

College of Engineering, Pune
End Semester Examination
(MT 210) - (Material Analysis)
Semester – II

Year: S.Y.B-Tech
Academic Year: 2011-12
Duration: 3 Hours

Branch: Metallurgy
Date: 07 May 2012
Max Marks: 50

Instruction to candidates:

1. All questions are compulsory.
 2. **Negative marks for EXTRA / IRRELEVANT writing.**
 3. Write answers of problems with an **accuracy of three digits.**
 4. Marks given to the right side indicate full marks.
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- Q.1. a) Explain the steps in analysis of Manganese in En 24, by using Atomic Absorption Spectroscopy. [6]
- b) Explain the role / need of(Any TWO) [4]
1. Tin granules in Strohlein apparatus.
 2. Sodium thio-sulphate in analysis of sulphur by Evolution titration method.
 3. Chopper in AAS.
- Q.2. a) Calculate the pH at each of the following stages of titration experiment [6]
1. If 40 ml of 0.09 M HCl is diluted to 100 ml.
 2. Then 10 ml of 0.1 M NaOH added
 3. More of the same Alkali added, till equivalence point is reached. Find volume of alkali need to be added.
 4. Finally total 30 ml NaOH added.
- b) Explain how a concentration cell works. State the relevant expression of EMF of such a cell. [4]
- Q.3. a) The reagents $K_2Cr_2O_7$ and $KMnO_4$ have overlapping absorption spectra in 1 M H_2SO_4 . $K_2Cr_2O_7$ has an absorption maximum at 440 nm and $KMnO_4$ has a band at 545 nm. A mixture is analyzed by measuring the absorbance at these two wavelengths with the following results. [6]
- $A_{440} = 0.405$, $A_{545} = 0.712$ in 1 cm cell.
- The absorbance of pure solutions of $K_2Cr_2O_7$ ($2 \times 10^{-4} M$) and $KMnO_4$ ($1 \times 10^{-3} M$) in one mole H_2SO_4 using the same cell gave the following results.
- $A_{Cr, 440} = 0.374$, $A_{Cr, 545} = 0.009$, $A_{Mn, 440} = 0.019$, $A_{Mn, 545} = 0.475$. Calculate the concentrations dichromate and permanganate in the sample solution.

- b Give approximate chemical composition of a) Low carbon steel [4]
b) AISI 304/316.
- Q.4. a. Give reactions (only) of "Sulphur by Evolution Titration Method" with neat diagram. [5]
b. Define Buffer capacity. Find the buffer capacity of a mixture containing 0.12 M acetic acid and 0.20 M Na - acetate $pK_a = 4.755$. [5]
- Q.5. a. Explain the working (i.e. only operation) of Strohlein apparatus with neat diagram. [6]
b. Calculate the S.P. of Silver chromate (Ag_2CrO_4) given that 1 liter of saturated solution at $25^\circ C$ contains about 4.3×10^{-2} g of salt. Molecular Weight of $Ag_2CrO_4 = 331.8$ [4]
