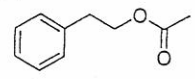
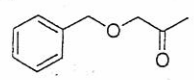
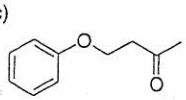
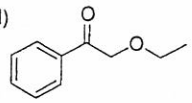
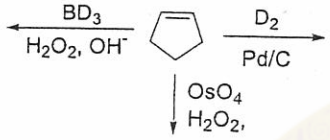
有機化學共 50 分

（一）單選題(每題 2 分，共 30 分，請依題號順序於『選擇題作答區』內作答。)

(1) The ^{1}H NMR spectrum of an unknown compound **A** ($C_{10}H_{12}O_2$) shows: δ 7.2-7.4 (5H, multiplet), 4.28 (2H, triplet), 2.92 (2H, triplet), 2.0 (3H, singlet). What is the structure of the unknown **A**?

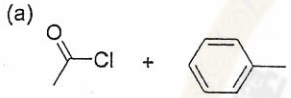
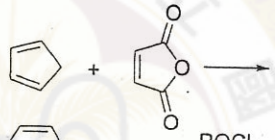
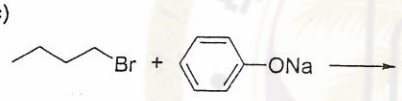
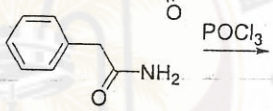
(a) 
(b) 
(c) 
(d) 

(2) How many of the following three addition reactions would favor the **syn**-adduct?

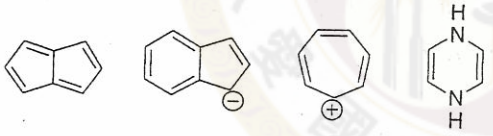


(a) 0　(b) 1　(c) 2　(d) 3

(3) Which of the following reactions would give an **alkene** as the major product?

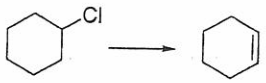
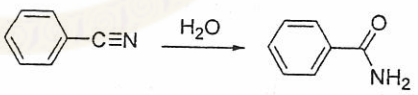
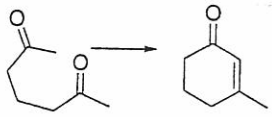
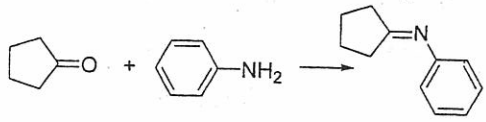
(a) 
(b) 
(c) 
(d) 

(4) How many of the following four compounds are **aromatic**?

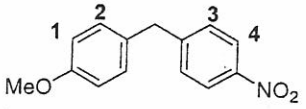


(a) 0　(b) 1　(c) 2　(d) 3

(5) Which of the following reactions would **not** be promoted under basic conditions?

(a) 
(b) 
(c) 
(d) 

(6) Which position would be the **most reactive** towards electrophilic aromatic substitution?



(a) 1　(b) 2　(c) 3　(d) 4

(7) How many of the following eight substituents are **activating, ortho-para directing** substituents?

$-OCH_3$, $-CH_3$, $-COCH_3$, $-NO_2$, -Cl, -Br, -CN, $-NH_2$

(a) 1　(b) 3　(c) 5　(d) 6

(8) How many of the following nine reagents are synthetically useful **reducing agent**.

$LiAlH_4$, $AlCl_3$, $NaBH_4$, Na metal, Zn metal,
MCPBA, OsO_4, NH_2NH_2, PCC

(a) 3　(b) 4　(c) 5　(d) 6

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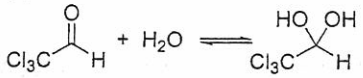
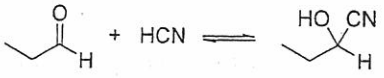
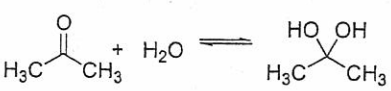
(9) Which of the following chemical equilibriums would have the equilibrium constant **K < 1**?

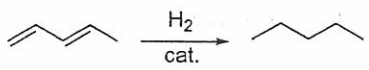
(a) 

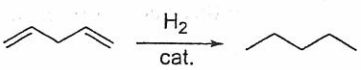
(b) 

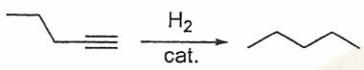
(c) 

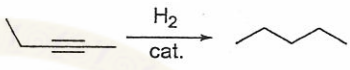
(d) 

(10) Which of the following reactions would give the **highest** heat of hydrogenation (the heat energy released)?

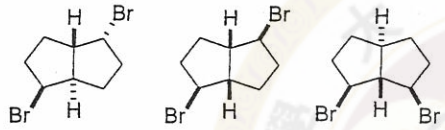
(a) 

(b) 

(c) 

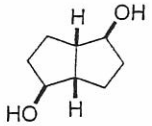
(d) 

(11) How many of the following compounds are **chiral**?



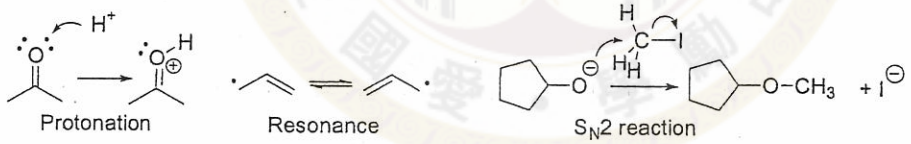
(a) 0　(b) 1　(c) 2　(d) 3

(12) How many stereogenic centers of ***S*** configuration are in the following compound?



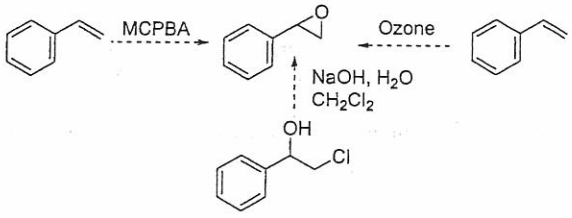
(a) 0　(b) 2　(c) 4　(d) 8

(13) How many of the following three expressions are **incorrect**?



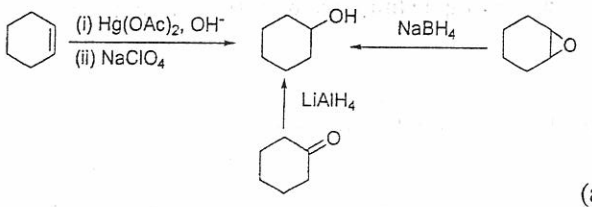
(a) 0　(b) 1　(c) 2　(d) 3

(14) How many of the following three reactions allow one to obtain the target **epoxide** compound?



(a) 0　(b) 1　(c) 2　(d) 3

(15) How many of the following three reactions allow one to obtain the target **alcohol** compound?



(a) 0　(b) 1　(c) 2　(d) 3

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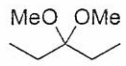
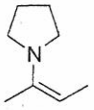
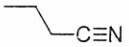
（二）問答題(共 20 分，請於『非選擇題作答區』內作答。)

(16) Name the functional group (每一小題 1 分，共 4 分)

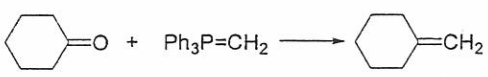
(a) 

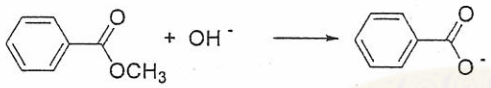
(b) 

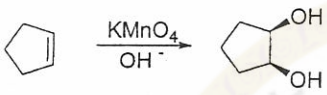
(c) 

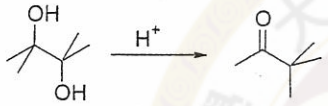
(d) 

(17) Propose the mechanisms for the following reactions. (每一小題 2 分，共 8 分)

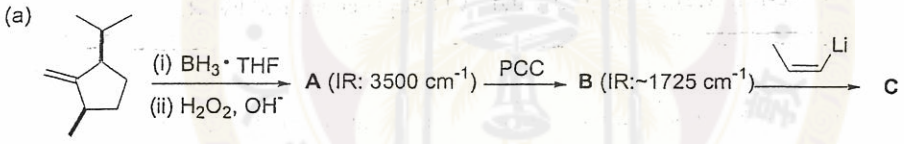
(a) 

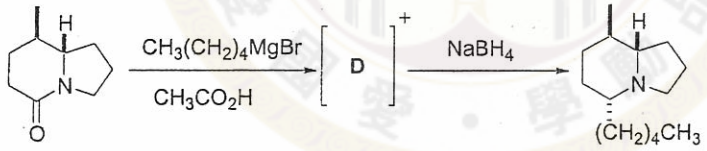
(b) 

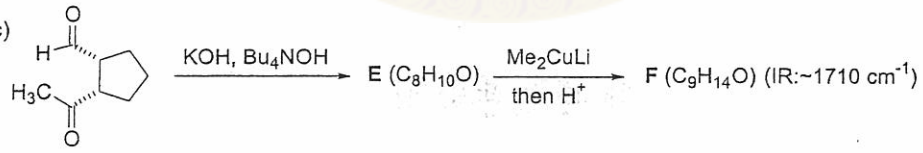
(c) 

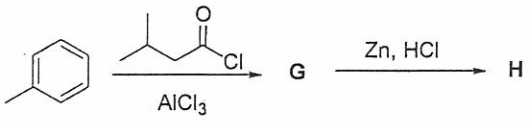
(d) 

(18) Give the structures of intermediates or products **A** through **H** for each of the following reactions: (每一結構 1 分，共 8 分)

(a) 

(b) 

(c) 

(d) 

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國立臺灣大學100學年度碩士班招生考試試題

無機化學共 50 分

1 In the reaction of ethylene hydrogenation with $RhH_2Cl(PPh_3)_3$, a rate law as below is obtained.

$-d[RhH_2Cl(PPh_3)_3]/dt = k_{obsd}[RhH_2Cl(PPh_3)_3]$

$k_{obsd}^{-1} = A([PPh_3]/[C_2H_4]) + B$

(a) Propose a mechanism that can explain the rate law. (8 分)

(b) What results you would expect if $RhH_2Cl(PPh_3)_3$ and $RhD_2Cl(PPh_3)_3$ in 1:1 ratio were used for the reaction. Explain. (8 分)

2 CH_4 is insoluble in water; H_2S however, is acidic in water; whereas NaH reacts with water vigorously by evolving H_2.

(a) Characterize the hydrogen in each of these three compounds. (8 分)

(b) Why does the H element behave so differently in these three compounds? (8 分)

3 The reaction of fac-$Mn(Me)(PPh_3)_2(CO)_3$ and ^{13}CO has been studied by IR.

(a) Draw the structure for the organometallic reactant and product(s). Assign their point groups. Give their IUPAC names. (8分)

(b) Each product of this reaction has a new, rather strong IR band that is distinctly different energy from any band in the reactant. Account for this band with their symmetry and bonding characters, and predict its approximate location in cm^{-1} in the IR spectrum. (10分)

試題隨卷繳回