
Please solve the wave function and the energy for a particle in the box with length  $l$ .

(15%)



2. The rate constant for the reaction of hydrogen with iodine is  $2.45 \times 10^{-4} \text{ M}^{-1}\text{s}^{-1}$  at  $302^\circ\text{C}$  and  $0.950 \text{ M}^{-1}\text{s}^{-1}$  at  $508^\circ\text{C}$ . Calculate the activation energy and Arrhenius preexponential factor for this reaction. (10%)

3. Consider the following sequential reaction scheme:



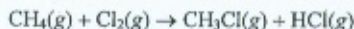
Assuming that only reactant A is present at  $t = 0$ , what is the expected time dependence of [P] using the steady-state approximation? (10%)

4. Consider the following energy-level diagram.

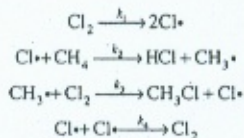
Determine the probability of occupying the second energy level at 300 K. (10%)



5. Consider the following reaction of methane with molecular chlorine:



Experimental studies have shown that the rate law for this reaction is one-half order with respect to  $\text{Cl}_2$ . Show that the following mechanism is consistent with this behavior. (15%)



6. How many types of energy levels are there for polyatomic molecules? Arrange them in the order of increasing energy-level spacing. (10%)
7. Please explain the following terms: (20%)
- a. State function
  - b. Pauli exclusion principle
  - c. Greenhouse gases
  - d. Supercritical fluids
  - d. Phosphorescence
8. The average bond enthalpy of the O–H bond in water is defined as one-half of the enthalpy change for the reaction  $\text{H}_2\text{O}(g) \rightarrow 2\text{H}(g) + \text{O}(g)$ . The formation enthalpies,  $\Delta H_f^\circ$ , for  $\text{H}(g)$  and  $\text{O}(g)$  are 218.0 and 249.2  $\text{kJ mol}^{-1}$ , respectively, at 298.15 K, and  $\Delta H_f^\circ$  for  $\text{H}_2\text{O}(g)$  is  $-241.8 \text{ kJ mol}^{-1}$  at the same temperature. (10%)
- a) Determine the average bond enthalpy of the O–H bond in water at 298.15 K.
  - b) Determine the average bond energy,  $\Delta U$ , of the O–H bond in water at 298.15 K. Assume ideal gas behavior.

第一部份: 填充

1. Write the multiplier for the following prefix. (4%)

a) Z \_\_\_\_\_ (b) n \_\_\_\_\_

2. Write the full name of SRM in English. \_\_\_\_\_ (6%)

3. The distribution of replicate data in most of the quantitative analytical experiments approaches \_\_\_\_\_ curve, the highest value in the curve the \_\_\_\_\_ of the sample. (4%)

4. What kind of chemical or physical properties can be employed in the following instrumental methods? (6%)

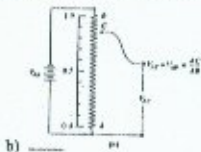
i. Roman spectroscopy \_\_\_\_\_

ii. Coulometry \_\_\_\_\_

5. Which of the following digital data domain represent the most efficient method for encoding data? (a) count serial data, (b) binary-coded aerial data (serial), (c) paralleled binary data \_\_\_\_\_ (3%)

6. Choose the best answer that the following circuits represent. (6%)

(1) resistors in parallel (2) current divider (3) voltage divider (4) resistors in series

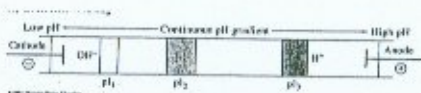


7. Write the operation mode for the following CE separations. (6%)

a)



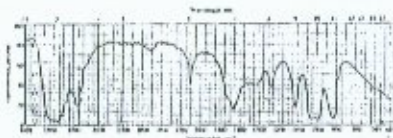
b)





## 第二部份：簡答及計算

1. What kind of fields or gradients can be used in the FFF (field flow fractionation)? (9%)
2. The following spectrum was obtained for a liquid with the empirical formula of  $C_5H_8O$ . Identify the compound. (9%)



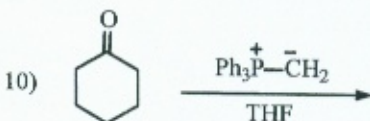
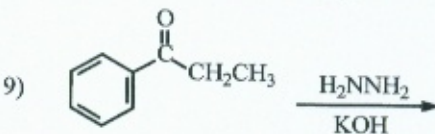
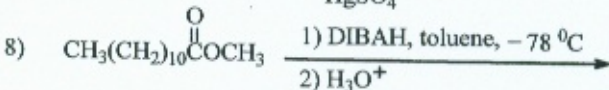
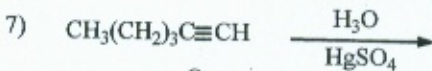
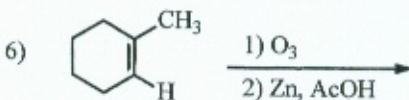
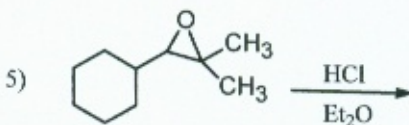
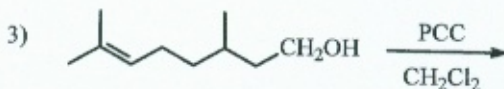
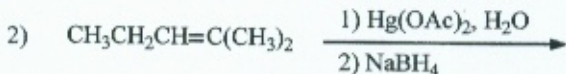
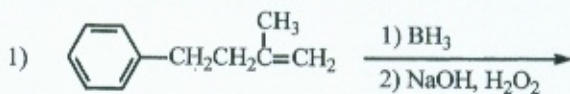
3. How do the spectra for electron-impact and field ionization sources differ from each other? (6%)
4. Define (10%)
  - a) gradient elution
  - b) stop-flow injection
5. Calculate the (a) median; (b) spread, or range; of the following data.(2.7, 3.0, 2.6, 2.8, 3.2).(6%)
6. Draw the titration curve for amperometric titration which the analyte is the only electroactive species. (5%)
7. Supply the missing data in the table below ( $K_{aHIO_3} = 1.7 \times 10^{-1}$ )(15%)

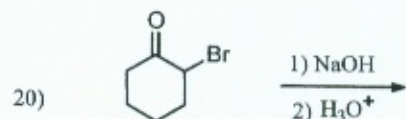
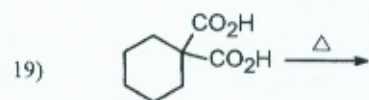
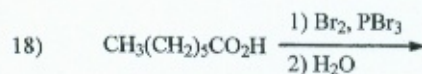
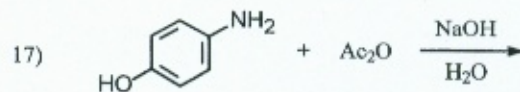
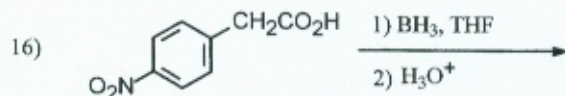
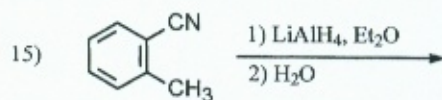
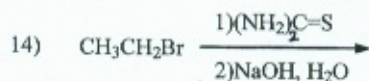
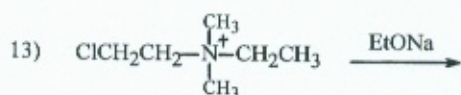
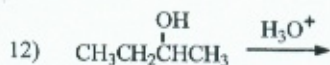
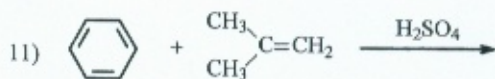
Acid	$c_T = c_{HA} + c_{A^-}$	pH	[HA]	[A <sup>-</sup> ]	$\alpha_2$	$\alpha_1$
Iodic acid ( $HIO_3$ )	0.200					0.765

8. Write the full name of SFC in English and predict the effects of the following changes to the elution time when we use  $SF_6/CO_2$  as an eluant. (9%)
  - i. Increases flow rate (under constant pressure and temperature)
  - ii. Increased temperature (under constant pressure and flow rate)

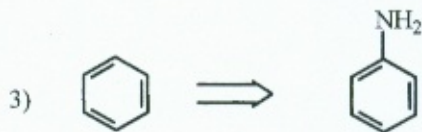
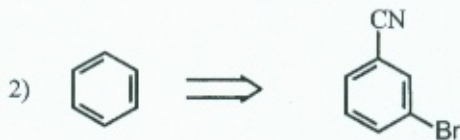
1. 寫出下列物質之主要組成成分或畫出其構造 (12 分)
  - 1) triacylglycerol
  - 2) lactose
  - 3) proteoglycan
  - 4) NADH
2. 請就下列特性比較 classical enzymes 與 allosteric enzymes 之不同 (10 分)
  - 1) 酵素與受質交互作用之模式
  - 2) 酵素動力學特性
3. 說明 polymerase chain reaction 及 site directed mutagenesis 之原理及用途 (10 分)
4. 寫出 ketone bodies 之三種成分, 並說明其如何合成及利用(10 分)
5. 說明 LDL 及 HDL 如何參與 cholesterol 之代謝?(10 分)
6. 說明 insulin 如何調控 glycolysis 及 glycogen synthesis?(8 分)
7. 敘述 ubiquitin pathway 如何參與 protein degradation?(8 分)
8. microRNA 如何參與 gene regulation?(8 分)
9. 請說明如何進行 Mismatch DNA repair? 寫出所參與之酵素及其作用(8 分)
10. 如何進行 pre-mRNA 之 RNA splicing?(8 分)
11. 請寫出 urea cycle 之代謝意義 (8 分)

[I] 寫出下列方程式的主要產物：(40%)

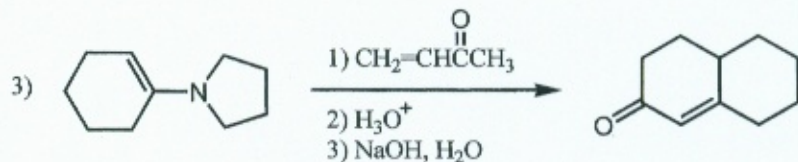
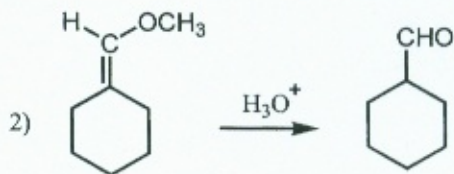
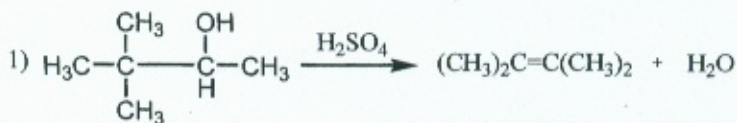




[II] 寫出下列方程式的合成設計：(30%)



[III] 寫出下列方程式可能的反應機構：(30%)

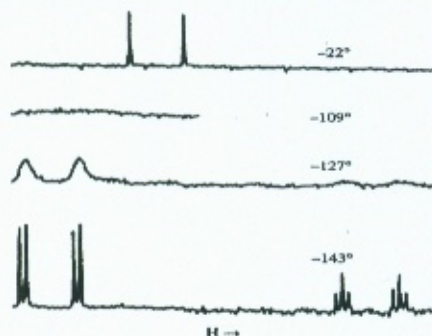


1. Explain the following term: (18%)  
1) Laporte's rule, 2) Berry pseudorotation, 3)  $\alpha$ -abstraction, 4) F-strain and 5) fluxional, 6) Jahn-Teller Theorem.
2. Determination the point group of the following compounds:  $C_2H_6$ (staggered conformation) and  $B_2H_6$ . (6%)
3. Predict the structure of following compound from the Walsh diagram 1)  $BH_2^+$ , 2) the first excited state of  $BeH_2^+$ . (8%)
4. Describe the parameter affect the 10 Dq values of metal complexes for ligand field theory. (8%)
5. Predict the structure of the following compounds by VSEPR:  $XeO_3F_2$ ,  $TeCl_4$  and  $CIF_3$ . (6%)
6. Give the valence electron count for the following species. (9%)  
a)  $(\eta^4\text{-cot})(\pi\text{-cp})_6Co$ , b).  $[C_7H_7Mo(CO)_3]^+$ , c).  $Fe_3(CO)_{12}$ .
7. Compare and explain the order stretching frequency ( $\nu_{CO}$ ) for the following compound:  $Mn(CO)_6^+$ ,  $Cr(CO)_6$  and  $V(CO)_6^-$ . (5%)
8. Compare and explain the basicity of following compounds:  $NH_3$ ,  $Me_3N$ ,  $Me_2NH$ ,  $MeNH_2$  in aqueous solution. (6%)
9. Draw all isomer for  $M(abcde\overset{\curvearrowright}{e})$  assuming the complex forms a octahedral and  $\overset{\curvearrowright}{e}$  are cis position. (8%)
10. Determine the number of IR-active C-O stretching modes for  $Mn(CO)_5$ . (8%)

$C_4$	$E$	$2C_4$	$C_2$	$2\sigma_v$	$2\sigma_d$		
$A_1$	1	1	1	1	1	$z$	$x^2 + y^2, z^2$
$A_2$	1	1	1	-1	-1	$R_z$	
$B_1$	1	-1	1	1	-1		$x^2 - y^2$
$B_2$	1	-1	1	-1	1		$xy$
$E$	2	0	-2	0	0	$(x, y), (R_x, R_y)$	$(xz, yz)$

$D_{3h}$	$E$	$2C_3$	$3C_2$	$\sigma_h$	$2S_6$	$3\sigma_v$	$(x \text{ axis coincident with } C_2)$	
$A_1'$	1	1	1	1	1	1		$x^2 + y^2, z^2$
$A_2'$	1	1	-1	1	1	-1	$R_z$	
$E'$	2	-1	0	2	-1	0	$(x, y)$	$(x^2 - y^2, xy)$
$A_1''$	1	1	1	-1	-1	-1		
$A_2''$	1	1	-1	-1	-1	1	$z$	
$E''$	2	-1	0	-2	1	0	$(R_x, R_y)$	$(xz, yz)$

11. The following NMR spectrum is  $^{19}\text{F}$  NMR of  $\text{PCl}_2\text{F}_3$  compound, predict its structure (10%)



12. Based on Table 1, what is the substitution mechanism, why? (8 %)

Table 1 Effect of nonleaving ligands on acid hydrolysis rates of some  $\text{Co}^{\text{III}}$  Complexes

$$\text{trans-}[\text{Co}(\text{N}_4)\text{LCl}]^{\text{n}+} + \text{H}_2\text{O} \longrightarrow \text{trans-}[\text{Co}(\text{N}_4)\text{L}(\text{H}_2\text{O})]^{\text{(n+1)+}} + \text{Cl}^-$$

Complex	$k(\text{s}^{-1})$
$\text{trans-}[\text{Co}(\text{cyclam})\text{Cl}_2]^+$	$1.1 \times 10^{-6}$
$\text{trans-}[\text{Co}(\text{cyclam})(\text{NCS})\text{Cl}]^+$	$1.1 \times 10^{-9}$
$\text{trans-}[\text{Co}(\text{cyclam})(\text{CN})\text{Cl}]^+$	$4.8 \times 10^{-7}$
$\text{trans-}[\text{Co}(\text{tet-b})\text{Cl}_2]^+$	$9.3 \times 10^{-6}$
$\text{trans-}[\text{Co}(\text{tet-b})(\text{NCS})\text{Cl}]^+$	$7.0 \times 10^{-7}$
$\text{trans-}[\text{Co}(\text{tet-b})(\text{CN})\text{Cl}]^+$	$3.4 \times 10^{-4}$