Part I. Question 1 to 10, please choose the answer closest to the underlined word or phrase. Question 11 to 15, please choose the answer that best completes the sentence. One Answer Only. 2 points.

1. Some of the **potential** dangers to cows treated with synthetic bovine growth hormone were brought into light through the effort of some scientist.
(A) related (B) possible (C) certain (D) obvious
2. As more U.S workers spend their days at keyboards, hand injuries and lawsuits are **multiplying**.
(A) increasing (B) minimizing (C) boundary-crossing (D) profit-making
3. There are several **bodies** that match volunteers with voluntary groups, including the National Volunteering Centre.
(A) organizations (B) remains (C) people (D) motivations
4. Piaget believed that we go through four stages in understanding the world. Each of the stages is age-related and consists of **distinct** ways of thinking.
(A) new (B) simple (C) different (D) exact
5. Some people think that spoken language is **transient** but writing tends to last because of its physical medium (characters on some surface).
(A) unimportant (B) temporary (C) interesting (D) clear
6. But what most prevents women from reaching the boardroom, say bosses and headhunters, is lack of **hands-on** experience of a firm's core business.
(A) significant (B) available (C) tested (D) practical
7. Manufactured in the **tranquil** New England town of Concord, New Hampshire, the famous Concord Coach came to symbolize the Wild West.
(A) peaceful (B) bustling (C) industrial (D) tiny
8. With oil prices shooting up, the demand for big cars is **dwindling**. Now compact cars are on great demand.
(A) depressing (B) surpassing (C) decreasing (D) swirling
9. All of this she conferred on me without ever **setting foot in** the kitchen of her house.
(A) leaving (B) dressing (C) entering (D) preparing
10. In choosing your career, you should follow your heart, but you also need to be **rational**.
(A) making decisions based on intelligent thinking (B) making decisions using strong emotion of feeling
(C) making decisions because of relationships (D) making decision because of profits
11. _____ abolishing death penalty is a global trend, the public is so polarized over the issue that it requires more discussion.
(A) Because (B) Whereas (C) Although (D) In addition to
12. Women now often work areas _____ medicine, business management and higher education, which would not have been possible 100 years ago.
(A) regardless of (B) in virtue of (C) due to (D) such as
13. Both the National Cancer Institute and the World Health Organization say there isn't evidence to support the assertion that cell phones are a _____ threat.
(A) health public (B) healthy public (C) public-health (D) publically health
14. _____ on barren slopes can help prevent erosion.
(A) Planting trees (B) For trees to be planted (C) In order to plant trees (D) Trees are planted
15. Almost four in five people around the world believe that _____, a poll for the BBC World Service suggests.
(A) access the Internet is a fundamental right (B) that access to the Internet is a fundamental right
(C) fundamental right accessing the Internet is (D) the fundamental right is access the Internet

II. Question 16 to 25, please choose the best answer to fill each of the numbered blanks in the passages. 2 points each.

People communicate in many different ways and yawning is one important means of **16** communication. It gives many different **17** to people and everyone yawns. Some birds, reptiles, fish and most mammals also yawn. However, the reason why we do it is still a mystery. There is also very little research available on yawning as for most people, it is not a problematic **18**. Here are a few things that are know about yawns: 1). The **19** duration of a yawn is about six seconds; 2.) in humans, the **20** yawn happens about eleven weeks after conception; 3.) Yawns become contagious to people between the first and second years of life.

16. (A) audio (B) friendly (C) non-verbal (D) scenario
17. (A) messages (B) funs (C) challenges (D) experiments
18. (A) resistance (B) repeat (C) reflex (D) rejection
19. (A) critical (B) analytical (C) terminal (D) average
20. (A) most difficult (B) earliest (C) most fundamental (D) experiential

Culture shock can be an excellent lesson **21** human differences. The reason culture shock occurs is that we are not prepared for these differences. **22** the way we are taught in our culture, we are all ethnocentric. This term comes from the Greek root ethnos, **23** a people or group. Thus, it refers to **24** our outlook or world view is centered on our own way of life. Ethnocentrism is the belief that one's own patterns of behavior are the best: the most natural, beautiful, right, or important. Therefore, other people, **25** that they live differently, live by standards that are inhuman, irrational, unnatural, or wrong.

21. (A) on relative values and understanding (B) in relative values and in understanding
(C) about relating values and on understanding (D) by means of relative values and understanding
22. (A) Because of (B) Because (C) In the event of (D) In spite of
23. (A) it means (B) it is meaning (C) meaning (D) by meaning
24. (A) that the fact (B) the fact that (C) the fact (D) the fact that is
25. (A) to the extend (B) by and large (C) more or less (D) drawing a line

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

Dariusz Leszczynski, a research professor at Finland's Radiation and Nuclear Safety Authority in Helsinki, has done studies indicating that radio frequency radiation may create a stress reaction in the cells that line blood vessels, leading to a dangerous breach in the blood-brain barrier. "Mobile-phone radiation may be able to indirectly hurt cells, perhaps by interfering with their ability to repair normal DNA damage," he says. "Given the scientific uncertainty, it's premature to say the use of cell phones is safe."

If radio frequency radiation increases the chances of developing brain cancer, it should show up in long-term studies of cell-phone users. But many epidemiological studies have found no clear connection, including a 2007 Danish Cancer Society study of 421,000 cell-phone users, which led many in the media to conclude that mobiles are harmless. To date, "peer-reviewed scientific evidence has overwhelmingly indicated that wireless

devices do not pose a risk," says John Walls, a spokesman for CTIA, a global wireless association.

26. According to Prof. Dariusz Leszczynski,
(A) whether or not the use of cell phones is safe is still uncertain.
(B) it is proved that cell phone would impair normal DNA.
(C) Using cell phones will block blood vessels.
(D) The research on cell phones is not reliable.
27. The passage following these two passages might be about
(A) the autobiography of Dariusz Leszczynski.　(B) problems with many of these studies.
(C) the development of brain cancer.　(D) peer review of cell phones.

While fats have lately acquired a bad image, one should not forget how essential they are. Fats provide the body's best means of storing energy, a far more efficient energy sources than either carbohydrates or proteins. They act as insulation against cold, as cushioning for the internal organs, and as lubricants. Without fats, energy would have no way to utilize fat-soluble vitamins. Furthermore, some fats contain fatty acids that contain necessary growth factors and help with the digestion of other food.

An important consideration of fat intake is the ratio of saturated fats to unsaturated fats. Saturated fats, which are derived from dairy products, animal fats, and tropical oils, increase amount of cholesterol in the blood. Cholesterol may lead to coronary heart disease by building up in the arteries of the heart. However, unsaturated fats, derived from vegetable oils, tend to lower serum cholesterol if taken in a proportion twice that of saturated fats.

The consumption of a variety of fats is necessary, but the intake of too much fat may lead to a variety of health problems. Excessive intake of fats, like all nutritional excesses, is to be avoided.

28. Comparing with carbohydrates or proteins, fats
(A) store food more efficiently.　(B) deserve their bad image.
(C) consume more oils.　(D) provide more fluids.
Which of the followings is the main idea of
29. The main idea of the third paragraph is that
(A) people are eating less and less fat today.　(B) fats should be eliminated.
(C) excessive consumption of fats may be dangerous to one's health.
(D) fats taken in the proper proportion may reduce serum cholesterol.
30. With which of the following is the whole passage primarily concerned?
(A) The role of fats in human health　(B) The dangers of cholesterol
(C) The benefits of fats in the diet　(D) The importance of good nutrition

Gender Equity

(1)　In the past decade, increasing attention has been paid to the issue of gender equity in the science, technology, engineering, and mathematics (STEM) fields. Research publications, including the American Association of University Women Educational Foundation's Tech Savvy (2000) and Women at Work (2003), have documented the troubling shortage of girls and women preparing to work in these fields. In response to this "**shrinking pipeline**" of girls and women in STEM, a wide array of programs and strategies has been promoted and funded by governmental and nongovernmental organizations.

(2)　The AAUW Educational Foundation and the National Science Foundation are among the top supporters of gender equity projects in the STEM fields. In the last decade alone, these two foundations have

invested nearly $90 million to fund more than 400 projects specifically aimed at increasing the participation of girls and women in STEM fields. This body of projects presented a unique opportunity to explore the nature of gender equity intervention projects in STEM. Until now, no comparable survey of gender equity intervention projects in STEM has been done.

(3) The research for this report, led by Yasmin Kafai and a team of researchers at the University of California, Los Angeles, was guided by several overarching questions: What types of projects have been funded within and across the various STEM disciplines? Are there areas where we have concentrated our efforts, and areas we have overlooked? What patterns emerge among the project types and disciplines?

(4) The findings document impressive efforts in preparing girls and women for science, technology, engineering, and mathematics studies and careers and demonstrate a rich and diverse body of gender equity intervention projects within all STEM disciplines. About two-thirds of the projects involved extracurricular informal learning activities such as museum visits and field trips. Equally important were mentoring activities in many forms, ranging from traditional one-to-one to large-scale online versions, and professional development activities, such as course taking and network building, that were successfully integrated into projects.

(5) At the same time, the findings reveal some troubling trends. Many projects focused predominantly on career advice without providing access to necessary skill and content development. A majority of projects occurred outside the school curriculum. While such extracurricular1 projects can be effective and valuable, the overall lack of integration into the school curriculum suggests that gender equity remains on the margins of teaching and learning in the STEM fields. Finally, an absence of data on participant demographics and a lack of project evaluation make it difficult to determine who is being served and if and how project outcomes are being measured.

31. What does the phrase "shrinking pipeline" in paragraph refer to?
(A) the shortage of oil supply　　(B) the shortage of labor supply
(C) the shortage of training programs　　(D) an issue that is getting smaller

32. Which of the sentences below best express the essential information in the highlighted sentence in the passage 2? (Incorrect choices change the meaning in important ways or leave out essential information.)
(A) These projects allowed us to study the differences between men and women employed in STEM jobs.
(B) We were able to intervene when women STEM workers were being treated unfairly.
(C) Studying these projects helped to create more gender equity intervention projects.
(D) STEM jobs were able to be studied by exploring nature.

33. In paragraph 3, "Are there areas where we have concentrated our efforts, and areas we have overlooked?" In this sentence, "we" refers to
(A) the author and his/her coworkers.　　(B) people involved in creating gender equity projects.
(C) people in the STEM disciplines.　　(D) Yasmin Kafai and his team.

34. According to paragraph 4, what is one positive finding of this research?
(A) the STEM field is rich and diverse　　(B) many projects involved mentoring opportunities
(C) girls and women are being prepared for STEM jobs　　(D) the quality of the questions asked

35. According to paragraph 5, what is one negative trend discovered through this research?
(A) access to unnecessary content　　(B) extracurricular projects were common
(C) evaluation of the projects was too specific　　(D) focus on career advice

Chili peppers are decidedly an international phenomenon, spicing up regional dishes from Thailand to North Africa. In Thailand Confidential, this week’s Globalist Bookshelf selection, Jerry Hopkins gives insight

to the culture and history surrounding this fiery fruit (yes, technically a fruit) and highlights how it may be one of the world's best medical miracles.

In Thailand—where restaurants rate their dishes by placing one, two, three, and sometimes four little red chilis on the menu next to the dishes' names to alert diners—I am tolerated. Barely.

A longtime friend, who is a Thai chef, used to bring home food purchased at street stalls and as she placed this on the table, she would point to one container and say, "Mine," then to another, saying, "Yours." As if to say, "Poor dear."

Thailand is not the birthplace of the Capsicum, or chili pepper; it only acts as if it is. In fact, the chili was imported, along with much else in the national diet. However, in Thailand the **per capital consumption** of the small, fiery fruit is surely as high if not higher than it is anywhere else. And it is in the use of unprocessed, fresh, ripe chilis where Thailand rings all the loudest bells.

The truth is that chili is an international phenomenon. There is a bimonthly magazine published in the United States, Chili Pepper (there is no agreement on the spelling), and a wide variety of products is available, including pepper-shaped wind chimes, bells, and strings of Christmas tree lights. There is even a Hot Sauce Club of America; members receive two new hot sauces and a newsletter every month. There is even a popular American rock and roll band that calls itself the Red Hot Chili Peppers. Yes, the band is hot.

36. From these passages, we learn that the author
(A) enjoys chili peppers everywhere.
(B) does not really like chili peppers.
(C) likes to have chili peppers to go with some certain kind of food.
(D) like to go to restaurant famous for chili peppers.
37. The best title for these passages is
(A) Thailand and Chili peppers.　　(B) Chili Peppers and Spicy Dishes.
(C) Different Tastes all over the World.　(D) Chili Peppers and Globalization.
38. Based on the passages, which of the following is NOT TRUE?
(A) That Thailand uses unprocessed, fresh, ripe chili peppers has started the popularity of chili peppers.
(B) Thailand exports a lot of chili peppers.
(C) Chili peppers are a kind of fruit.
(D) Thai food is normally quite spicy.
39. What does **per capital consumption** mean?
(A) amount consumed per person within a specific population.
(B) capital population and its consumption.
(C) capital with that the government provides each person for food consumption.
(D) capital that each person can get for their daily food consumption.
40. What is the main idea of the last paragraph?
(A) Chili peppers are very popular in the United States.
(B) The use of chili peppers in the United States is being influenced by Thailand.
(C) Chili peppers are made into different toys.
(D) Chilli peppers have made a rock band very hot.

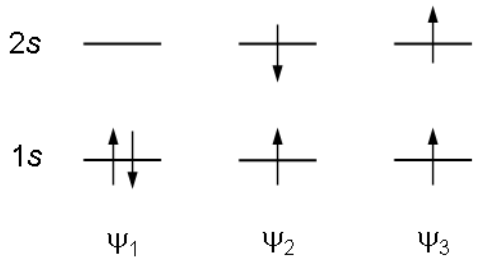
IV. Essay. 20 points.

Please write a well-structured essay on how you can prepare yourself for living in a diverse and more global society in 150 to 200 words discussing your opinions.

高雄醫學大學 99 學年度 研究所 招生考試 命題系所：醫藥暨應用化學系碩士班
考試科目：物理化學

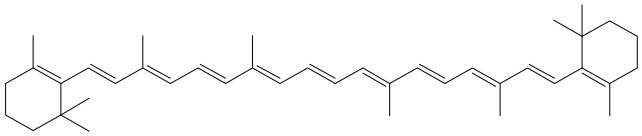
*可用計算機

1. The following diagram illustrates the ground state ($1s^2$) and two excited states ($1s^12s^1$) for the helium atom. The notation ↑ and ↓ is used to represent α and β spins, respectively.



Please write the antisymmetric wave functions (i.e., Slater determinants) for these electronic states. And briefly explain why the electronic wave function has to be expressed in a determinantal form rather than a simple product of spin orbitals? (25%)

2. The chemical structure of β-Carotene is as follow. If we take each CC bond length to be about 140 pm, please roughly estimate the wavelength of the first electronic absorption. [Hint: using the model of particle in a box] (15%)



β-Carotene

3. How to do if you would like to determine the activation energy for chemical reactions? And then what do you do if you are interested in the enthalpy change for reactions? [Hint: using Arrhenius and van't Hoff equations] (20%)

4. Consider the reaction $CH_4(g) + 2H_2S(g) \leftrightarrow CS_2(g) + 4H_2(g)$. In one experiment, 1.00 mol of CH_4, 1.00 mol of CS_2, 2.00 mol of H_2S, and 2.00 mol of H_2 are mixed in a 250-mL vessel at 960°C. At this temperature, $K_c = 0.036$.

a) In which direction will the reaction proceed to reach equilibrium? (10%)

b) If $[CH_4] = 5.56\ M$ at equilibrium, what are the equilibrium concentrations of the other substances? (10%)

5. Explain the following terms. (20%)

a) partition function (in statistical thermodynamics) b) intersystem crossing

c) mean free path d) fluorescence e) phosphorescence

高雄醫學大學 99 學年度 研究所 招生考試 命題系所：醫藥暨應用化學系碩士班
考試科目：分析化學

不可使用電子計算機

1. Please state the difference between
   (a) Precision and **Accuracy, (5%)**
   (b) Random Error and **Systematic Error, (5%)**
   (c) Ideal Blank and **Solvent Blank, (5%)**
   (d) Limit of detection (LOD) and **limit of quantitation (LOQ) (5%)**

2. There are mainly three types of instruments for optical spectroscopy instruments: **absorption**, **fluorescence**, and **emission**. Please plot the arrangement of components for each type of instrument and explain how these instruments work and the major difference among them. **(15%)**

3. Please define:
   (a) Ionic strength (3%),
   (b) Buffer solution (3%),
   (c) Doppler broadening (3%),
   (d) Instrumental noise in chemical analyses **(3%),**
   (e) Beer's Law (3%)

4. Fourier transform technique has been applied widely in spectroscopy. (i.e. FT-IR, FT-Mass, FT-NMR,..) Please list and briefly describe the possible advantages of this technique. **(10%)**

5. Although both Infrared spectroscopy and Raman spectroscopy provide the vibrational information of molecules, the principles of these two spectroscopies are somehow different. Please compare the theories between Infrared absorption spectroscopy and Raman spectroscopy. **(10%)**

6. What is electroosmotic flow in capillary electrophoresis (CE)? **(5%)** What is a guard column in partition chromatography? **(5%)**

7. Please briefly describe the apparatus of inductively coupled plasma – mass spectrometer (ICP-MS) **(10%)**

8. Please briefly describe the anodic stripping method in electrochemical analyses. **(10%)**

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考試科目：生物化學

A. Multiple choice. Please choose **the best one** answer. (30%)

1. Which amino acid and its one-letter code are **mis**matched? A) Tryptophan - W B) Phenylalanine - F C) Methionine - M D) Tyrosine – Y E) Glutamine – E

2. Which coenzyme(or its precursor) and its transient carrier are **mis**matched? A) FAD - Electrons B) Folate – H atoms C) Vitmin B1 - Aldehydes D) Biotin – CO_2 E) Coenzyme A – Acyl group

3. Which one is a monosaccharide? A) Mannose B) Lactose C) Sucrose D) Maltose E) Amylose

4. The deamination of Cytosine turns to A) Guanine B) Adenine C) Uracil D) Thymine E) Guanosine

5. Which fatty acid belongs to 16:0? A) Stearic acid B) Myristic acid C) Arachidic acid D) Lauric acid E) Palmitic acid

6. The ouabain, a steroid derivative, is a specific inhibitor of A) G protein B) NF-κB C) p53 D) Na^+K^+ ATPase E) HIV

7. FAD is conversed to $FADH_2$ during generating _____ in TCA cycle? A) malate B) fumarate C) citrate D) succinyl-CoA E) α-ketoglutarate

8. Alkaptonuria is caused by the defective of A) HMG-CoA synthase B) pyruvate dehydrogenase C) phosphoprotein phosphstase 1 D) XMP-glutamine amidotransferase E) homogentisate dioxygenase

9. Which medical drug is used to inhibit the cell wall synthesis in bacteria? A) penicillin B) viagra C) erythropoietin D) tamoxifen E) AZT

10. Which protein and ligand bind most tightly? A) avidin/biotin, Kd：$1x\ 10^{-15}$ B) insulin/insulin receptor, Kd：$1x\ 10^{-10}$ C) gp41/anti-gp41 antibody, Kd：$4x\ 10^{-10}$ D) Ni^{+2}/Ni^{+2}-binding protein, Kd：$1x\ 10^{-7}$ E) Ca^{+2}/calmodulin, Kd：$2x\ 10^{-5}$

B. Fill in. Choose the terms from the list below for the following questions. (30%)

A. Phosphatidylethanolamine	B. Uric acid	C. 4-Hydroxyproline	D. Collage
E. N-Acetylneuraminic acid	F. Creatine	G. Glucuronate	H. Dopamine
I. Sphingomyelin	J. cAMP	K. Lecithin	L. Proteoglycan
M. Muramic acid	N. Ornithine	O. NAD	

1. _____ are amino acids or amino acid derivates.
2. _____ are nitrogenous base or nucleotide derivates.
3. _____ are lipids or lipid derivates.
4. _____ are hexoses or hexose derivates.

C. Short answer. (30%)

1. Ramachandran plot	2. MALDI MS	3. Edman degradation
4. Polymerase chain reaction	5. Phosphofructokinase-1	6. Acetoacetate

D. Essay.(10%)

1. What is ‘the secondary structure of proteins”?

命題教師簽章：_____

（簽章請勿超過虛線）

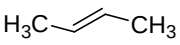
高雄醫學大學 99 學年度 研究所 招生考試

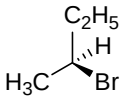
命題系所: 醫藥暨應用化學系碩士班

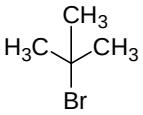
考試科目:有機化學(化學系碩士班)

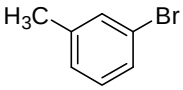
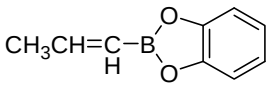
1. (45%) Give the major product of each of the following reactions.

a) $C_4H_9CH{=}CH_2$ $\xrightarrow[2.\ NaBH_4]{1.\ Hg(O_2CCF_3)_2,\ CH_3OH}$

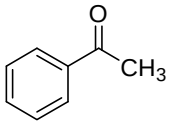
b)  $\xrightarrow{Br_2,\ CH_2Cl_2}$

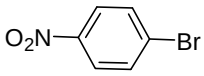
c)  $\xrightarrow{CH_3O^-\ (high\ conc.)}$

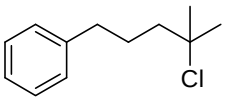
d)  $\xrightarrow[CH_3O^-]{CH_3OH}$

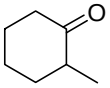
e)  +  $\xrightarrow[NaOH]{Pd(PPh_3)_4}$

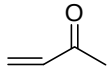
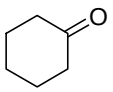
f)  $\xrightarrow[peroxide]{NBS,\ h\nu,\ or\ \triangle}$

g)  $\xrightarrow[H_2SO_4]{HNO_3}$

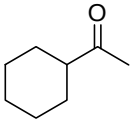
h)  $\xrightarrow{1.\ C_2H_5NH_2/\ \triangle}$

i)  $\xrightarrow[2.\ NBS,\triangle,\ peroxide]{1.\ AlCl_3}$

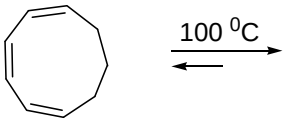
j)  $\xrightarrow[CH_2Cl_2]{LDA,\ -78\ ^0C}$

k)  +  $\xrightarrow[2.\ \triangle]{1.\ OH^-}$

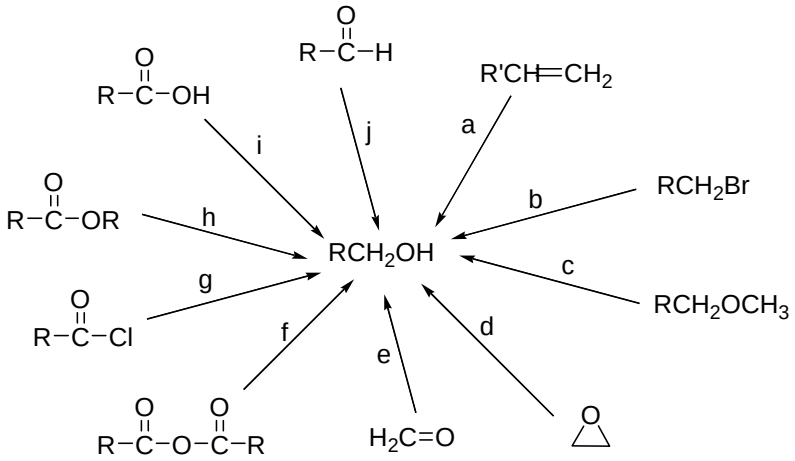
l) $CH_3CH_2C{\equiv}CH$ $\xrightarrow{NaBH_4}$

m)  $\xrightarrow{RCOOH}$

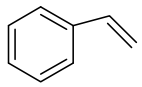
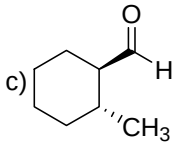
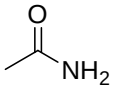
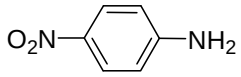
n)  + Br_2 $\xrightarrow[300\ ^0C]{FeBr_3}$

o) 

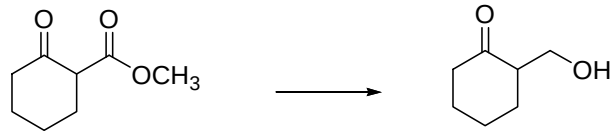
2. (20%) Show the reagents required to form the primary alcohol. (P)

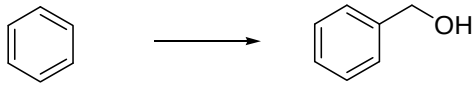


3. (10%) Give the systematic name for each of the following compounds.

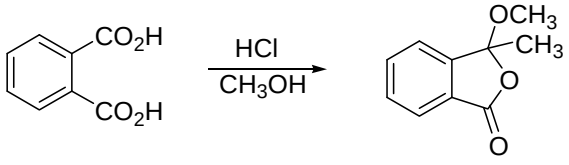
a) 
b) 
c) 
d) 
e) 

4. (12%) Design a synthesis for the target molecule from the indicated starting material.

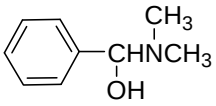
a) (6%) 

b) (6%) 

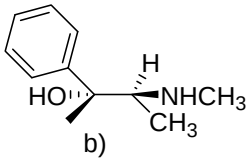
5. (5%) Propose a reasonable mechanism for the following reaction.



6. (8%) For many centuries, the Chinese have used extracts from a group of herbs known a ephedra to treat ashma. A compound named ephedrine that has been isolated from these herbs was found to be a potent dilator of air passages in the lungs. a) How many stereoisomers are possible for ephedrine? b) The stereoisomer shown below is the one that is pharmacologically active. What is the configuration of each of the asymmetric centers?



a) ephedrine

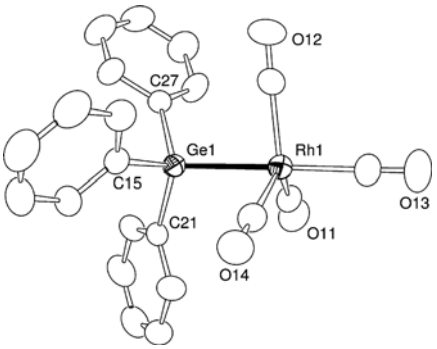


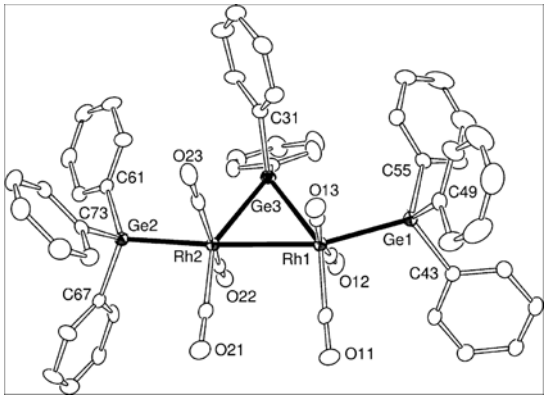
b)

高雄醫學大學 99 學年度 研究所 招生考試

命題系所：醫藥暨應用化學系碩士班
考試科目：無機化學

1. Using group vibration method determines the symmetry of the following complexes : $Rh(CO)_4(GePh_3)$ and $Rh_2(CO)_6(GePh_3)_2(\mu\text{-}GePh_2)$. How many IR-active carbonyl stretching bands would you expect? (10%)





2. Arrange the following complexes in order of the expected frequency of their ν (CO) bands and explain the reasons. (12%)
   (1) $V(CO)_6$, $Cr(CO)_6$, $Mn_2(CO)_{10}$, $Fe(CO)_5$, $Co_2(CO)_8$, $Ni(CO)_4$
   (2) $[Cr(CO)_6]$, $[Mo(CO)_6]$, $W(CO)_6$
   (3) $[Ti(CO)_6]^{2-}$, $[V(CO)_6]^{-}$, $Cr(CO)_6$, $[Mn(CO)_6]^{+}$
   (4) $[Mn(CO)_6]^{+}$, $[(MeNH_2)Mn(CO)_5]^{+}$, $[(en)Mn(CO)_4]^{+}$, $[(tren)Mn(CO)_3]^{+}$
   (en = ethylenediamine, tren = diethylenetriamine)
3. Consider the half-lives of substitution reactions of the pairs of complexes:

Half-Lives Shorter than 1 Minute	Half-Lives Longer than 1 Day
$[Cr(CN)_6]^{4-}$	$[Cr(CN)_6]^{3-}$
$[Fe(H2O)_6]^{3+}$	$[Fe(CN)_6]^{4-}$
$[Co(H2O)_6]^{2+}$	$[Co(NH_3)^5(H_2O)]^{3+}$ (H_2O exchange)

   Interpret the differences in half-lives in terms of the electronic structures. (8%)
4. Substitution of electronegative atoms or groups, such as fluorine or chlorine, in place of hydrogen on ammonia or phosphine results in weaker bases. For example, PF_3 is a much weaker base than PH_3. Predict and explain the order of N-B bond strength when ammonia reacts with the following reagents. BF_3, BCl_3, BBr_3. (5%)
5. Glycine has the structure NH_2CH_2COOH. It can lose a proton from the carboxyl group and form chelate rings bonded through both the N and one of the O atoms. Draw structures for all possible isomers of tris(glycinato)cobalt(III). (10%)
6. Explain the order of the magnitudes of the following Δ_o values for Cr(III) complexes in terms of the s and p donor and acceptor properties of the ligands. (5%)

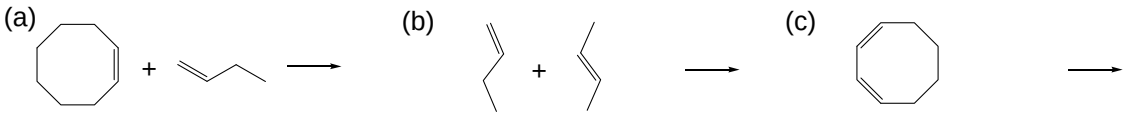
Ligand	F^-	Cl^-	H_2O	NH_3	en	CN^-
$\Delta_o(cm^{-1})$	15200	13200	17400	21600	21900	33500

7. Choose the following transition metal complex that would not exhibit the Jahn-Teller effect and explain. (12%)

   (A) $[Ti(H_2O)_6]^{3+}$ (B) $[Cu(H_2O)_6]^{2+}$ (C) $[FeF_6]^{3-}$ (D) $[CoF_6]^{3-}$

8. Describe the benefits of using the Cp* substituted for Cp. (10%)

9. Predict the products if the following compounds undergo metathesis: (6%)



10. The complexes $[Co(NH_3)_5X]^{2+}$ (X = Cl, Br, I) have charge transfer to metal bands. Which of these complexes would you expect to have the lowest-energy charge transfer bands? Why? (10%)

11. Explain the following terms: (12%)

    a. Dewar-Chatt-Duncanson model. b. lanthanide contraction. c. β-H Elimination.

    d. Orthometallation

Character table:

C_2	E	C_2		
A	1	1	z, R_z	x^2, y^2, z^2, xy
B	1	−1	x, y, R_x, R_y	yz, xz

C_3	E	C_3	C_3^2		$\varepsilon = \exp(2\pi i/3)$
A	1	1	1	z, R_z	x^2+y^2, z^2
E	$\begin{Bmatrix}1\\1\end{Bmatrix}$	ε	ε^*	$(x, y)(R_x, R_y)$	$(x^2-y^2, xy)(yz, xz)$
		ε^*	ε		

C_{2v}	E	C_2	$\sigma_v(xz)$	$\sigma_v'(yz)$		
A_1	1	1	1	1	z	x^2, y^2, z^2
A_2	1	1	−1	−1	R_z	xy
B_1	1	−1	1	−1	x, R_y	xz
B_2	1	−1	−1	1	y, R_x	yz

C_{3v}	E	$2C_3$	$3\sigma_v$		
A_1	1	1	1	z	x^2+y^2, z^2
A_2	1	1	−1	R_z	
E	2	−1	0	$(x, y)(R_x, R_y)$	(x^2-y^2, xy)

C_{2h}	E	C_2	i	σ_h		
A_g	1	1	1	1	R_z	x^2, y^2, z^2, xy
B_g	1	−1	1	−1	R_x, R_y	xz, yz
A_u	1	1	−1	−1	z	
B_u	1	−1	−1	1	x, y	

C_{3h}	E	C_3	C_3^2	σ_h	S_3	S_3^5		$\varepsilon = \exp($
A'	1	1	1	1	1	1	R_z	$x^2+y^2,$
E'	$\begin{Bmatrix}1\\1\end{Bmatrix}$	ε	ε^*	1	ε	ε^*	(x, y)	$(x^2-y^2$
		ε^*	ε		ε^*	ε		
A''	1	1	1	−1	−1	−1	z	
E''	$\begin{Bmatrix}1\\1\end{Bmatrix}$	ε	ε^*	−1	$-\varepsilon$	$-\varepsilon^*$	(R_x, R_y)	(xz, yz)
		ε^*	ε		$-\varepsilon^*$	$-\varepsilon$		