TRIBHUVAN UNIVERSITY INSTITUTE OF ENGINEERING

Examination Control Division

2078 Kartik

Exam.		Back	
Level	BE	Full Marks	80
Programme	BCE, BGE, BME, BCH	Pass Marks	32
Year / Part	1/1	Time	3 hrs.

Subject: - Engineering Chemistry (SH 403)

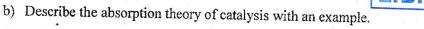
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt <u>All</u> questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

l.	What is Daniel cell? Calculate the emf	of the following combination.			[1+4]
	$Fe^{++}(0.2M) \rightarrow Fe^{+++}(0.1M) + e^{-},$	$E^{\circ} = -0.77V$			[- 1]
1	$Cu^{++}(0.3M) + 2e^{-} \rightarrow Cu$,	$E^{\circ} = 0.34V$	* 3.		

2. Derive Henderson equation. To 1 liter of buffer solution containing 0.1M NH₄OH and 0.2M NH₄Cl, if 0.2 g of NaOH is added, what will be the pH of the resulting solution? $[pK_b=4.74]$.

3. a) Define the terms:

- (i) Auto Catalyst
- (ii) Catalytic poisons



[3] 4. What is Particulate Matter (PM)? What are the types and sources of particulate matter causing air pollution? Also mention their adverse effect. [1+2+2]

5. Write the consequence of acid rain. How do oxides of Nitrogen and sulphur make water acidic?` [2+3]

6. What do you mean by biodegradable polymers? Give the preparation and uses of epoxy resin and polystyrene. [1+4]

7. What is inorganic polymer? Write the preparation and uses of Polyphosphazine and Polymeric sulphur. [1+4]

8. Why are d-block elements called transition elements? Write the electronic configuration of elements of 3d series.

9. Mention the main reasons of exhibiting variable oxidation states of transition elements. Manganese exhibits the highest oxidation state among the 3d elements, why? Cu+2 compounds are coloured and paramagnetic while Zn+2 compounds are white and diamagnetic, explain. [2+1+2]

10. Compare the magnetic behaviour of the complex [NiCl₄]²⁻ and [Ni(CN)₄]²⁻ using valence bond theory. [2.5+2.5]

11. a) What do you understand by a chelating ligand? Describe Sidwick theory of coordination compounds with an example. [1+2]

b) Name the following complexes by IUPAC system.

[4×0.5]

[2+3]

[2×1]

- (i) [Co(NH₃)₅SO₄]Br
- (ii) [Co(en)₃]Br₃
- $(iii)K_3[Cr(NO_3)_6]$
- $(iv)[Ni(CN)_4]^2$

12. W	hat is explosive? Write the preparations and uses of trinitrotoluene(TNT) and nitrocellulose.	
uı	muocenuose.	[1+4]
13. a)	Mention the functions of lubricant and discuss about solid lubricant.	[2.5]
b)	Write requisites of good paints and mention the important constitutes of paints.	[2.5]
14. a)	Give the necessary conditions for the molecule to exhibit geometrical isomerism and write an example with Z and E notation.	[2.5]
b)	Write the possible optical isomer of 2, 3-dichloropentane and distinguish enantiomers and diastereomers.	[2.5]
15. a)	Explain the mechanism of the reaction of bromomethane in aqueous potassium hydroxide.	[3]
b)	What types of nucleophile and solvent favours SN2 and SN1 reaction mechanism?	[2]
l6. Dis	scuss the mechanism for the reaction of tertiary alkyl halide with alcoholic sodium droxide. Write the differences between E_1 and E_2 reactions.	[3+2]
