

Ex/MET/CHEM/T/111/2017(S)

B. MET. ENGG. EXAMINATION, 2017

(1st Year, 1st Semester, Supplementary)

CHEMISTRY-I

Full Marks: 100

Time: Three Hours

*The figures in the margin indicate full marks*Answer any six questions

1. (a) Define hydrolysis with suitable examples of your choice. 4
- (b) Show that the p^H due to the hydrolysis of the salt derived from strong acids and weak bases will be: $p^H = \frac{1}{2} pK_w - \frac{1}{2} pK_b - \frac{1}{2} \log C$
(where the symbols have their usual meanings). 5
- (c) Distinguish between solubility product and solubility product principle. 4
- (d) Write a short note on "Ionic Product of Water". 3
2. (a) What do you mean by buffer capacity? 3
- (b) What is "Tris" buffer? Write down its structure. 1+1=2
- (c) Calculate the p^H of pure water at 100 °C.
[Given: K_w at 100 °C is 5.45×10^{-13}] 3
- (d) Define buffer solution with examples. Mention some uses of buffer solutions. 2+2=4
- (e) Deduce the Henderson equation: $p^H = pK_a + \log\{[Salt]/[Acid]\}$ 4
3. (a) Briefly enumerate the application of solubility product principle and common ion effect in Qualitative Group Analysis. 7
- (b) Write down the complete balanced equation for the titration of Fe^{2+} with $Cr_2O_7^{2-}$ in acidic medium. Which type of reaction it is? 3+1=4
- (c) Write down the full name and structure of B.D.S. indicator. 2
- (d) NaCl and NaOH cannot be used in place of NH_4Cl and aqueous NH_3 to precipitate the cations of Group IIIA in qualitative group analysis. Explain. 3
4. (a) "Smoking is injurious to health". Why? 3
- (b) Name four Green House Gases. 2

- (c) Write a short note on Biochemical effects of Arsenic. 7
- (d) Which Company was involved in Bhopal Gas tragedy? Which compound was the final target of this Industry? What is the cause of toxicity and disaster in Bhopal? 4
5. (a) What is pesticide? Which class of pesticide is deadly harmful to human health? 2+2=4
- (b) Why an increase in concentration of CO₂ in the atmosphere causes an increase in temperature? How CO₂ is equilibrated in the atmosphere? 3+3=6
- (c) In which atmospheric strata maximum amount of ozone is present and how far it is from the earth surface? How does ozone protect living beings on the earth surface? 4
- (d) How does toxicity of ions or molecules related to concentration? 2
6. (a) Distinguish between chemical reaction and nuclear reaction. 4
- (b) Provide one example where radio isotope has been used to propose the reaction mechanism. 4
- (c) Write a short note on Radio Carbon dating. 6
- (d) Give one example of auto catalysis reaction. 2
7. (a) Define "nuclear binding energy" and "mass defect". Explain the "fission" and "fusion" reactions from nuclear binding energy per nucleon curve. 3+3+4=10
- (b) Briefly enumerate the catalytic cycle of the hydrogenation of alkene employing Wilkinson's catalyst. 6

General Proficiency: 4