

Topic: Intermolecular Forces

20. For a molecule to possess a dipole moment, the following condition is necessary but not sufficient.
- A) Three or more atoms in the molecule
 - B) Presence of one or more polar bonds
 - C) A non-linear structure
 - D) Presence of oxygen or fluorine
 - E) Absence of a carbon-carbon double or triple bond

Ans: B

Topic: Intermolecular Forces

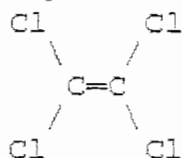
21. A non-zero dipole moment is exhibited by:

A) SO_2

D) BF_3

B) CO_2

E)



C) CCl_4

Ans: A

Topic: Intermolecular Forces

22. Which of these is the weakest of the intermolecular attractive forces?

A) Ion-ion

D) Covalent bonding

B) van der Waals

E) Hydrogen bonding

C) Dipole-dipole

Ans: B

Topic: Functional Groups

23. Which compound listed below is a secondary alcohol?

A) $\text{CH}_3\text{CH}_2\text{CHCH}_3$

D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$

B) $\begin{array}{c} \text{OH} \\ | \\ \text{CH}_3\text{CHCH}_2\text{OH} \end{array}$

E) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_3$

C) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}-\text{OH} \\ | \\ \text{CH}_3 \end{array}$

Ans: A

Topic: Functional Groups

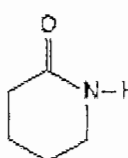
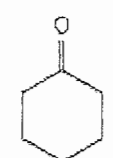
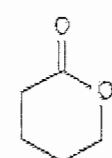
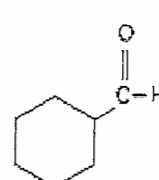
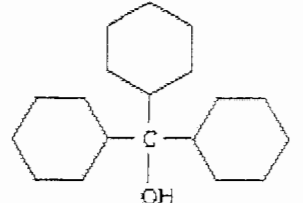
24. Which compound is a secondary amine?

- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
- B) $\begin{array}{c} \text{CH}_3\text{CHCH}_3 \\ | \\ \text{NH}_2 \\ \text{CH}_3\text{CH}_2\text{NH} \\ | \\ \text{CH}_3 \end{array}$
- C) $\begin{array}{c} \text{CH}_3\text{CH}_2\text{NH} \\ | \\ \text{CH}_3 \end{array}$
- D) $\begin{array}{c} \text{CH}_3-\text{N}-\text{CH}_3 \\ | \\ \text{CH}_3 \\ \text{CH}_3\text{CH}_2\text{CHNH}_2 \\ | \\ \text{CH}_3 \end{array}$
- E) $\begin{array}{c} \text{CH}_3\text{CH}_2\text{CHNH}_2 \\ | \\ \text{CH}_3 \end{array}$

Ans: C

Topic: Functional Groups

25. Which compound is an aldehyde?

- I: 
- II: 
- III: 
- IV: 
- V: 
- A) I B) II C) III D) IV E) V

Ans: D

Topic: Functional Groups

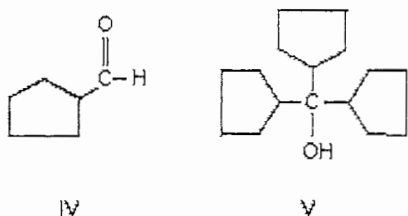
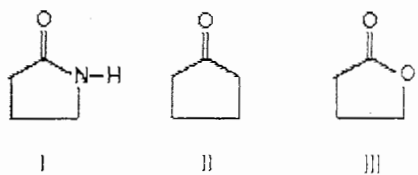
26. Which compound is a ketone?

- A) $\begin{array}{c} \text{O} \\ || \\ \text{HCOH} \end{array}$
- B) $\begin{array}{c} \text{CH}_3\text{CCH}_2\text{CH}_3 \\ || \\ \text{O} \end{array}$
- C) $\begin{array}{c} \text{O} \\ || \\ \text{HCOCH}_3 \end{array}$
- D) $\begin{array}{c} \text{H} \\ | \\ \text{C}=\text{O} \\ | \\ \text{H} \\ | \\ \text{CH}_3 \\ | \\ \text{CHOH} \\ | \\ \text{CH}_3 \end{array}$
- E) $\begin{array}{c} \text{H} \\ | \\ \text{C}=\text{O} \\ | \\ \text{H} \\ | \\ \text{CH}_3 \\ | \\ \text{CHOH} \\ | \\ \text{CH}_3 \end{array}$

Ans: B

Topic: Functional Groups

27. Which compound is an ester?

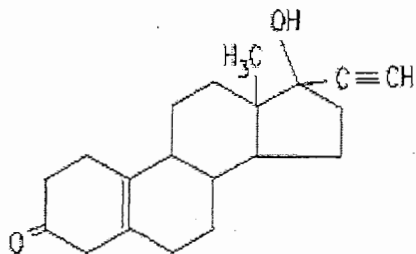


A) I B) II C) III D) IV E) V

Ans: C

Topic: Functional Groups

28. The compound shown below is a synthetic estrogen. It is marketed as an oral contraceptive under the name Enovid.



In addition to an alkane (actually cycloalkane) skeleton, the Enovid molecule also contains the following functional groups:

- A) Ether, alcohol, alkyne.
- B) Aldehyde, alkene, alkyne, alcohol.
- C) Alcohol, carboxylic acid, alkene, alkyne.
- D) Ketone, alkene, alcohol, alkyne.
- E) Amine, alkene, ether, alkyne.

Ans: D

Topic: Functional Groups

29. Which is a 3° alkyl halide?

- A) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{C}-\text{Cl} \\ | \\ \text{CH}_3 \end{array}$
- B) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 \\ | \\ \text{CH}_3\text{CCH}_2\text{Cl} \\ | \\ \text{CH}_3 \\ \text{CH}_3\text{CH}_2\text{CHCH}_3 \\ | \\ \text{Cl} \end{array}$
- C) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{C}-\text{Cl} \\ | \\ \text{CH}_3 \end{array}$
- D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$
- E) $\begin{array}{c} \text{ClCHCH}_2\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$

Ans: A

Topic: Functional Groups

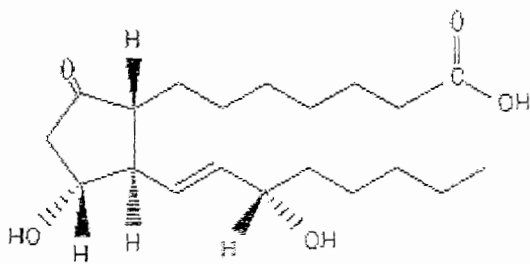
30. Which is a 3° amine?

- A) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}-\text{NH}_2 \\ | \\ \text{CH}_3 \end{array}$
- B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
- C) $\text{CH}_3\text{CH}_2\text{N}(\text{CH}_3)_2$
- D) $\begin{array}{c} \text{CH}_3\text{CHNHCH}_3 \\ | \\ \text{CH}_3 \end{array}$
- E) $(\text{CH}_3)_3\text{CNHCH}_3$

Ans: C

Topic: Functional Groups

31. Which functional group is not contained in prostaglandin E_1 ?



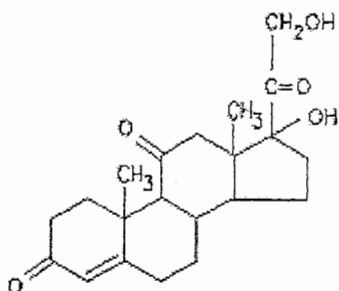
Prostaglandin E_1

- A) Ketone
- B) 2° alcohol
- C) 3° alcohol
- D) Carboxylic acid
- E) Alkene

Ans: C

Topic: Functional Groups

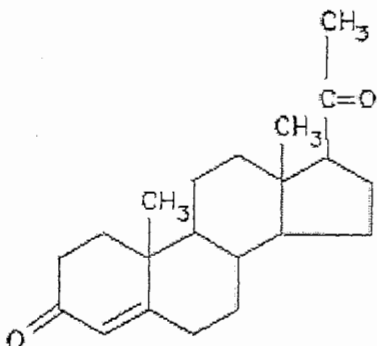
32. The compound below is an adrenocortical hormone called cortisone. Which functional group is not present in cortisone?



- A) 1° alcohol
B) 2° alcohol
C) 3° alcohol
D) Ketone
E) Alkene
- Ans: B

Topic: Functional Groups

33. The compound shown below is a steroid called progesterone.

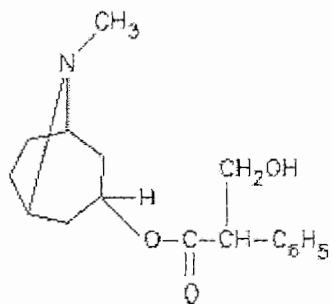


In addition to the cycloalkane skeleton, the progesterone molecule contains which other functional groups?

- A) Alkene and ketone
B) Alkene, ketone, and ether
C) Aldehyde, alkene, and ketone
D) Ester, alkene, and ketone
E) Ether, ester, and alkyne
- Ans: A

Topic: Functional Groups

34. Drawn below is atropine.



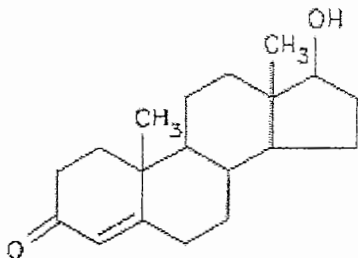
Which of the following functional groups is NOT in atropine?

- A) Amine
- B) Ester
- C) Alcohol
- D) Benzene ring
- E) Ketone

Ans: E

Topic: Functional Groups

35. The compound shown below is the male sex hormone, testosterone.



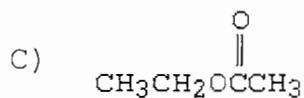
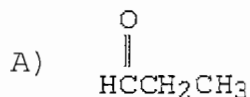
In addition to a cycloalkane skeleton, testosterone also contains the following functional groups:

- A) Alkene, ester, tertiary alcohol.
- B) Alkene, ether, secondary alcohol.
- C) Alkene, ketone, secondary alcohol.
- D) Alkyne, ketone, secondary alcohol.
- E) Alkene, ketone, tertiary alcohol.

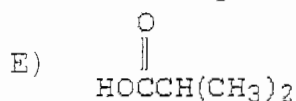
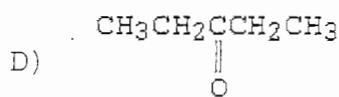
Ans: C

Topic: Functional Groups

36. Which is a carboxylic acid?

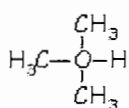


Ans: E

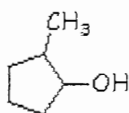


Topic: Functional Groups

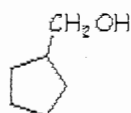
37. Which compound is a tertiary alcohol?



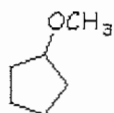
I



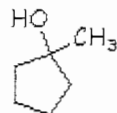
II



III



IV



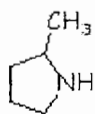
V

A) I B) II C) III D) IV E) V

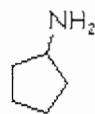
Ans: E

Topic: Functional Groups

38. Which compound is a primary amine with the formula $\text{C}_5\text{H}_{13}\text{N}$?



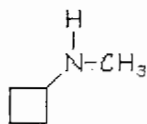
I



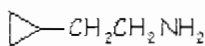
II



III



IV



V

A) I B) II C) III D) IV E) V

Ans: C

Topic: Functional Groups

39. Which compound is an alcohol?

- A) CH_3CONH_2 D) CH_3CHO
 B) $\begin{array}{c} \text{CH}_3\text{CCH}_3 \\ || \\ \text{O} \end{array}$ E) $(\text{CH}_3)_3\text{COH}$
 C) $\text{CH}_3\text{CO}_2\text{CH}_2\text{CH}_3$

Ans: E

Topic: Functional Groups

40. The C-O-C bond angle in diethyl ether is predicted to be approximately:

- A) 90° D) 120°
 B) 105° E) 180°
 C) 110°

Ans: B

Topic: Functional Groups

41. Which compound contains a secondary carbon atom?

- A) CH_4 D) $\begin{array}{c} \text{CH}_3\text{CHCH}_3 \\ | \\ \text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$
 B) CH_3CH_3 E) $\begin{array}{c} \text{CH}_3\text{CH} \\ | \\ \text{CH}_3 \end{array}$
 C) $\text{CH}_3\text{CH}_2\text{CH}_3$

Ans: C

Topic: Functional Groups

42. The number of unique monochloro derivatives of propene is:

- A) 2 B) 3 C) 4 D) 5 E) 6

Ans: C

Topic: Functional Groups

43. The carbon-carbon bond in $\begin{array}{c} \text{H} \\ | \\ \text{CH}_3\text{C}=\text{O} \end{array}$ results from the

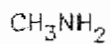
overlap of which orbitals (in the order C_1 , C_2)?

- A) $\text{sp}-\text{sp}^2$ D) sp^2-sp^3
 B) $\text{sp}-\text{sp}^3$ E) sp^3-sp^3
 C) sp^2-sp^2

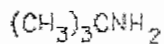
Ans: D

Topic: Functional Groups

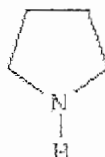
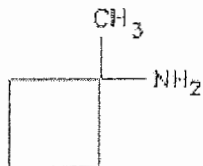
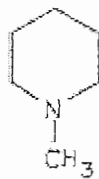
44. An example of a tertiary amine is:



I



II

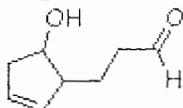


- A) I B) II C) III D) IV E) V

Ans: C

Topic: Functional Groups

45. Which functional groups are present in the following compound?



- A) Alkene, 1° alcohol, ketone
B) Alkene, 2° alcohol, aldehyde
C) Alkene, 2° alcohol, ketone
D) Alkyne, 1° alcohol, aldehyde
E) Alkyne, 2° alcohol, ketone

Ans: B

Topic: Functional Groups

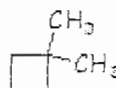
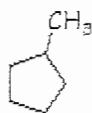
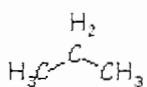
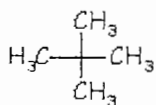
46. How many constitutional isomers are possible with the formula $\text{C}_4\text{H}_{10}\text{O}$?

- A) 3 B) 4 C) 5 D) 6 E) 7

Ans: E

Topic: Functional Groups

47. A tertiary carbon atom is present in which of these compounds?



- A) I B) II C) III D) IV
E) None of these
- Ans: C

Topic: Functional Groups

48. Which of these compounds is a secondary alkyl chloride?

- A) CH₃CH₂CH₂CH₂CH₂Cl D) $\begin{array}{c} \text{CH}_3\text{CH}_2\text{CHCl} \\ | \\ \text{CH}_2\text{CH}_3 \end{array}$
- B) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CCH}_2\text{CH}_3 \end{array}$ E) Two of these
- C) $\begin{array}{c} \text{Cl} \\ | \\ \text{CH}_3\text{CHCH}_2\text{CH}_2\text{CH}_3 \end{array}$
- Ans: E

Topic: Functional Groups

49. How many 2° alkyl bromides, neglecting stereoisomers, exist with the formula C₆H₁₃Br?

- A) 4 B) 5 C) 6 D) 7 E) 8
- Ans: C