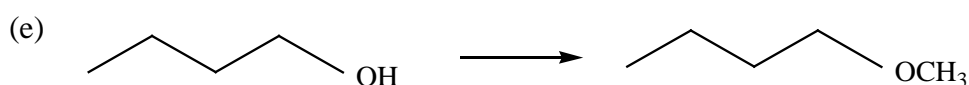
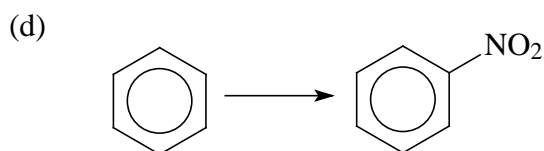
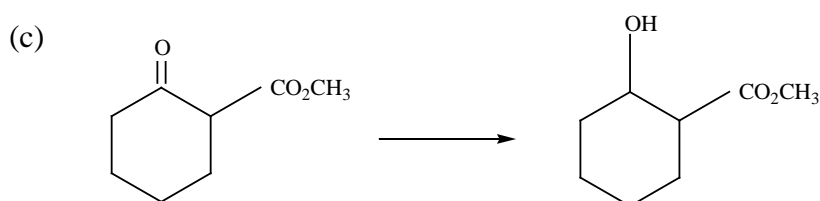
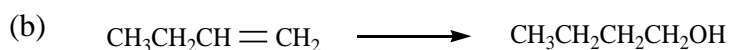
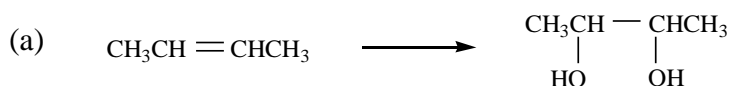


系級	化學系碩士班	考試時間	100 分鐘
科目	綜合化學	本科總分	100 分

1. (10%) Provide necessary reagents for each of the following conversions:



2. (10%) Give the structure for each of the following terms:

(a) aldehyde

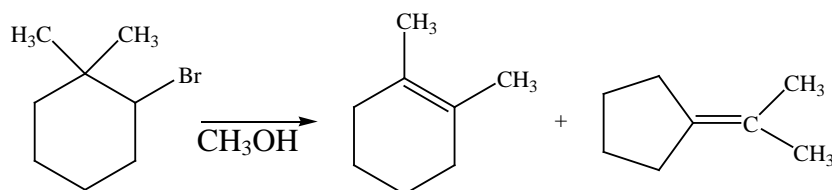
(b) ester

(c) TsCl

(d) THF

(e) *cis*-1-ethyl-4-isopropylcyclohexane

3. (5%) Give the mechanism for the following reaction:



4. (15%) For each of the following molecules, write the Lewis structure(s), predict the molecular geometry and give the expected hybrid orbitals on the central atom (a) XeF_4 (b) ClF_3 (c) SO_2 (d) IF_5 (e) ClF_2^+ .

東吳大學 104 學年度碩士班研究生招生考試試題

第 2 頁，共 2 頁

系級	化學系碩士班	考試時間	100 分鐘
科目	綜合化學	本科總分	100 分

5. (10%) Tetrahedral $[\text{Ni}(\text{Cl})_4]^{2+}$ is paramagnetic with two unpaired electrons, while square-planar $[\text{Pt}(\text{NH}_3)_4]^{2+}$ is diamagnetic, even though both metal ions are d^8 . Explain the experimental results using valence bond theory (VBT).
6. (5%) What is the point group for H_2O ?
7. (5%) Through a Carnot cycle, 1000 J is transferred from a heat reservoir of 500 K and then 600 J is transferred to a heat reservoir of 300 K. What is the work (in J) involved in this procedure?
8. (5%) The energy level of hydrogen atom is $-13.6 \text{ eV}/n^2$, where n is the quantum number. Please calculate the excitation energy from the ground state to the first excited state?
9. (5%) Please give the equation of state for ideal gas (理想氣體方程式).
10. (5%) For a reaction $\text{A} \rightarrow \text{B}$, a plot of $\ln([\text{A}])$ versus time (t) is a straight line of slope $-k$ and intercept $\ln([\text{A}]_0)$. What is the rate law for this reaction?
11. (10%) Define the following terms
 - (a) mass spectrometry
 - (b) liquid chromatography
12. (10%) Calculate the pH of a 0.01M solution of NaCN

$\text{HCN} \quad K_a = 7.2 \times 10^{-10}$
13. (5%) Write a charge balance expression for a solution containing KNO_3 , KCl and $\text{Al}_2(\text{SO}_4)_3$. (Neglect the dissociation of water)