

Names of all students (please print) _____

CHEM 243 Organic Chemistry I

Points _____ (10 max)

Worksheet #16: October 30, 2024. Complete the following worksheet by collaborating with a group of 3-4 students. You can use a text book or your lecture video notes. You must work together, with the names of all students included on **ONE** sheet and turned in for a group grade.

From now on you can expect to see “**think outside the box**” types of worksheet problems, that require you to use your problem-solving skills, and information from earlier in the course.

Your course notebook will be essential! Remember, my worksheets are designed with the assumption that you have: (1) watched the videos, (2) taken notes, and (3) have your notebook open on your bench.



(1) SN2 Reactions Background Information. Fill in the blanks to complete each sentence about SN2 reactions.

- (a) In an SN2 reaction, the _____ substitutes for the _____
- (b) In SN2 reactions, the electrophilic carbon has a _____ charge, and is bonded to the _____
- (c) In SN2 reactions, the nucleophile can best be described as a _____
- (d) In SN2 reactions, the leaving group forms a _____ as a product
- (d) In SN2 reactions, the nucleophile forms a bond to the electrophilic carbon from the side _____ the leaving group.
- (e) In SN2 reactions, the nucleophile forms a bond to the electrophilic carbon at the same time that the leaving group leaves. This is referred to as a _____ reaction.

(2) SN2 Reactions – The Energy Diagram. The figure at the right represents an exothermic Energy Diagram for a one-step SN2 reaction. Complete the blanks a-f to label the:

Reactant (R) _____

Product (P) _____

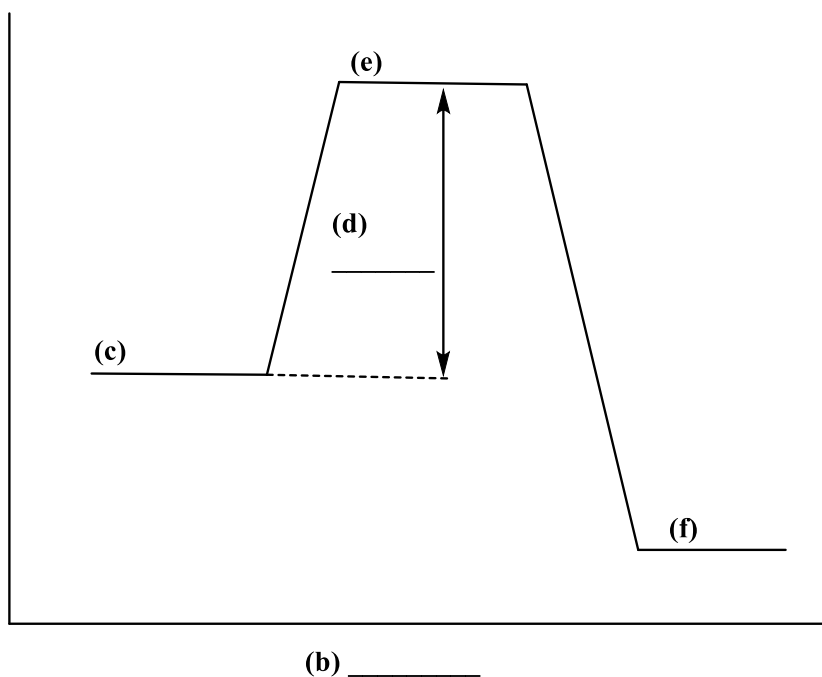
Activation Energy (AE) _____

Energy (E) _____

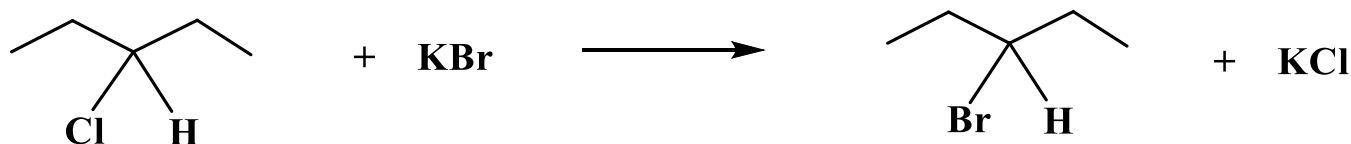
Transition State (TS) _____

Progress of Reaction (PR) _____

(a) _____

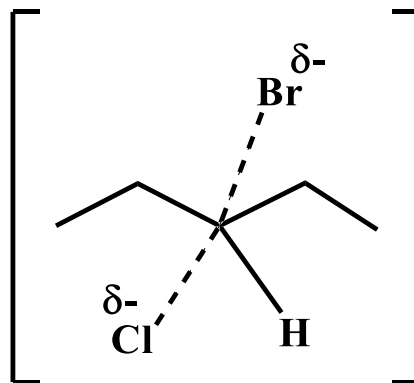


(3) SN2 Reaction Theory. Answer the following questions for the SN2 reaction drawn below:



- (a) Label the electrophilic carbon with a δ^+ charge.
- (b) What is the Nucleophile (be specific and write with correct charge, if relevant) _____
- (c) What is the Leaving Group (be specific and write with correct charge, if relevant) _____
- (d) Is the Leaving Group bonded to a **1°**, **2°**, or **3°** carbon: CIRCLE your answer.
- (e) What is the role of the K^+ ion? _____

(4) SN2 Reactions – The Transition State. The hypothetical structure of the Transition State for the SN2 reaction shown in question #3 is drawn below. Why is the SN2 Transition State referred to as being “crowded”?



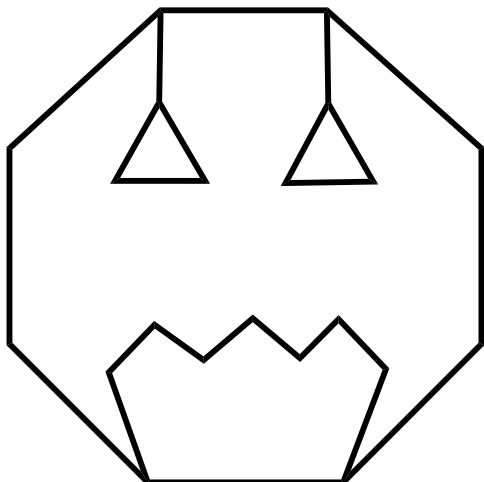
HALLOWEEN BONUS POINTS!

Group Points _____ (10 max)

Complete the following Bonus Questions with the students in your group.



This is “Pumpkin-ane”



(a) How many 3° carbons can you find? _____

(b) What is the Hydrogen deficiency? _____
(Hint – count the rings)

(c) How many chiral carbons can you find? _____

(d) What is the maximum # of stereoisomers? _____

(e) Could Pumkinane be a Meso Compound? **YES** **NO**

(g) Using the atomic numbers in each box, spell Halloween words with the Periodic Table:

16	84	8	19	39
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67	29	16		84	6	92	16
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5	8	8
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(h) Can you come up with your own Halloween word(s) using the periodic table?
