Mid-semester Test for Modules 06530, 06550, 06590

Organic Chemistry

General remarks (read before answering the questions)

- The duration of the test is **30 minutes**.
- Each question contains five possible answers; **(A)**, **(B)**, **(C)**, **(D)** and **(E).** Select your answer by marking clearly the appropriate letter **on the answer sheet**.
- Students taking modules **06530** and **06590** are expected to attempt **Q1-12 only** (answering more questions will not gain you any additional marks).
- Students taking module **06550** are expected to attempt **all** questions.

Hand your test in before you leave and do not forget to identify your test sheet below with your student number (or name) and the module number.

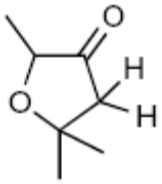
STUDENT ID NUMBER: _____

MODULE: **06530** **06590** **06550**

Start of questions

1. The two protons shown in structure **X** are not equivalent and so split with each other, what is the approximate coupling constant?

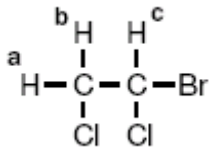
X



1 Hz	4 Hz	8 Hz	18 Hz	50 Hz
A	**B**	**C**	**D**	**E**

2. Consider the statements below regarding compound **Y** and its ^{1}H NMR spectrum, and state the correct answer accordingly.

Y



(i) The spectrum shows a triplet (1 proton) and a doublet (2 protons).
(ii) All three protons are equivalent and one singlet is shown.
(iii) Protons **a** and **b** are enantiotopic.
(iv) All three protons are different and each gives a double doublet.

(**A**) (i) only is correct

(**B**) (iii) only is correct

(**C**) (ii) and (iii) only are correct

(**D**) (iii) and (iv) only are correct

(**E**) (iv) only is correct

3. Consider the following statements regarding field strength in ^{1}H NMR, and state the correct answer accordingly.

(i) Precessional frequency varies with field strength.
(ii) Coupling constants vary with field strength.
(iii) There is less chance of signal overlap at higher field strength.
(iv) Coupling constants do not vary with field strength.

(**A**) (i) only is correct

(**B**) (iii) only is correct

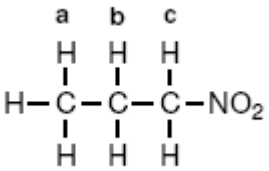
(**C**) (i) and (ii) only are correct

(**D**) (i), (iii) and (iv) only are correct

(**E**) (i), (ii) and (iii) only are correct

4. Consider the following statements regarding compound **Z** and its ^{1}H NMR spectrum, and state the correct answer accordingly.

Z



(i) All three sets of protons give triplets.
(ii) Double irradiation at the frequency of protons **b** simplifies the spectrum to two singlets.
(iii) A shift reagent would affect the signal of protons **a** the most.
(iv) Protons **b** are diastereotopic.

(**A**) (i) only is correct

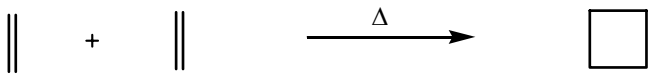
(**B**) (ii) only is correct

(**C**) (ii) and (iii) only are correct

(**D**) (ii), (iii) and (iv) only are correct

(**E**) (iv) only is correct

5. For the thermal cycloaddition of ethene, pick out the following statement which is correct:



A : The reaction is antarafacial and allowed

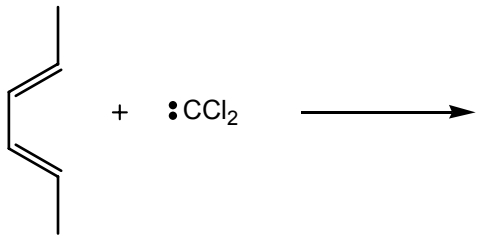
B : The reaction is antarfacial and forbidden

C : The reaction is suprafacial and allowed

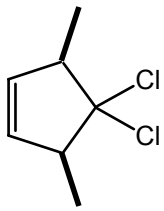
D : The reaction is suprafacial and forbidden

E : None of the above

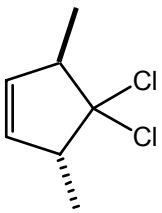
6. For the following reaction, pick out the product:



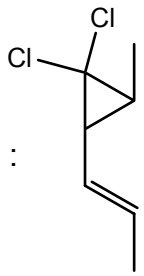
A :



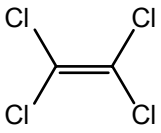
B :



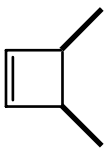
C :



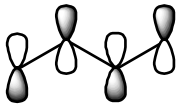
D :

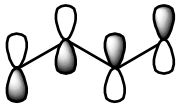


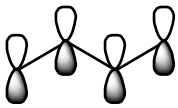
E :

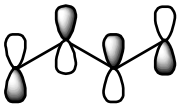


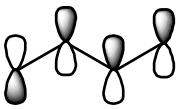
7. For butadiene, pick out the highest occupied molecular orbital (HOMO):

A : 

B : 

C : 

D : 

E : 

8. Using Woodward-Hoffmann rules, pick out the combination which is thermally allowed:

A : $\pi^4_s + \pi^2_s + \sigma^4_a$

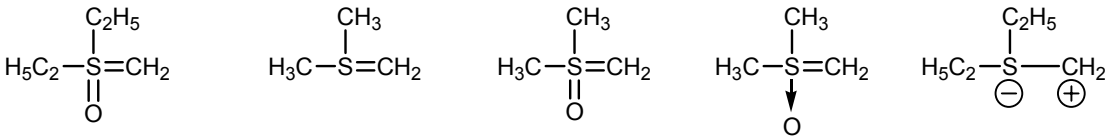
B : $\sigma^2_a + \pi^2_a + \sigma^2_a$

C : $\pi^2_s + \pi^2_s + \sigma^4_a$

D : $\pi^6_s + \sigma^2_a + \pi^2_s$

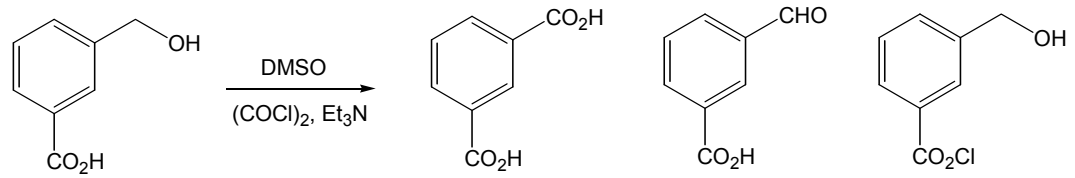
E : $\pi^6_s + \pi^4_s + \sigma^4_a$

9. The structure of dimethylsulphoniummethylide is:

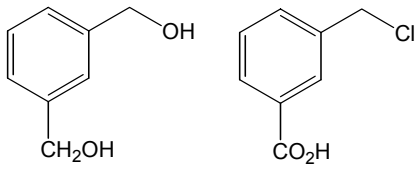


A **B** **C** **D** **E**

10. Identify the correct product formed in the following reaction:

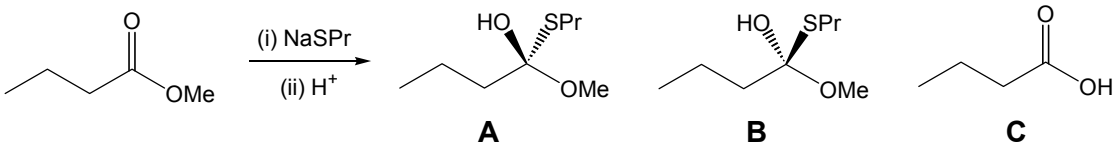


A **B** **C**

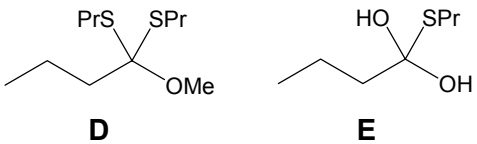


D **E**

11. Identify the correct product formed in the following reaction:

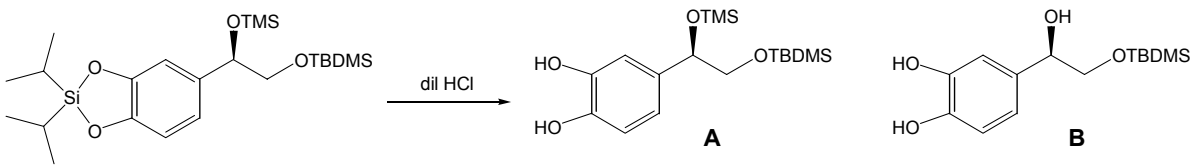


A **B** **C**

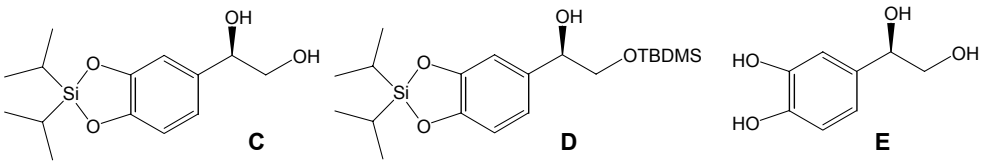


D **E**

12. Identify the correct product formed in the following reaction:



A **B**



C **D** **E**

13. Consider the benzo and pyrido rings that make up quinoline and then decide which of the following statements is true.

(A) The pyrido ring is more reactive towards nucleophiles than the benzo ring.

(B) The benzo ring is more reactive towards nucleophiles than the pyrido ring.

(C) The pyrido ring is reactive towards both electrophiles and nucleophiles

(D) Neither ring is reactive towards nucleophiles

(E) Neither ring is reactive towards electrophiles

14. The Skraup method for making quinolines often uses nitrobenzene in the reaction mixture:

(A) to provide a source of aniline (aminobenzene)

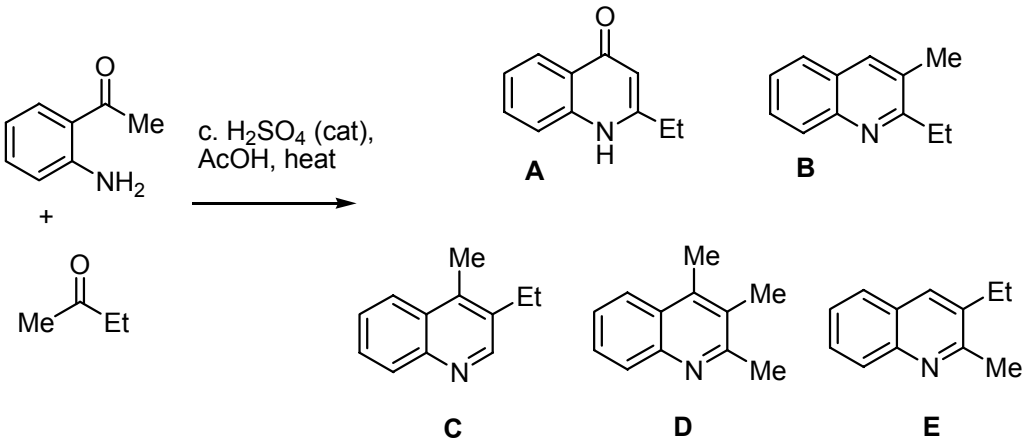
(B) as it has a high boiling point

(C) to reduce the 3,4-dihydroquinoline intermediate

(D) to convert the glycerol into acrolein

(E) to oxidise the 1,2-dihydroquinoline intermediate

15. The product formed in the following reaction is:



16. The product formed in the following reaction is: