

1. Explain briefly (a) 18-electron rule (b) electron deficient compound (4%)
2. Criticize the statement that the CsCl lattice is an example of body-centered cubic packing. (3%)
3. Explain briefly why the iron-cyanide framework of Turnbull's blue is the same as that of Prussian blue. (4%)
4. What is the bond order of the bond in each of the following species? Give brief explanation. (a) O_2^+ (b) NO^+ (c) OCl^- . (9%)
5. Explain why $[Mn(CO)_4NO]$ is diamagnetic. (4%)
6. Calculate the spin-only magnetic moment of $[FeF_6]^{3-}$ complex. (26Fe) (4%)
7. The values of pK_a for H_3PO_3 and H_3AsO_3 are 2.0 and 9.2, respectively. Draw the Lewis structures for them. (4%)
8. Write down the formula of the conjugate base of each of the following acids: (a) H_3BO_3 (b) VO^{2+} (c) H_5IO_6 (6%)
9. What element in the second period of the periodic table is a useful window material in X-ray diffraction spectrometer? why? (3%)
10. (a) Is $Cu_{2-x}O$ a n-type or a p-type semiconducting oxide? why? (4%)
(b) What is the effect of increasing oxygen pressure on the conductivity of $Cu_{2-x}O$? (2%)
11. Predict and draw the ligand field splitting of d orbitals in (a) an octahedral ML_6 complex, (b) a cubic ML_8 complex. (8%)
12. Draw out all of the geometrical and optical isomers of $[Co(en)(NH_3)_2BrCl]^+$. (6%)
13. Complete the following reactions:
(a) $O_2 + PtF_6 \longrightarrow$
(b) $Hg_2^{2+} + OH^- \longrightarrow$
(c) $Be_2C + H_2O \longrightarrow$
(d) $Mn(CO)_5Br + Re(CO)_5^- \longrightarrow$
(e) $(CN)_2 + OH^- \longrightarrow$ (12%)
(f) $BrO_3^- + F_2 + OH^- (5M) \longrightarrow$
14. List four of gas chromatographic detectors. (4%)
15. Discuss the possible reasons which cause the deviation of the absorbance of a sample solution from the Beer's law. (4%)

16. Describe briefly the basic principle of the ESCA technique. (4%)

17. A sample feldspar gives the following percentage analysis: K_2O 16.90%; Al_2O_3 18.28%; SiO_2 64.74%. What is the empirical formula of feldspar? (At. Wt. K: 39.10, Al: 26.98, Si: 28.09, O: 16.00) (5%)

18. Calculate the pH below which FeS will not be precipitated when one liter of solution containing 11.0 g of Fe^{2+} as $FeCl_2$ is saturated with H_2S so that $[H_2S] = 0.10 M$. (At. Wt. Fe: 55.85, $K_{sp}(FeS) = 5.0 \times 10^{-18}$, $K_a(H_2S) = 1.0 \times 10^{-7}$, $K_a(HS^-) = 1.3 \times 10^{-13}$). (5%)

19. Calculate the lattice energy of RbF .

