

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Chemistry II
Program: B.Tech. CE+RP
Course Code: CHEM 2019

Semester: III
Time 03 hrs.
Max. Marks: 100

Instructions: Read the instructions given below carefully:

1. All questions are compulsory.
2. Internal choice is given in question number 10 and 12.

SECTION A

S. No.		Marks	CO
Q 1	What is the standard deviation in the velocity of an electron if the uncertainty in its position is 100 nm? (Given: $h = 6.626 \times 10^{-34}$ Js, mass of electron = 9.11×10^{-31} kg)	4	CO1
Q 2	What do you understand by the expression $\psi\psi^*d\tau$?	4	CO1
Q 3	What is the difference between D,L and d,l system.	4	CO3
Q 4	How nucleophilicity increases with increase in the nuclear charge?	4	CO4
Q 5	Which set of quantum numbers are not permissible and why? (i) $n = 5, l = 4, m = 0, m_s = \frac{1}{2}$ (ii) $n = 3, l = 0, m = -1, m_s = -\frac{1}{2}$ (iii) $n = 3, l = 1, m = 2, m_s = \frac{1}{2}$ (iv) $n = 2, l = 2, m = 0, m_s = \frac{1}{2}$	4	CO1

SECTION B

Q 6	Give reasons and discuss factors affecting acidity of the molecules.	8	CO4
Q 7	Discuss the relation of solvent and nucleophilicity in details.	8	CO3
Q 8	Draw MO energy level diagram of N_2 and HCl molecules.	8	CO2
Q 9	What is the role of solvent in SN^1 and SN^2 reactions?	8	CO3
Q 10	Discuss the kinetic and thermodynamis aspect of any organic reactions. OR Explain the concept of antiperiplanarity in elimination reactions with examples.	8	CO3

SECTION-C

Q 11	(a) Discuss the effect of substituent in SN^1 and SN^2 reactions. (b) How the angle strain, torsional strain and steric strains affects the stability? (c) Compare inductive effect, mesomeric effect and electromeric effect with suitable examples.	5 5 10	CO4 CO3 CO4
Q 12	(a) What is radial probability density? Draw the radial probability distribution curves for 1s, 2s and 2p orbitals.	10 + 10	CO1 CO2

	<p>(b) Describe the combination of s orbitals to give bonding and antibonding molecular orbitals. Explain with pictorial representation.</p> <p style="text-align: center;">OR</p> <p>(a) (i) Write the Hamiltonian for hydrogen atom and hence the corresponding Schrodinger equation. (ii) Write down MO electrons configuration for nitrogen oxide (NO) molecules and show that it is paramagnetic in nature.</p> <p>(b) Discuss the formation of following complex ions on the basis of valence-bond theory (i) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ (ii) $[\text{Fe}(\text{CN})_6]^{3-}$. (Given: atomic number of Cr and Fe are 24 and 26 respectively)</p>		<p>CO1 CO2</p>
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