

# 國立彰化師範大學九十六學年度碩士班招生考試試題

系所：化學系

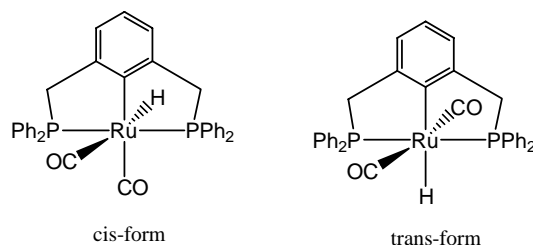
科目：無機化學與分析化學

★★請在答案紙上作答★★

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## 無機化學 (50 %)

1.



- I. Suggest a spectroscopic technique which can distinguish between the cis-form and the trans-form. Explain your choice. (3 %)
- II. Sketch the proton signal for the hydride in the cis-form. (2 %)
- III. What is the formal oxidation state of Ru in these two complexes? (2 %)
- IV. Predict and explain the stability of these two complexes. (3 %)

2.

$D_{2h}$	$E$	$C_2(z)$	$C_2(y)$	$C_2(x)$	$i$	$\sigma(xy)$	$\sigma(xz)$	$\sigma(yz)$		
$A_g$	1	1	1	1	1	1	1	1		$x^2, y^2, z^2$
$B_{1g}$	1	1	-1	-1	1	1	-1	-1	$R_z$	$xy$
$B_{2g}$	1	-1	1	-1	1	-1	1	-1	$R_y$	$xz$
$B_{3g}$	1	-1	-1	1	1	-1	-1	1	$R_x$	$yz$
$A_u$	1	1	1	1	-1	-1	-1	-1		
$B_{1u}$	1	1	-1	-1	-1	-1	1	1		$z$
$B_{2u}$	1	-1	1	-1	-1	1	-1	1		$y$
$B_{3u}$	1	-1	-1	1	-1	1	1	-1		$x$

- I. With the help of the character table, sketch and label the eight group orbitals for  $F-H-F^-$ . (8 %)
  - II. What group orbitals in your answers for part (I) can interact with the central H atom based on symmetry consideration alone? (2 %)
3. Draw all possible resonance structures for thioformate ion, assign formal charges, and select the most likely resonance structure to describe the ion. (5 %)
  4. What elements are there in a typical zeolite? (2 %)
  5. Explain why  $Ni(CO)_4$  is tetrahedral but  $[Ni(C\equiv N)_4]^{2-}$  is square planar. (4 %)

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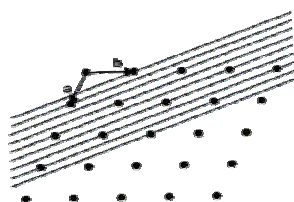
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6. Based on HSAB concept, explain,

- I. the solubility trend:  $\text{LiBr} > \text{LiCl} > \text{LiI} > \text{LiF}$ . (5 %)
- II.  $\text{AgBr}$  is yellow but  $\text{AgCl}$  is colorless. (4 %)

7.



- I. What is the Miller Indices for the lattice planes shown in the diagram? (3 %)
- II. If the interspacing of these planes is  $2\lambda$ , calculate the scattering angle at which diffraction occurs. (3 %)
- III. Draw on the diagram the set of (010) lattice planes. (2 %)
- IV. Give the name of this lattice if  $\alpha$  and  $\beta = 90^\circ$ . (2 %)

分析化學 (50 %)

1. For measuring spectrum in the UV range, what material must be used for the curvet? (4 %)
2. What is used as the source of radiation in atomic absorption spectroscopy? (4 %)
3. What is the goniometer setting ( $2\theta$ ) in order to observe the  $K_{\alpha 1}$  of Mo ( $\lambda = 0.71073 \text{ \AA}$ ) when the diffracting crystal is NaCl ( $d = 2.820 \text{ \AA}$ )? (assume second order) (5 %)
4. Describe the measurement of spin-lattice relaxation time ( $T_1$ ). (8 %)
5. Describe a technique for characterizing a surface. (4 %)
6. Explain why C-13 NMR spectra are always collected on a FT-NMR instead of a CW-NMR machine. (5 %)
7. What is the percentage transmittance of a  $6.24 \times 10^{-5} \text{ M}$  solution of the complex at 470 nm in a 1.00-cm cell? (10 %)
8. Describe the importance of temperature programming in gas chromatography. (10 %)