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B.Sc/1st Sem (G)/CHEM/22(CBCS)

2022

1st Semester Examination

CHEMISTRY (General)

Paper : DSC - 1A/2A/3A-T

[CBCS]

Full Marks : 40

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

Group - A

Answer any *five* questions : $2 \times 5 = 10$

1. Mention the essential conditions for Linear combination of atomic orbitals to form molecular orbitals. 2
2. 'The Fischer projection formula of molecule cannot be rotated through 90° and 270° .' — Explain. 2
3. Which one of the following carbocation is more stable and why?

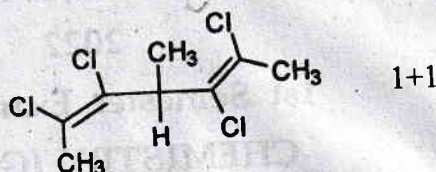
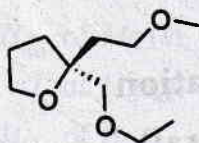


4. Bond angles in F_2O and Cl_2O are 105° and 110° respectively. Explain. 2
5. What will be the de Broglie wavelength of a grain of sand weighting 1 mg moving with a speed of 100 m/s? 2

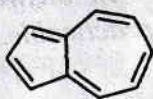
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(2)

6. Assign the configuration (R/S) of the stereogenic centre in the following molecules



7. $AlCl_3$ is largely covalent, whereas AlF_3 is predominantly ionic. Justify the statement. 2
8. Predict which of the following compounds are aromatic, anti-aromatic and non-aromatic and Why?



+

2

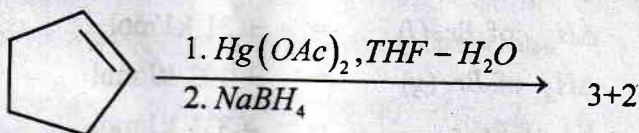
Group - B

Answer any **four** questions : $5 \times 4 = 20$

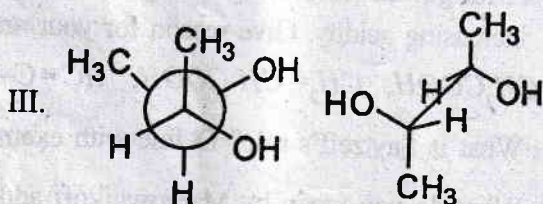
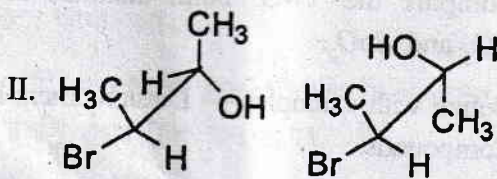
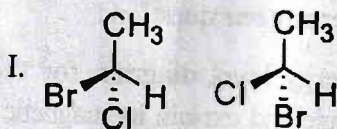
9. (i) State Heisenberg's principle and explain its significance.
- (ii) Write down the electronic configuration of Cu^{+2} and Ti^{+3} ions. 3+2
10. (i) Using MO theory explain the observations that the bond length in N_2^+ is $0.02 \text{ \AA}$ greater than N_2 , while bond length in NO^+ is $0.09 \text{ \AA}$ less in NO .
- (ii) What are the necessary conditions for a molecule to be optically active? 4+1

11. Define the following terms giving a suitable example of each I. Threo form. II. Erythro form. III Centre of Symmetry. 1½+1½+2

12. (i) Write short note on Ozonolysis (provide example and mechanism).
 (ii) Predict the product of the following reaction (provide mechanism if possible)



13. (i) Predict the following pair of compounds as homomers, diastereomers or enantiomers.



P.T.O.

- (ii) Using VSEPR model predict the structure of XeF_4 and XeF_6 . 3+2

14. Define Lattice energy of an ionic solid. Show the necessary Born-Haber cycle for the formation of $MgBr_2$ and hence calculate its lattice energy.

$$\begin{aligned}
 \Delta H_{\text{sub.}} \text{ of } Mg(s) &= +148 \text{ kJ/mol} \\
 I_1 + I_2 \text{ of } Mg(g) &= +2187 \text{ kJ/mol} \\
 \Delta H_{\text{vap.}} \text{ of } Br_2(l) &= +31 \text{ kJ/mol} \\
 \Delta H_{\text{dis.}} \text{ of } Br_2(g) &= +193 \text{ kJ/mol} \\
 EA \text{ of } Br(g) &= -331 \text{ kJ/mol} \\
 \Delta H_{\text{formation}} \text{ of } MgBr_2 &= -524 \text{ kJ/mol} \quad 5
 \end{aligned}$$

Group - C

Answer any **one** question : 10×1=10

15. (i) Draw the energy level diagram for the MOs of oxygen molecule and explain its magnetic behaviour. Compare the 'O-O' bond distance among O_2 , KO_2 and BaO_2 .

- (ii) Define with examples — Diastereomers and Meso Compounds. 6+4

16. (i) Arrange the following compounds in order of increasing acidity. Give reason for your answer



- (ii) What is Saytzeff's rule? Define with example.

- (iii) What do you mean by Markownikoff addition and Anti-Markownikoff addition? Provide example.

(5)

(iii) What is Madelung constant? Is it really a constant quantity?

3+2+3+2

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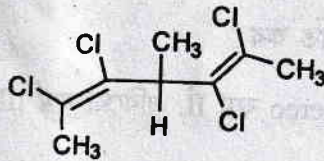
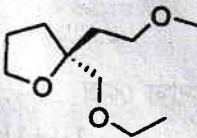
বিভাগ - ক

যে কোন পাঁচটি প্রশ্নের উত্তর দাও : $2 \times 5 = 10$

1. আণবিক অরবিটাল গঠনের জন্য পারমাণবিক অরবিটালের রৈখিক সংমিশ্রণের প্রয়োজনীয় শর্তগুলি উল্লেখ কর। 2
2. 'অণুর ফিশার অভিক্ষেপ ফর্মুলাকে 90° এবং 270° ঘোরানো যায় না'। উক্তিটি ব্যাখ্যা কর। 2
3. নিচের কার্বোক্যাটায়নের মধ্যে কোনটি বেশি স্থিতিশীল এবং কেন? 2



4. F_2O এবং Cl_2O তে বন্ধন কোণগুলি যথাক্রমে 105° এবং 110° । ব্যাখ্যা কর। 2
5. 100 মি/সেকেন্ড গতিতে 1 মিলিগ্রাম ওজনের বালির দানার ডি ব্রগলি তরঙ্গ দৈর্ঘ্য কত হবে? 2
6. নিম্নলিখিত অণুতে স্টেরিওজেনিক কেন্দ্রে কনফিগারেশন (R/S) বরাদ্দ কর। 1+1



1+1

P.T.O.