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CEM 352 –Quiz 1

Spring 2026

NAME	

Score		

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READ THIS!

Bubble in your PID in the space above. Write your answer for each question in the space provided.

LEAVE THIS COVER SHEET ATTACHED TO THE QUIZ!

1. _____/18

2. _____/12

3. _____/11

4. _____/9

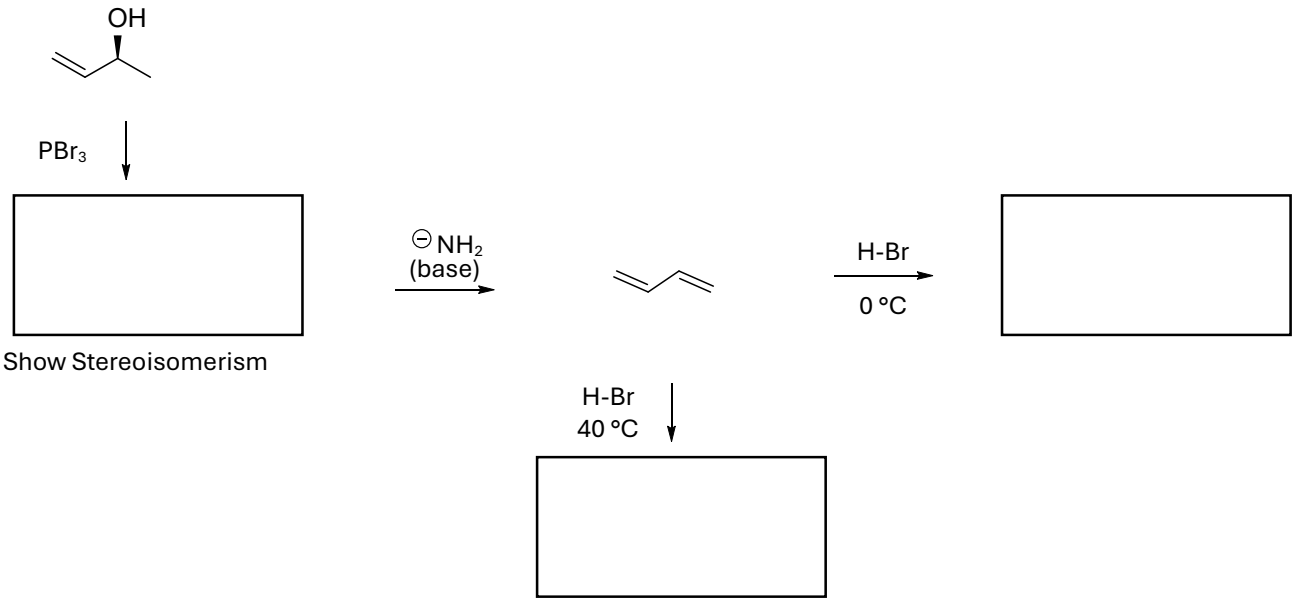
TOTAL:_____/ 50

CIRCLE THE 'H' BELOW
If you are in the Honors College and/or
Registered for the CEM352 Honors Option

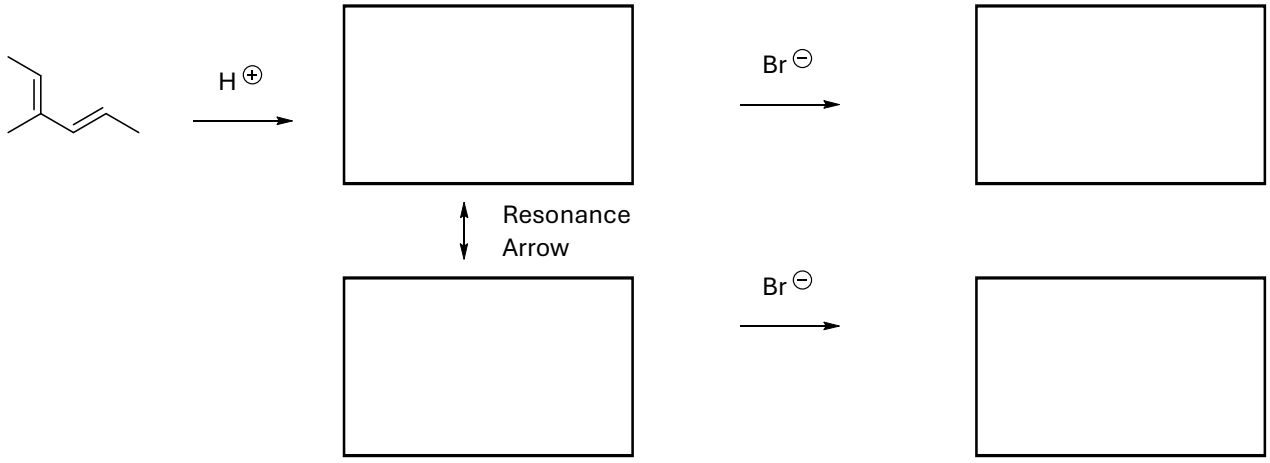
H

HONORS OPTION _____/6

1) (6 pts) Show the reaction products or pathway intermediates



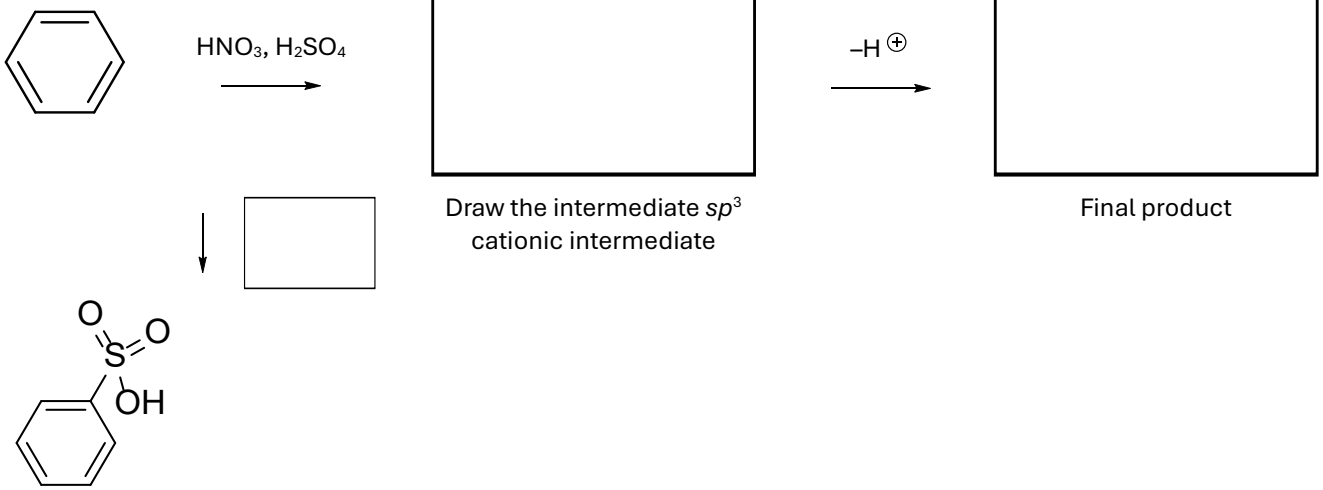
2) (8 pts) Show the preferred route for the following reaction.



3) (4 pts) Draw the reaction product(s). NBS: *N*-bromosuccinimide

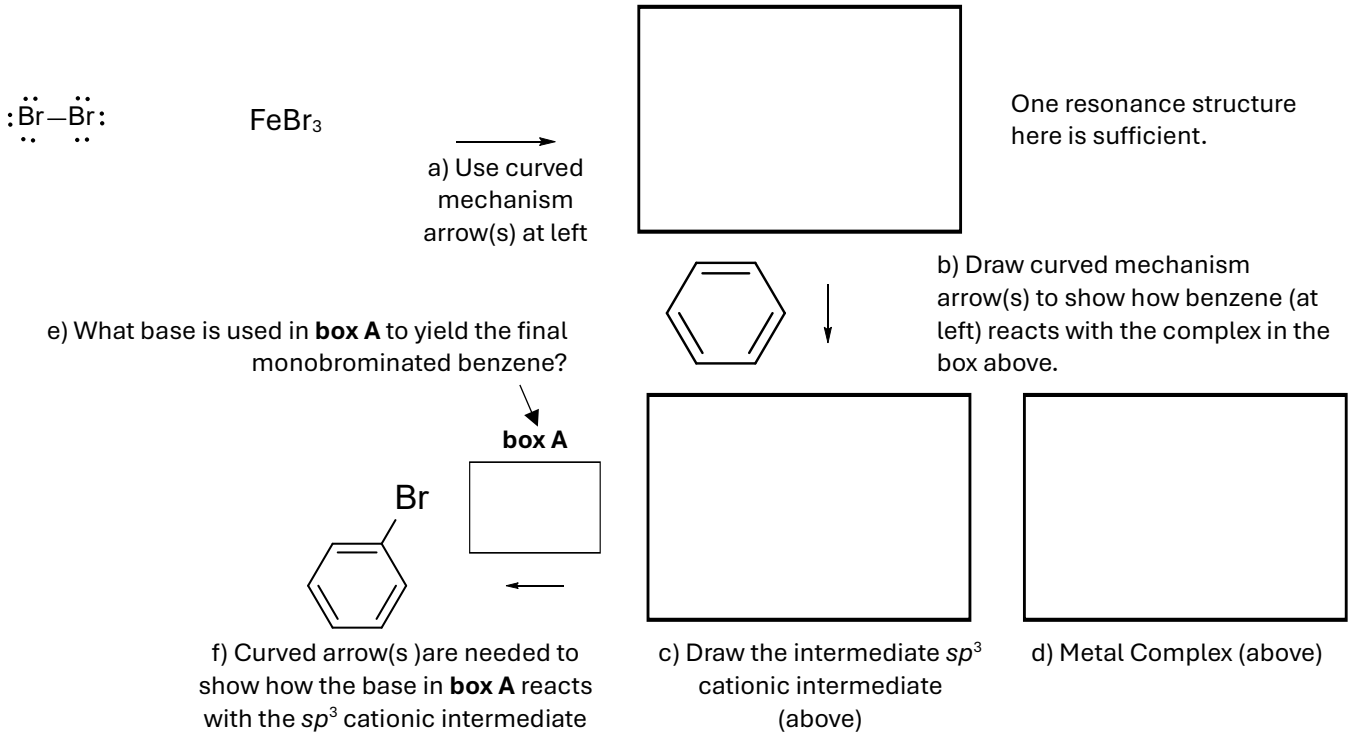
Write an 'X' above if only one unique product is made.

4) (5 pts) Draw the intermediates, products or the reagents needed to conduct the following transformations.

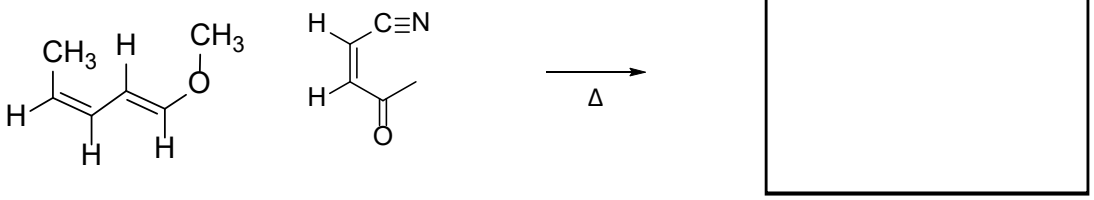


5) (7 pts) While bromine gas (Br_2) has a very short-lived dipole moment, enabling it to react with an isolated π-bond or non-aromatic conjugated π-system, it cannot brominate benzene. Instead, a Lewis acid catalyst such as $FeBr_3$ or $AlBr_3$ is used to increase the reactivity of Br_2.

Complete the following mechanism **using curved arrows for each step** to show how the Lewis acid catalyst activates Br_2.



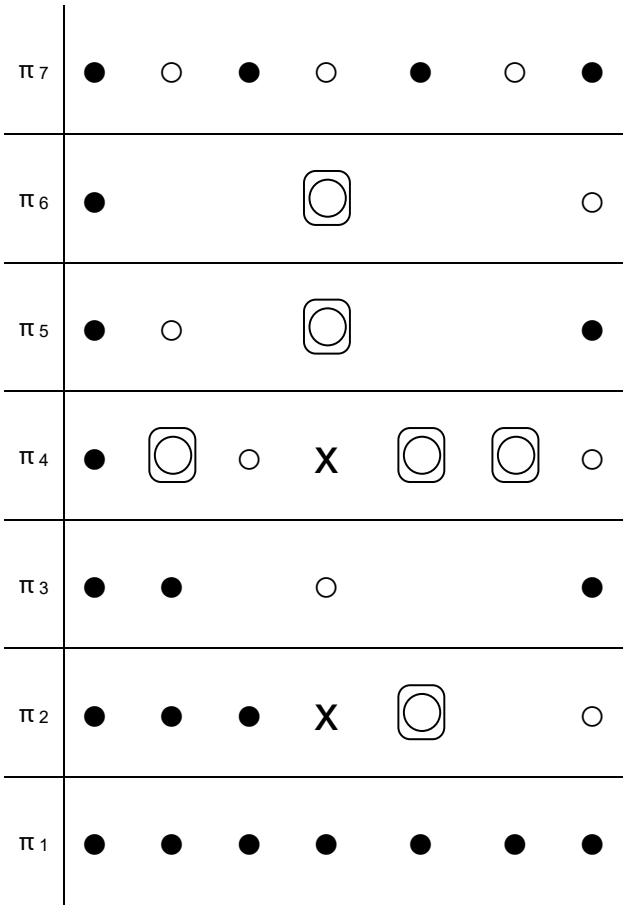
6) (5 pts) Draw the product.



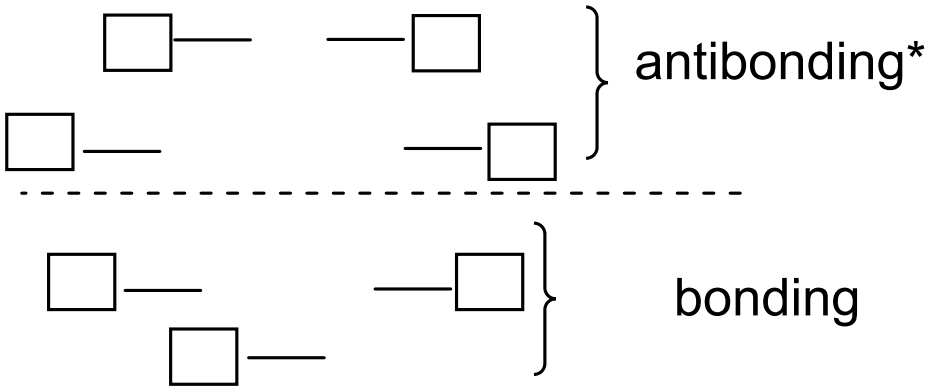
You may need to redraw this to a more familiar rotamer.

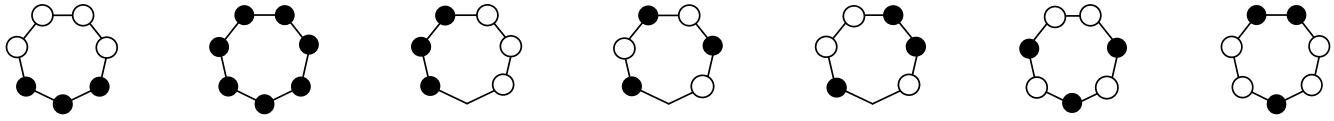
Consider endo/exo selectivity when drawing the major product (1 pt)
Stereoisomerism (1 pt)
Disregard Regioisomerism

7) **(6 pts).** The table below uses the shorthand representations of the top-lobe phases of the p-orbitals in the MO diagram for a conjugated π-system containing 7 p-orbitals. **The table is incomplete; the missing lobe phases and nodes must be CLEARLY filled in to receive credit for shading the open circles within** the boxes. ◯. The open circles in boxes need to be CLEARLY filled in (●), left unfilled (○), or turned into a node (⊗) to satisfy the MO symmetry.

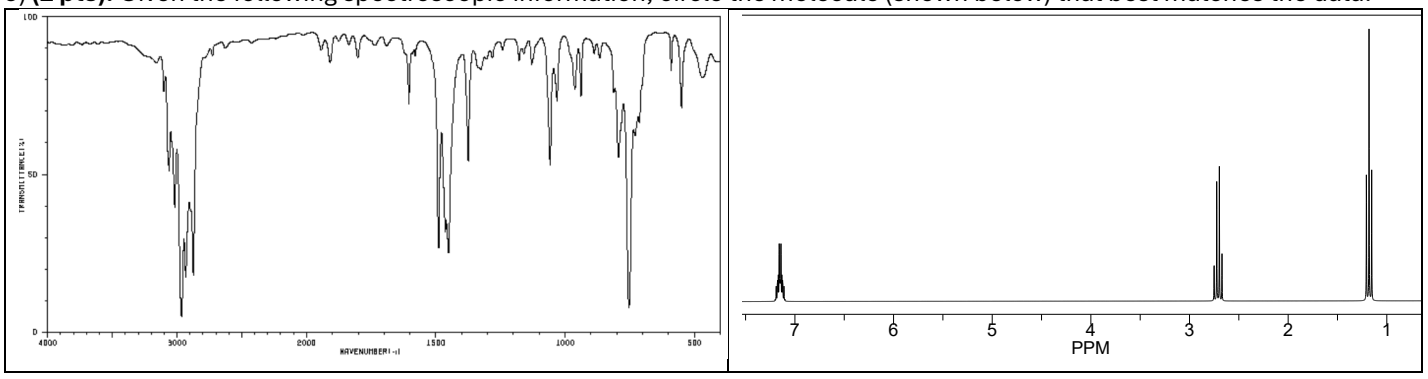


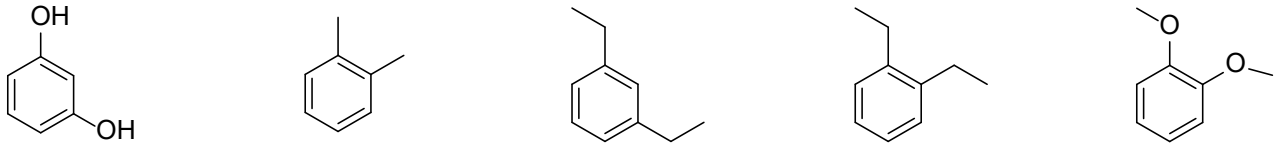
8) **(7 pts).** The MOs of the cycloheptatrienyl cation are shown below and are ordered by energy, with 3 sets of degenerate molecular orbitals and one low-energy molecular orbital. P**lace a letter in each box** corresponding to the correct bonding and antibonding MO.





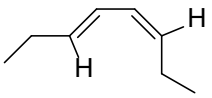
9) **(2 pts).** Given the following spectroscopic information, circle the molecule (shown below) that best matches the data.

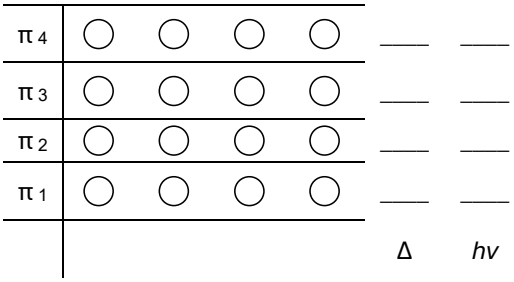




Honors Question (FOR HONORS STUDENTS ONLY; NOT EXTRA CREDIT FOR NON-HONORS STUDENTS) (6 pts)

Honors 1) Complete the shorthand MO diagram below of the conjugated π-system for (E,Z)-3,5-octadiene by shading in the open circles or leaving them unshaded to represent the phases of the p-orbitals in the MO.



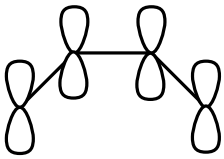


Show the electron configurations in the MO diagram for the thermal condition (Δ) and photochemical condition (*hv*) above.

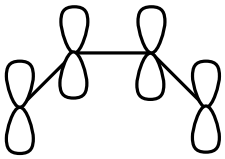
The HOMO (highest occupied MO) for the thermal and photochemical conditions will differ. The phases of the terminal p-orbital of the HOMO are used to determine the stereoisomerism of the products in ring closure and ring opening reactions.

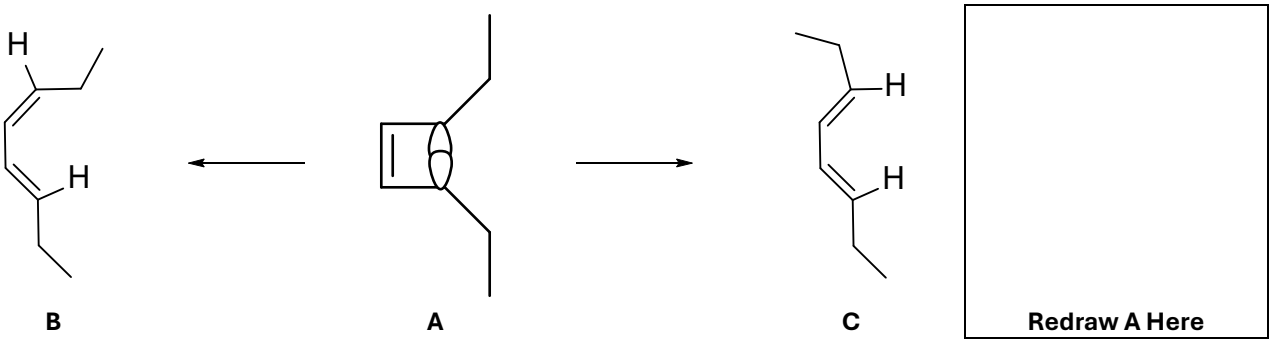
Honors 2) Referencing your shorthand MO diagram above, shade the conventional p-orbital lobes for the HOMO of the thermal and photochemical reactions below.

THERMAL



PHOTOCHEMICAL





a) **Shade one or both lobes of the constructive σ-bond MO of the cyclobutene (A) to show a bonding MO**
b) **How must the σ-bond MOs rotate (conrotatory or disrotatory) to yield the thermal product (B) and photochemical product (C)? Explain based on the orbital phasing of the HOMOs used for each process (BELOW).**
c) **Are the ethyl groups on A *cis* or *trans*? REDRAW 'A' IN THE BOX ABOVE.**