


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, May 2022			
Course: Industrial Chemicals and Environment Program: B. Sc. (Hons.) Chemistry Course Code: CHEM 3007D		Semester: VI Time : 03 hrs. Max. Marks: 100	
Instructions: 1. All questions are compulsory. 2. Write all parts of a question at one place.			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	List out the applications and hazards of hydrochloric acid and nitric acid.	4	CO3
Q 2	What is nitrogen cycle. Discuss with the help of a suitable diagram.	4	CO2
Q 3	Discuss any four effects of air pollution on human life and vegetation.	4	CO2
Q 4	What is the environmental impact of nuclear power and wind power?	4	CO1
Q 5	List out five advantages of biocatalyst enabled manufacturing over chemistry enabled.	4	CO1
SECTION B (4Qx10M= 40 Marks)			
Q 6	(i) Write down any six applications or uses of biocatalysts. (ii) List out any four disadvantages of liquid fuel over solid fuel.	6 4	CO1
Q 7	(i) Briefly discuss the manufacture, application and hazards of any two of the following inorganic chemicals. Sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum. (ii) Describe the refining process of ultrapure metals taking example of Van-Arkel-de Boer process and Zone refining process.	5 5	CO3
Q 8	Discuss the various methods of removal of suspended particulates from air.	10	CO2
Q 9	How chlorine is used for water purification? How to estimate the amount of chlorine present in a given water sample? Write procedure with reactions.	10	CO2
OR			

	Describe the IR photometry method and resonance fluorescence method for the detection of CO.																	
SECTION-C (2Qx20M=40 Marks)																		
Q 10	<p>(i) Illustrate with suitable diagram the fractional distillation of petroleum giving the boiling point ranges of various fractions.</p> <p style="text-align: center;">OR</p> <p>Classify coal by its ranking. Discuss briefly giving calculations, how coal can be analyzed by proximate analysis. List out five limitations of fossil fuels.</p> <p>(ii) What is hardness of water? Write down the salts responsible for different types of hardness? Explain the methods of determining hardness of a water sample.</p> <p style="text-align: center;">OR</p> <p>Explain the methods of removal of dissolved solids (electrodialysis, reverse osmosis and ion exchange) during waste water treatment.</p>	10	CO1															
Q 11	<p>(i) A sample of water on analysis was found to contain the following impurities:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Impurity</th> <th style="text-align: center;">MgCO₃</th> <th style="text-align: center;">Ca(HCO₃)₂</th> <th style="text-align: center;">CaCl₂</th> <th style="text-align: center;">MgCl₂</th> </tr> </thead> <tbody> <tr> <td style="text-align: left;">Quantity (mg/L)</td> <td style="text-align: center;">7</td> <td style="text-align: center;">5</td> <td style="text-align: center;">9</td> <td style="text-align: center;">6</td> </tr> <tr> <td style="text-align: left;">Mol. Wt.</td> <td style="text-align: center;">84</td> <td style="text-align: center;">162</td> <td style="text-align: center;">111</td> <td style="text-align: center;">95</td> </tr> </tbody> </table> <p>Calculate the temporary, permanent and total hardness of water in ppm.</p> <p>(ii) 200 mL of water sample, on titration with N/50 HCl using phenolphthalein as an indicator, gave the end point when 10 mL of acid were run down. Another lot of 200 mL of the sample also required 10 ml of the acid to obtain methyl-orange end point. What type of alkalinity is present in the sample and what is its magnitude?</p>	Impurity	MgCO ₃	Ca(HCO ₃) ₂	CaCl ₂	MgCl ₂	Quantity (mg/L)	7	5	9	6	Mol. Wt.	84	162	111	95	10	CO2
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