

Pharmaceutical Organic Chemistry (PC101) Final Examination

Wends 10/03/2021 - 9:30 AM

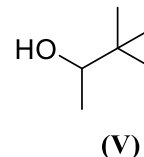
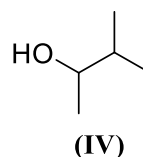
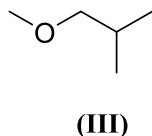
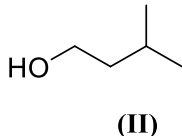
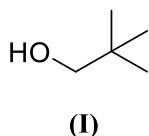
Time Allowed: 120 minutes

Total: 50 points

Please, read the following exam instructions, carefully:

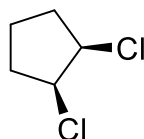
- This exam booklet contains **(8)** different pages.
- The last page doesn't contain any questions and can be used as a draft.
- The exam contains **50** questions, each question worth **ONE** point.
- Read the questions carefully and circle only **ONE** best answer.
- Fill your answers in the attached answer sheet (the bubble sheet).
- Any answers outside the answer sheet will **NOT** be graded.

❖ **Examine the following structures (I-V), then answer questions 1-5 below:**

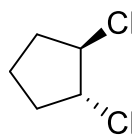


1. Which of the above structures (I-V) contains tertiary (3ry) carbon atoms:
A) (I) & (II) B) (II) & (III)
C) (I) & (IV) D) (I) & (V)
2. Which of the above structures (I-V) would be expected to have the **lowest** boiling point among the other ones:
A) (I) B) (II) C) (III) D) (IV) E) (V)
3. Which of the above structures (I-V) is **NOT** an isomer of the rest of structures:
A) (I) B) (II) C) (III) D) (IV) E) (V)
4. Which pair of compounds are considered functional isomers:
A) (I) & (II) B) (I) & (III)
C) (I) & (IV) D) (I) & (V)
5. Which of the above structures (I-V) can be represented by a pair of enantiomers:
A) (I) B) (II) C) (III) D) (IV) E) (V)

❖ **Examine the following structures (VI-VII), then answer questions 6-9 below:**



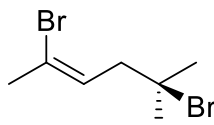
(VI)



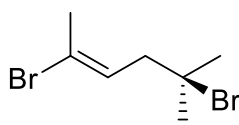
(VII)

6. The above pair of 1,2-dichlorocyclopentane structures (VI and VII) are considered:
 - A) conformers
 - B) diastereomers
 - C) enantiomers
 - D) the same compounds represented differently
 - E) two different compounds
7. The 1,2-dichlorocyclopentane structure (VI):
 - A) has a *Z* configuration
 - B) has an *E* configuration
 - C) is neither *Z* or *E*
8. Which of the compounds (VI and VII) is properly classified as a meso compound?
 - A) VI only
 - B) VII only
 - C) both VI and VII
 - D) none of VI and VII
9. For the above structures (VI and VII), which of the following statements is **correct**:
 - A) they have identical physiological properties.
 - B) they have specific rotations of opposite sign.
 - C) they have identical chemical properties.
 - D) they have different physical properties.

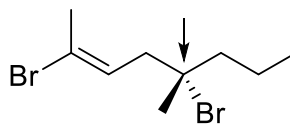
❖ **Examine the following structures (VIII-XI), then answer questions 10-15 below:**



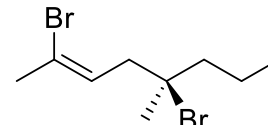
(VIII)



(IX)



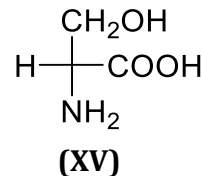
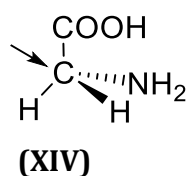
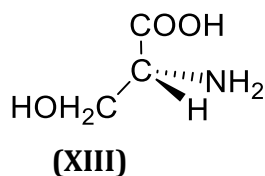
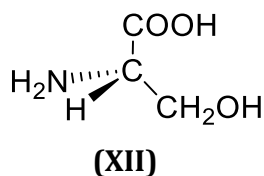
(X)



(XI)

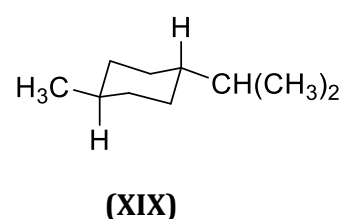
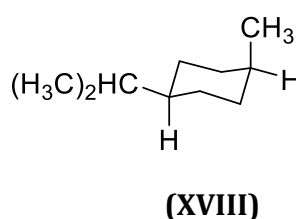
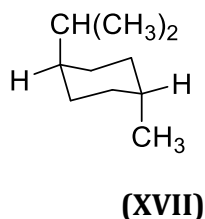
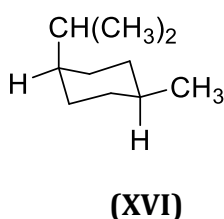
10. Which of the above structures (VIII-XI) represents *Z*-2,5-dibromo-5-methylhex-2-ene?
 - A) (VIII)
 - B) (IX)
 - C) (X)
 - D) (XI)
11. Structures (VIII) and (IX) are classified as:
 - A) enantiomers
 - B) diastereomers
 - C) different compounds
 - D) conformers
12. Structures (IX) and (XI) are classified as:
 - A) enantiomers
 - B) diastereomers
 - C) different compounds
 - D) conformers
13. Which of the above structures (VIII-XI) contains chiral center:
 - A) both (VIII) & (IX)
 - B) both (X) & (XI)
 - C) All of (VIII-XI)
 - D) None of (VIII-XI)
14. In structure (X), the arrow is pointing to C-5. The orbital hybridization of C-5 in (X) is:
 - A) sp^3
 - B) sp^2
 - C) sp
15. In structure (X), the arrow is pointing to C-5. The configuration around C-5 in (X) is:
 - A) *R*
 - B) *S*
 - C) it is not chiral

❖ **Examine the following amino acids (XII-XV), then answer questions 16-21 below:**



16. Which of the above structures (XII-XV) is optically inactive?
 A) (XII) B) (XIII) C) (XIV) D) (XV)
17. In structure (XIV), the arrow points to C-2. The type of C-2 in (XIV) is:
 A) primary B) secondary C) tertiary D) quaternary
18. In structure (XIV), the arrow points to C-2. The configuration around C-2 in (XIV) is:
 A) *R* B) *S* C) is achiral
19. Structures (XII) and (XIII) have identical physicochemical properties **except**:
 A) melting point B) solubility in ethanol
 C) functional groups D) optical rotations
20. Structures (XII) and (XV) are classified as:
 A) enantiomers B) diastereomers C) different compounds D) conformers
21. Structures (XIII) and (XV):
 A) both have an *R* configuration around C-2 B) are enantiomers
 C) are two different compounds D) are optically inactive

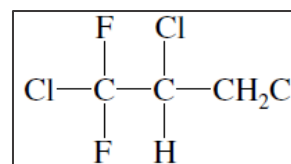
❖ **Examine the following structures (XVI-XIX), then answer questions 22-25 below:**



22. Regardless of the stereochemistry, the IUPAC name for structures (XVI-XIX) would be:
 A) 1-isopropyl-4-methylcyclohexane B) 4-methyl-1-isopropylcyclohexane
 C) 1-*t*-butyl-4-methylcyclohexane D) 1,4-diisopropylcyclohexane
23. Which is the most thermodynamically stable structure of (XVI-XIX)?
 A) (XVI) B) (XVII) C) (XVIII) D) (XIX)
24. Which structure of (XVI-XIX), has 1,3-diaxial interaction between CH₃ and CH(CH₃)₂?
 A) (XVI) B) (XVII) C) (XVIII) D) (XIX)
25. Which pair of structures are interconvertible by rotation around single bond?
 A) (XVI) & (XVII) B) (XVI) & (XVIII) C) (XVII) & (XIX) D) both (B) and (C)

26. The IUPAC name of the opposite compound is:

- A) 1,2-Dichloro-1,1-difluoropropane
 B) 1,2,3-Trichloro-1,1-difluoropropane
 C) 1,2,2-Trichloro-1,1-difluoropropane



27. Which of the following is a tertiary alkyl halide?

- A) 1-Chloro-2,2,4-trimethylpentane
 B) 3-Chloro-2,2,4-trimethylpentane
 C) 2-Chloro-2,4,4-trimethylpentane

28. Which of the following is not able to serve as a nucleophile in a chemical reaction?

- A) Br⁻ B) OH⁻ C) NH₃ D) CH₃⁺

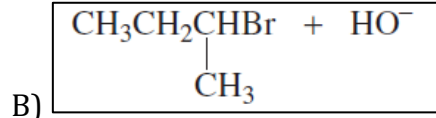
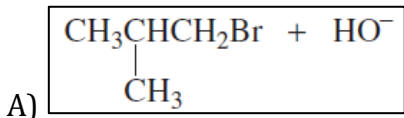
29. Rank the following carbocations in order of increasing stability (least → most stable):

- (1) CH₃⁺ (2) (CH₃)₃C⁺ (3) (CH₃)₂CH⁺
 A) 1 < 2 < 3 B) 2 < 3 < 1 C) 1 < 3 < 2 D) 2 < 1 < 3

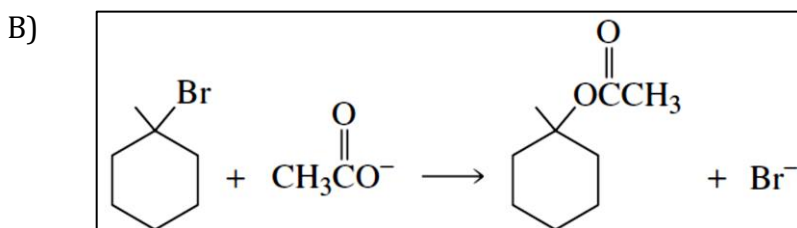
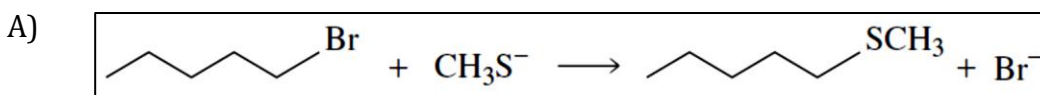
30. The major organic product formed by free-radical bromination of 2-Methylpentane is:

- A) 2-Bromo-2-methylpentane
 B) 1-Bromo-2-methylpentane
 C) 3-Bromo-2-methylpentane

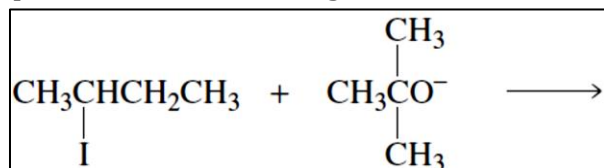
31. For each of the following pairs of S_N2 reactions, indicate which reaction occurs faster:



32. Which of the following reactions will go faster if the concentration of the nucleophile is increased?



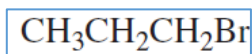
33. The minor product of the following reaction is:



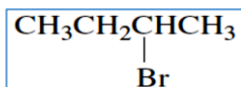
A) 1-butene

B) 2-butene

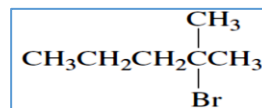
34. Which of the following alkyl halides is more reactive in an E1 reaction?



A)



B)



C)

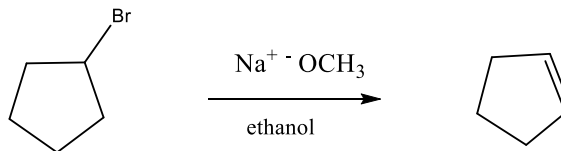
35. The type of the opposite reaction is likely to be:

A) S_N1

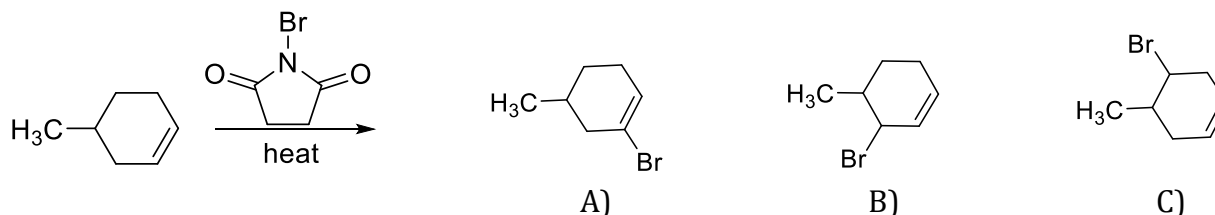
B) S_N2

C) E1

D) E2



36. What will be the major product of the following reaction?

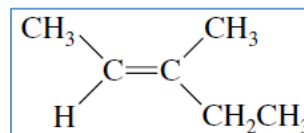


37. The IUPAC name of the opposite compound is:

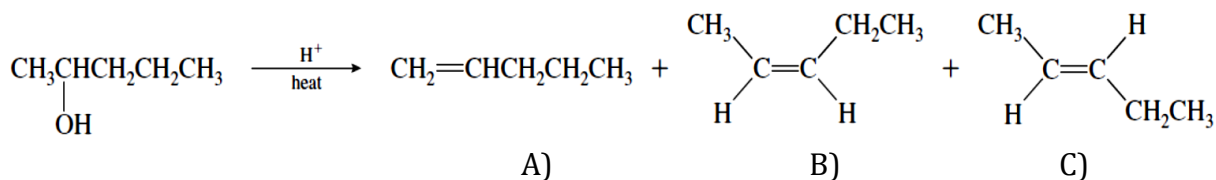
A) (*E*)-3-Methyl-2-pentene

B) 2-Methyl-2-pentene

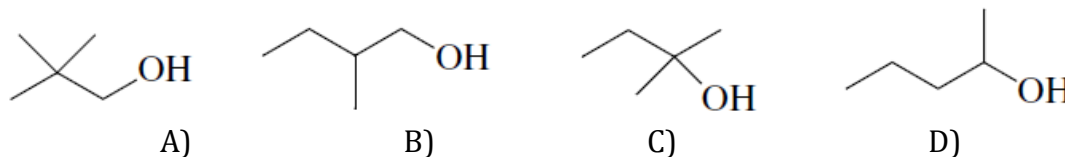
C) (*Z*)-3-Methyl-2-pentene



38. Which one of the following products is the major product?



39. Which of the following alcohols would be most likely to undergo dehydration with rearrangement by a process involving a methyl migration (methyl shift)?



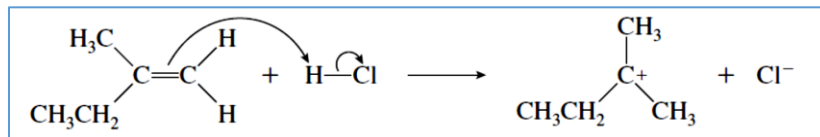
40. Which one of the following will give 2-methyl-1-butene as the only alkene on treatment with K OC(CH₃)₃ in dimethyl sulfoxide?

A) 2-bromo-2-methylbutane

B) 1-bromo-2-methylbutane

C) 2-methyl-2-butanol

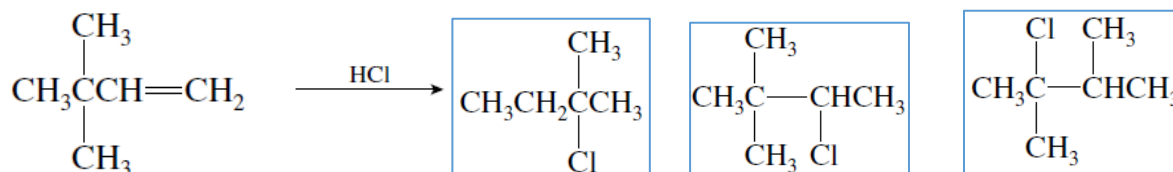
41. A tertiary carbocation is an intermediate in the following reaction:



A) True

B) false

42. In the following addition reaction, which of the following is the product of a tertiary carbocation intermediate:

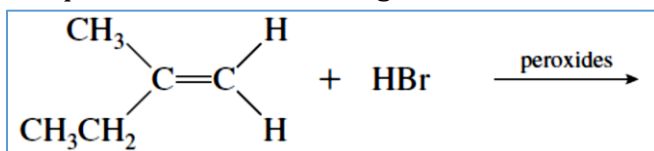


A)

B)

C)

43. The product of the following reaction is

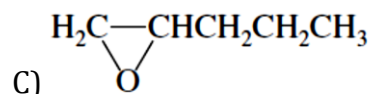
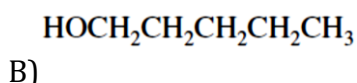
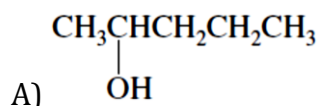
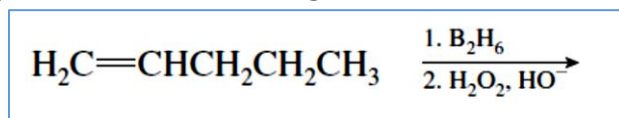


A) 3-Bromo-2-methylbutane

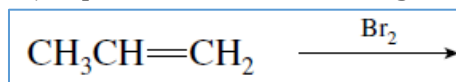
B) 2-Bromo-2-methylbutane

C) 1-Bromo-2-methylbutane

44. The product of the following reaction is



45. The major product of the following reaction is



A) 1,2-dibromopropane

B) 1,1-dibromopropane

C) 1,3-dibromopropane

46. To which point on the potential energy diagram for the reaction of 2-methylpropene with (HCl) does the figure shown at the right correspond?

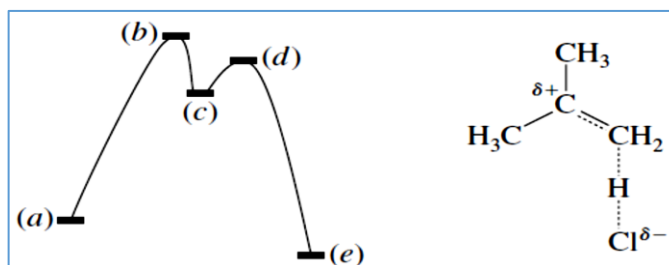
A) point (a)

B) point (b)

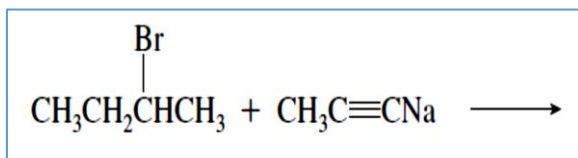
C) point (c)

D) point (d)

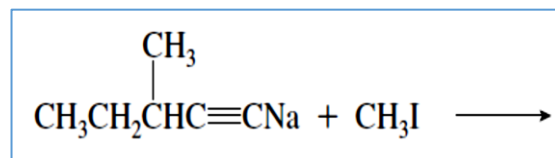
E) point (e)



47. Which one of the following reactions is effective in the synthesis of 4-methyl-2-hexyne?



A)



B)

48. Which alkyne yields butanoic acid ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$) as the only organic product on treatment with ozone followed by hydrolysis?

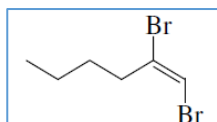
A) 1-Butyne

B) 1-Pentyne

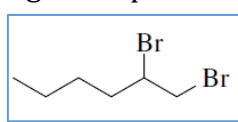
C) 4-Octyne

D) 2-Hexyne

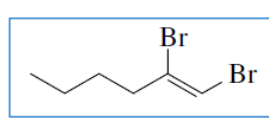
49. Which of the following is the product of the reaction of 1-hexyne with 1 mol of Br_2 ?



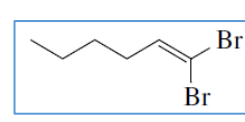
A)



B)

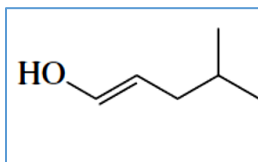


C)

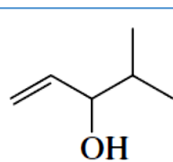


D)

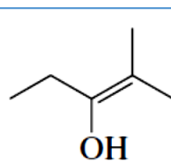
50. Which one of the following is the intermediate in the preparation of a ketone by hydration of an alkyne in the presence of H_2SO_4 and MgSO_4 ?



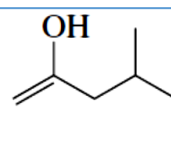
A)



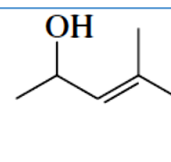
B)



C)



D)



E)

End of your exam questions

(you can use the following empty part as a draft & any answers here will not be graded)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[illegible]

Best Wishes