3 (Sem–2/CBCS) CHE HC 1

2024

CHEMISTRY

(Honours Core)

Paper : CHE–HC–2016

(Organic Chemistry–I)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

I. Question numbers 1 to 7 carry ***one*** mark each : 1×7=7

1. Alkynes have an acidic hydrogen atom. Explain.

2. Write the name of the reaction when alkyl halide is allowed to react with metallic sodium in presence of dry ether.

Contd.

3. What do you understand by directing effect of a group?

4. Write the conditions required for a compound to be optically active.

5. Define meso compound.

6. Name the products formed when propene is subjected to ozonolysis.

7. What products are obtained when alkenes are subjected to hydroxylation?

II. Question numbers 8 to 11 carry ***two*** mark each : 2×4=8

8. Draw Newman projection formula of the eclipsed and staggered conformers of 1,2-dinitroethane.

9. Explain the stability of *t*-butyl radical.

10. Explain Baeyer's strain theory.

11. How can you obtain carbonyl compounds from alkynes? Give a suitable example.

III. Question numbers 12 to 16 carry ***five*** marks each (Answer ***any three*** questions from them) : 5×3=15

12. Taking suitable examples, explain the differences between El and Elcb reaction mechanisms.

13. What are carbenes? Give one method of preparation of carbene. Write the structures of singlet and triplet methylene. 1+2+2=5

14. How can you obtain *cis-* and *trans-* alkene from an alkyne? Write the general reactions highlighting the role of the reagents involved. Also, write one example of each method. 1+2+2=5

15. *(i)* State one method by which carbocations can be generated.

(ii) Account for the stability of a benzyl cation.

(iii) Why is it difficult to form carbocations at bridgehead positions ? 1+2+2=5

16. Taking a suitable example, explain the mechanism of electrophilic aromatic substitution reaction. What is the name of the intermediate formed ? 4+1=5

IV. Question number 17 to 22 carries ***ten*** marks each (Answer ***any three*** questions from them) : 10×3=30

17. Draw Fischer projections for (2R, 3S)-2-methyl-3-nitrosobutane and (2S, 3R)-2-methyl-3-nitrosobutane, with the carbon chain on the vertical line. Label each structure as (2R, 3S) or (2S, 3R). Assume that you have a mixture of equal amount of each of the above compounds. What is this mixture called ? Can they be separated into two containers based on their physical properties ? Explain. 3+3+1+3=10

18. Give the 1,2- and 1,4- products of the addition of one equivalent of HBr to 1,3-hexadiene. Draw the transition states involved and predict which of them would be the major product and which will be minor. What are the 1,2- and 1,4- addition products of HBr with 2-methyl-1, 3-cyclohexadiene ? What is unusual about the products of 1,2- and 1,4- addition of HX to an unsubstituted cyclic 1,3-diene ? 2+4+2+2=10

19. *trans*-1,2-dichlorocyclohexane is more stable than *cis*-1,2 dichlorocyclo-hexane. Explain this observation. Draw all different structures with the formula C_6H_{12} with only one ring and name them. Also, draw the energy profile diagram and label the position of the structures. 2+4+4=10

20. Explain the following with a suitable mechanism : 5+5=10

(a) Oxymercuration-demarcuration

(b) Hydroboration-oxidation

21. Differentiate between the following terms : 2×5=10

(a) Nuclophilicity and Basicity

(b) Syn-isomer and Anti-isomer

(c) Enantiomer and Diastereomer

(d) Resonance and Hyperconjugation

(e) Saytzeff and Hofmann elimination

22. Discuss SNAr and benzyne mechanism for aromatic nucleophilic substitution reaction. Discuss the effect of leaving group and attacking nucleophile on aromatic nucleophilic substitution reaction. 3+3+2+2=10
