

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

CLASS: IMSc
BRANCH: MATH & PHY

SEMESTER : I
SESSION : MO/2022

SUBJECT: CH111 GENERAL CHEMISTRY-I

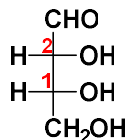
TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a) Write the postulates of Bohr's theory. Calculate the velocity of electron in 1 st and 2 nd Bohr orbit.	[5]	1	1
Q.1(b) For 1s and 2s orbitals, the maximum electron density is at nucleus. Draw the graph and explain. How it can be rectified in radial probability distribution function?	[5]	3	4
Q.2(a) What do you mean by effective nuclear charge? A 4s orbital is filled earlier than a 3d orbital - Explain by Slater's rule with example. Calculate the Z _{eff} for 3p electron of Phosphorus.	[5]	1	4
Q.2(b) What is electron gain enthalpy? Electron gain enthalpy values of noble gasses are positive while those of Be, Mg, N and P are almost zero. Justify.	[5]	1	1
Q.3(a) Derive Born Lande equation.	[5]	1	1
Q.3(b) Discuss metal excess defects due to anion vacancies. Draw the MO diagram for O ₂ molecule.	[5]	3	3
Q.4(a) i) Write the structure of products obtained from the following nucleophilic addition reaction in which propene is treated with HBr. ii) Which of them will be the major product and why? lii) Write the stepwise mechanism for the formation of the major product only.	[2+1+2]	4	4
$\text{H}_3\text{C}-\text{CH}=\text{CH}_2 \xrightarrow{\text{HBr}}$ <p style="margin-left: 40px;">Propene</p>			
Q.4(b) Write a short note on nucleophilic substitution reactions.	[5]	3	1
Q.5(a) i) Define and distinguish between optical rotation and specific rotation. ii) Draw the possible structures of trans-1,4-Dimethylcyclohexane in Chair Form. If there are two structures, which one is more stable?	[2+3]	2	2
Q.5(b) i) Identify the correct D/L & R/S (C1 & C2: marked) configuration in the following structure. ii) Convert the above fisher formula to Newman and Sawhorse projection formula and demonstrate the conversion steps.	[2+3]	3	4



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