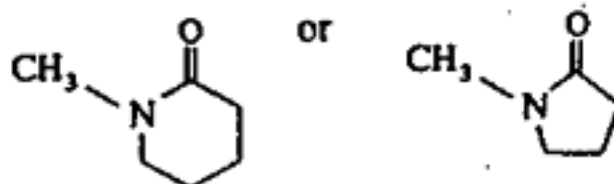


注意：請依序作答

1. What is the point group of the following species: (10%)
(a) B_2H_6 (b) $XeOF_4$ (c) PCl_3F_2 (d) $Ni(CN)_4^{2-}$ (e) $B_{12}H_{12}^{2-}$
2. Draw the molecular structure of the following species: (10%)
(a) H_3PO_2 (b) B_4H_{10} (c) $S_4N_4F_4$ (d) $Pt(C_2H_4)Cl_3^-$
(d) $Fe_2(CO)_9$
3. Predict the major product(s) for the following reactions: (10%)
(a) $Ag^+ + N_3^- \rightarrow$
(b) $PCl_5 + 4H_2O \rightarrow$
(c) $B_3N_3H_6 + 3HCl \rightarrow$
(d) $Closo-C_2B_9H_{11} + 2e^- \rightarrow$
(e) $Mn_2(CO)_{10} + H_2 \rightarrow$
4. Choose and explain: (16%)
(a) Higher first ionization energy: F or F_2
(b) Better oxidizing agent: F_2 or Cl_2
(c) Stronger reducing agent in aqueous solution: Li or Na
(d) Better π -acceptor ligand: CS or CO
5. Which of the following is more basic? Explain. (8%)
(a) $(CH_3)_2O$ or $(SiH_3)_2O$ (b)



6. Answer the following:
 - (a) Which of the following reactions would you expect to have the larger rate at room temperature? Why? (4%)
$$2Ce^{4+}_{(aq)} + Hg_2^{2+}_{(aq)} \rightarrow 2Ce^{3+}_{(aq)} + 2Hg^{2+}_{(aq)}$$
$$H_3O^+_{(aq)} + OH^-_{(aq)} \rightarrow 2H_2O_{(l)}$$
 - (b) Why is $[(\eta^5-C_5H_5)_2Fe]^+PF_6^-$ a good oxidizing reagent while $(\eta^5-C_5H_5)_2Co$ is a good reducing reagent? (4%)
 - (c) When visible light passes through a solution of nickel(II) sulfate, a green solution results. What are the spin allowed transitions responsible for this color? Would you expect a Jahn-Teller distortion for this complex? (6%)
 - (d) The ligand-to-metal charge transfer bands increase in energy in the series: $[CoI_4]^- < [CoBr_4]^- < [CoCl_4]^-$. Explain. (6%)

(背面仍有題目,請繼續作答)

