A. 

B. 

C. 

D. 

E. 

F. 

edge and dash not really needed here because the product is achiral

enantiomers

dia stereomers

dia stereomers

products
4(a) 
\[
\begin{align*}
\text{EtOH} & \quad \xrightarrow{\text{EtO}^-} \quad \left(20^\circ C\right) \quad (\text{SN}1/\text{SN}) \\
\text{SN2} & \quad + \quad \text{E2}
\end{align*}
\]
low polarizability
(favors E2 slightly)

4(b) 
\[
\begin{align*}
\text{EtOH} & \quad \xrightarrow{\text{EtO}^-} \quad \left(20^\circ C\right) \quad (\text{SN}1/\text{SN}) \\
\text{SN2} & \quad + \quad \text{E2}
\end{align*}
\]

4(c) 
\[
\begin{align*}
\text{EtOH} & \quad \xrightarrow{\text{EtO}^-} \quad \text{SN2} \\
\text{SN2} & \quad + \quad \text{m} \text{icor} \text{E2} \\
& \quad + \quad \text{m} \text{ajor E2}
\end{align*}
\]

4(d) 
\[
\begin{align*}
\text{EtOH} & \quad \xrightarrow{\text{EtO}^-} \quad \left(20^\circ C\right) \\
\text{SN2} & \quad + \quad \text{E2}
\end{align*}
\]
NO SN2 Here
(4e) \[ \text{Eto}^- / \text{EtOH} \]

\[ \text{SN}_2 + \text{E}_2 \]

No E2 here

anti config.

(4f) \[ \text{Eto}^- / \text{EtOH} \]

\[ \text{SN}_2 + \text{E}_2 \]

Only this one

(3a): \[ \text{NaOH} / \text{DMSO} \]

\[ \text{SN}_2 (\text{MATBE}) \]

(10C, 5B, 5N)

E2

(aii) \[ \text{KI} / \text{acetone} \]

\[ \text{SN}_2 \]

(10C, 5N, 5B)

No E2 here!
This reaction could occur if AgNO₃ was used.

For reaction (Sa,iu), the reaction product is N.R.

For reaction (Sb,ii), the reaction is carried out in DMSO at 3°C. The product is a mixture of two compounds, with the minor product being E₂ and the major product being S₃.N₂.

For reaction (Sb,iii), the reaction is carried out in acetone. The product is S₃.N₂.

For reaction (Sb,iv), the reaction product is a mixture of two compounds, with the major product being E₁.

For reaction (Sc,i), the reaction product is a mixture of S₃.N₂ and E₂.

For reaction (Sc,ii), the reaction is carried out in DMSO, and the product is a mixture of S₃.N₂ and E₂.
SN₂ only

Reasonably not formed

Small or amount b/c of size of nucleophile

MAJOR PRODUCT

$\text{SN}_1$

$\text{E}_1$
6. Predict the preferred product(s) (the *major products*) of the following $S_{N}$2 reactions, including stereochemistry when appropriate.

(a) \[
\begin{align*}
\text{CH}_3\text{C-CH}_2\text{CH}_3 & \quad \text{KCN} \\
\text{Br} & \rightarrow \text{CN}
\end{align*}
\]

(b) \[
\begin{align*}
\text{CH}_3 & \quad \text{KOH} \\
\text{Cyclohexane Br} & \rightarrow \text{Cyclohexanol}
\end{align*}
\]

(c) \[
\begin{align*}
\text{CH}_3\text{Br} & \quad \text{NaSCH}_3 \\
\text{CH}_2\text{CH}_3 & \rightarrow \text{SCH}_3
\end{align*}
\]

7. Predict the preferred product(s) (the *major products*) of the following $S_{N}$1/E1 reactions, including stereochemistry when appropriate.

(a) \[
\begin{align*}
\text{CH}_3\text{C-CH}_2\text{CH}_3 & \quad \text{CH}_3\text{OH} \\
\text{Br} & \rightarrow \text{CH}_3\text{CH}_2\text{CH}_3 + \text{CH}_3\text{CH}_2\text{OH} + \text{CH}_2\text{CH}_3 + \text{CH}_2=\text{CH}_2
\end{align*}
\]

(b) \[
\begin{align*}
\text{Cyclohexane} \quad \text{H}_2\text{O} & \\
\text{I} & \rightarrow \text{Cyclohexene} + \text{Cyclohexane} + \text{Cyclohexane}
\end{align*}
\]

(c) \[
\begin{align*}
\text{CH}_2\text{Br} & \quad \text{A}2\text{N}0_3 \\
\text{CH}_2\text{CH}_3\text{OH} & \rightarrow \text{Cyclohexane} + \text{Cyclohexane} + \text{Cyclohexane}
\end{align*}
\]
8. Predict the preferred product(s) (the major products) of the following E2 reactions, including stereochemistry when appropriate.

(a)

(b)

(c)

9. Synthesis: Propose substrates and reagents that could form each of the following products (there may be more than one possible correct answer).

(a)

(b)

(c)
10. Star each stereocenter (chiral atom) in the following compounds, and then determine whether it has the (R) or (S) configuration.

(a) \[ \text{CH}_3 \quad \text{CH}_3 \quad \text{H} \quad \text{HO} \] 
(b) \[ \text{CH}_3 \quad \text{Br} \quad \text{CH}_2 \text{CH}_3 \quad \text{R} \] 
(c) \[ \text{Cl} \quad \text{R} \quad \text{Cl} \quad \text{R} \] 
(d) \[ \text{H} \quad \text{H} \quad \text{CH}_3 \quad \text{R} \]

11. Indicate the relationship between the compound in the box and each of the three compounds on the right.

(a) \[ \text{H} \quad \text{Cl} \quad \text{Br} \quad \text{CH}_3 \] 
(b) \[ \text{Br} \quad \text{H} \quad \text{Cl} \quad \text{CH}_3 \] 
(c) \[ \text{Cl} \quad \text{H} \quad \text{Br} \quad \text{CH}_3 \]

12. Draw a Fischer projection of each of the following molecules.

(a) \[ \text{H} \quad \text{CH}_3 \quad \text{CH}_3 \quad \text{H} \] 
(b) \[ \text{H} \quad \text{CH}_3 \quad \text{H} \quad \text{OH} \] 
(c) \[ \text{H} \quad \text{Cl} \quad \text{CH}_2 \text{CH}_3 \quad \text{Cl} \] 

13. Convert the following Fischer projections to line drawing that use dashes and wedges to indicate stereochemistry.

(a) \[ \text{H}_2\text{N} \quad \text{COOH} \] 
(b) \[ \text{CH}_3 \quad \text{HO} \quad \text{H} \] 
(c) \[ \text{H} \quad \text{H} \quad \text{OH} \]