



CSIR-UGC-NET/JRF | GATE CHEMISTRY

TEST : REACTION MECHANISM + ORGANOMETALLIC COMPOUNDS

Time : 01: 00 Hour

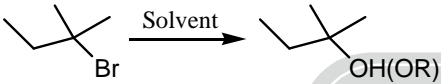
Date : 27-04-2018

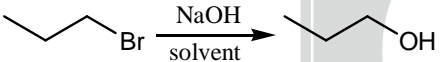
M.M. : 60

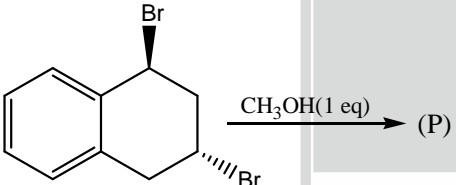
**INSTRUCTION :**

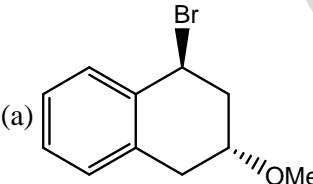
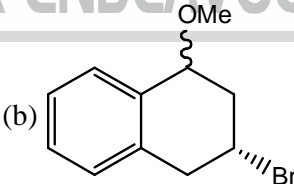
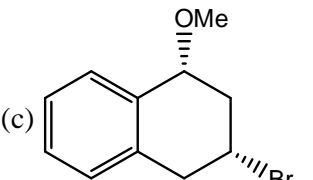
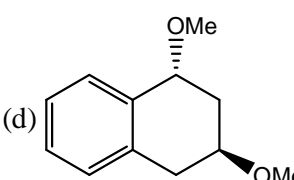
- There are Two Parts. Part-A contains 10 objective type questions, each question carry 2 marks and Part-B contains 10 objective type questions, each question carry 4 marks.
- There is negative marking, @ 25% will be deducted for each wrong answer.
- Attempt all the questions, use of calculator is not allowed.

**PART - A**

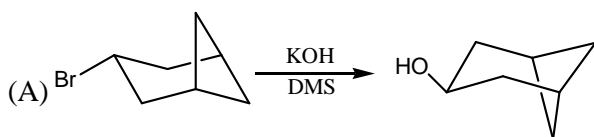
1.  The above synthetic transformation will be fastest in the solvent
- (a) 80% H<sub>2</sub>O + 20% ethanol (b) 40% H<sub>2</sub>O + 60% ethanol  
(c) ethanol alone (d) H<sub>2</sub>O alone

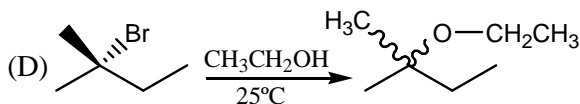
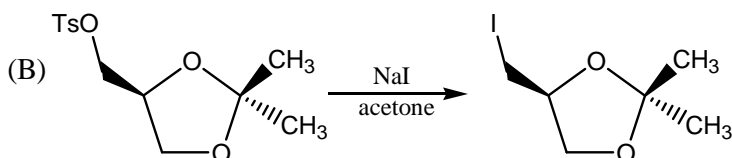
2.  The correct pair of solvent for the above synthetic transformation will be
- (a) CH<sub>3</sub>CN or H<sub>2</sub>O (b) DMF or MeOH  
(c) CH<sub>3</sub>CN or DMF (d) DMSO or TFA

3.  The major product (P) in the above reaction is

- (a) 
- (b) 
- (c) 
- (d) 

4. The correct mechanistic pair for the following reactions are respectively





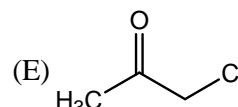
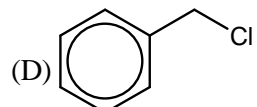
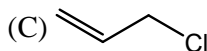
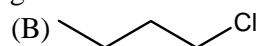
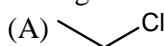
(a)  $S_N2, S_N1, S_N2, S_N1$

(b)  $S_N2, S_N2, S_N2, S_N2$

(c)  $S_N1, S_N2, S_N1, S_N2$

(d)  $S_N2, S_N2, S_N2, S_N1$

5. Arrange the rate of  $S_N2$  reaction for the following substrate



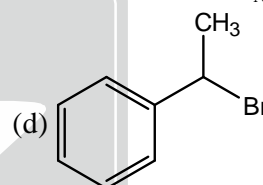
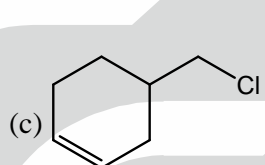
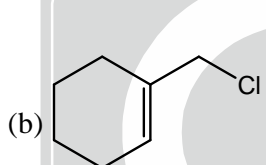
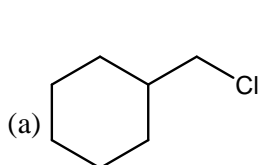
(a)  $A > B > C > D > E$

(b)  $E > D > C > B > A$

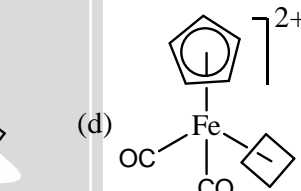
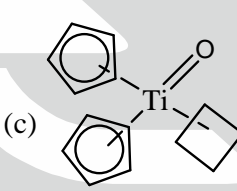
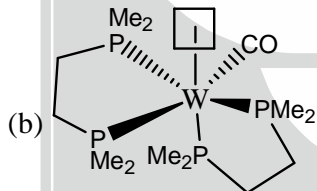
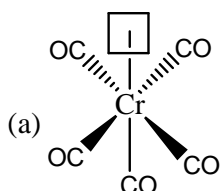
(c)  $E > D > C > A > B$

(d)  $D > C > B > A > E$

6. Which compound reacts most rapidly with potassium iodide in 2-propanone as a solvent by the  $S_N2$  mechanism.



7. To which of the following structure will  $F_2C = CHF$  bind most strongly



8. Which among the following will bind most strongly to a metal

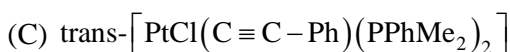
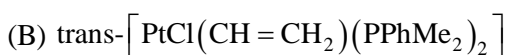
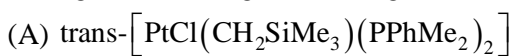
(a) COD

(b) ethylene

(c) norbornene

(d) cyclohexene

9. Arrange the following in increasing order of Pt-C bond lengths



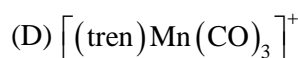
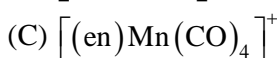
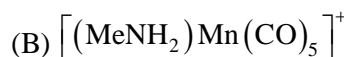
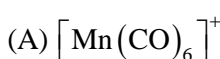
(a)  $C < B < A$

(b)  $A < B < C$

(c)  $A < B = C$

(d)  $B < A < C$

10. Arrange the following in order of decreasing order of  $\nu_{C-O}$  stretching frequency



(a)  $D > C > B > A$

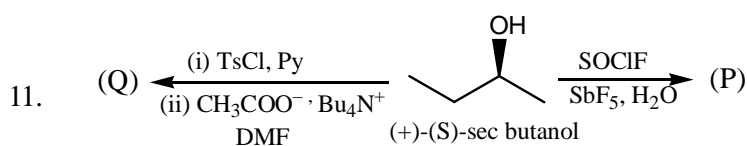
(b)  $B > C > D > A$

(c)  $D > C > A > B$

(d)  $A > B > C > D$

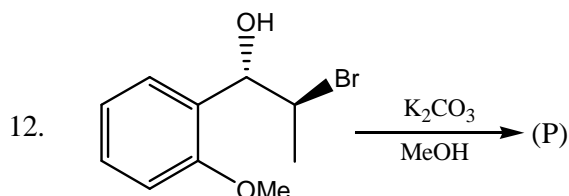


## PART - B

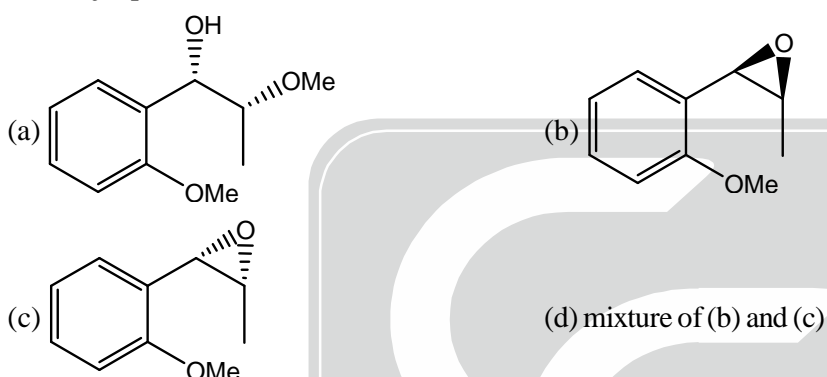


Which of the following statement is true about P and Q

- (a) P = Q = Racemic mixture (b) P = Q =  $\text{S}_{\text{N}}2$   
 (c) P =  $\text{S}_{\text{N}}2$  and Q =  $\text{S}_{\text{N}}1$  (d) P = Racemic mixture, Q = O.A.

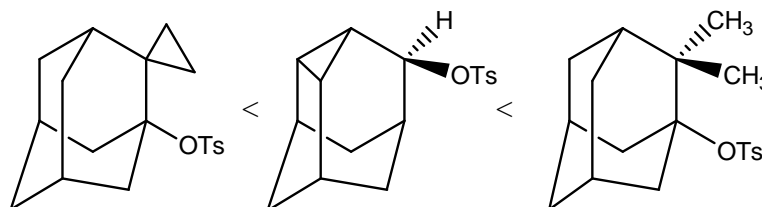


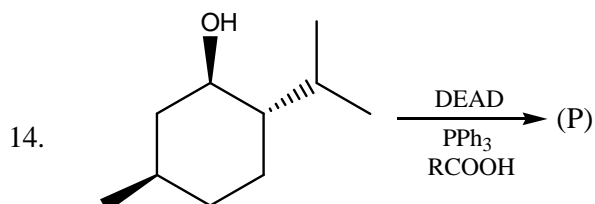
The major product (P) in the above reaction is



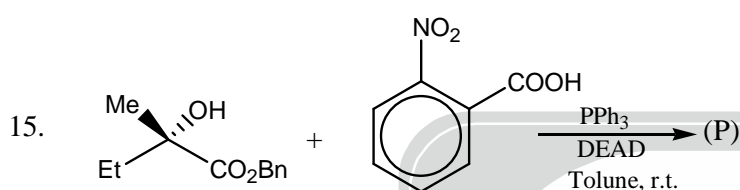
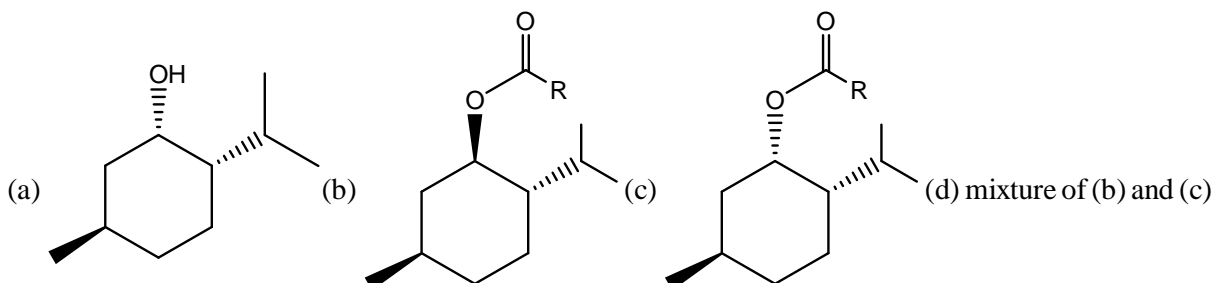
13. Among the following the correct statement is

- (a) The solvolysis of C12CCC3C1CC2C3C is faster than C12CCC3C1CC2C3C  
 (b) The solvolysis of C12CCC3C1CC2C3C is faster than C12CCC3C1CC2C3C  
 (c) The average relative  $\text{S}_{\text{N}}2$  rates for alkyl substrates Benzylic > Allylic > Isobutyl > Neopentyl  
 (d) The correct rate of acetolysis of following compound is

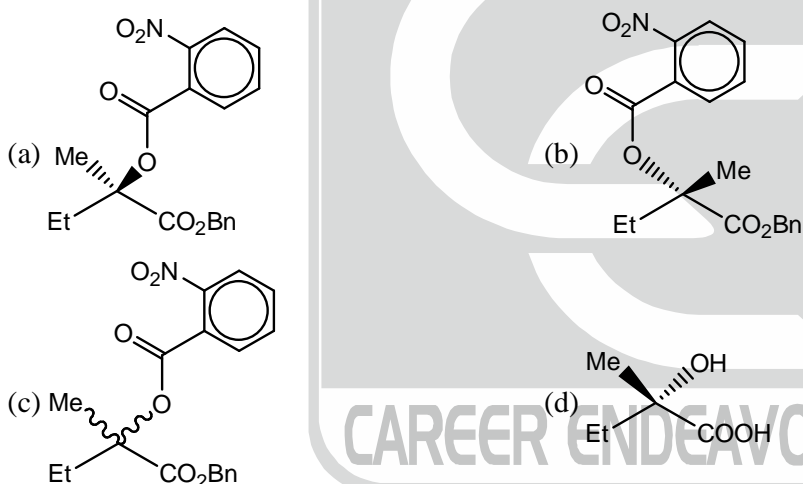




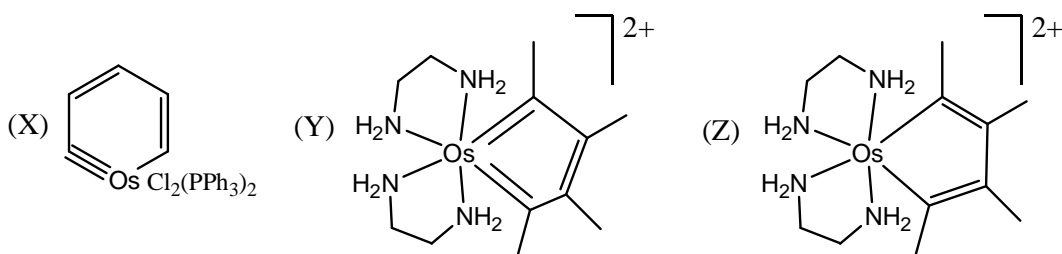
The major product (P) in the above reaction is



The major product (P) in the above synthetic transformation is



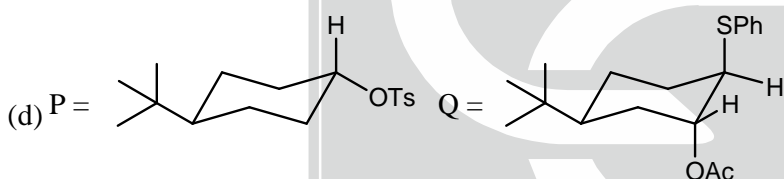
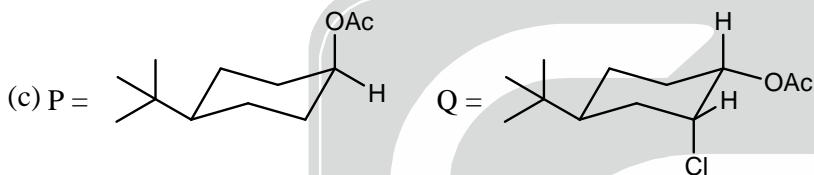
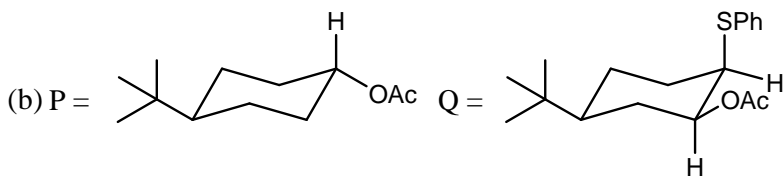
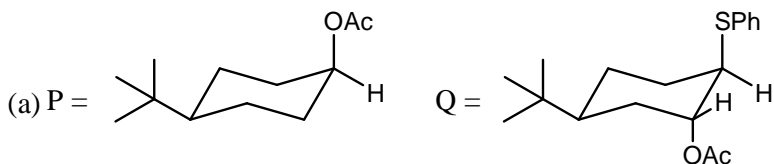
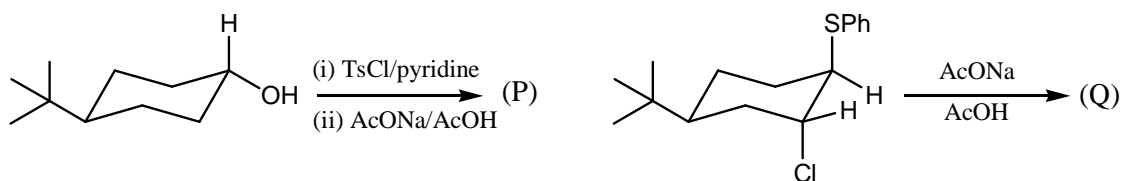
16. The correct oxidation state of Os in the complex (X), (Y) and (Z) are respectively



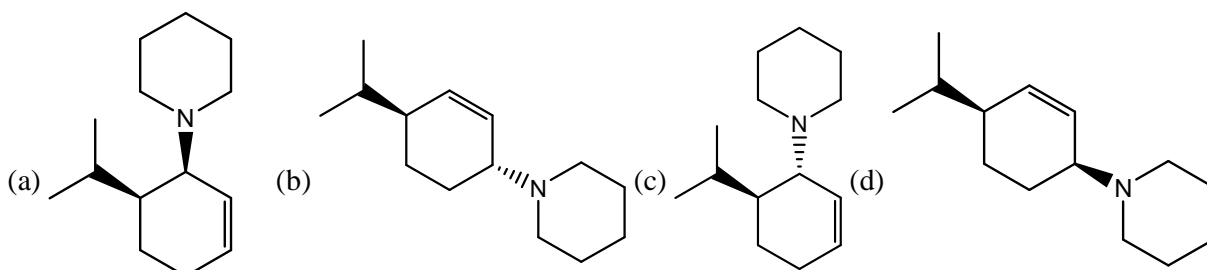
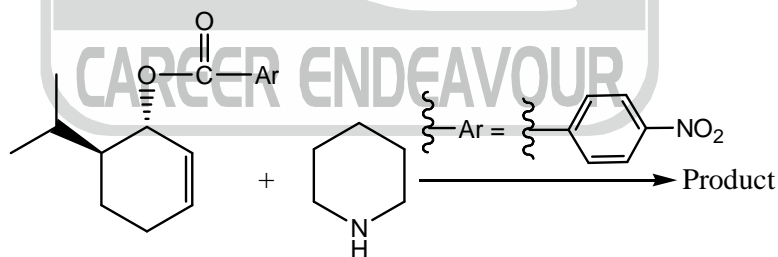
(a) Os(+6), Os(+6), Os(+2)  
 (c) Os(+4), Os(+2), Os(+6)

(b) Os(+6), Os(+6), Os(+4)  
 (d) Os(+3), Os(+2), Os(+2)

17. The major products (P) and (Q) in given reactions are



18. The major product in given reaction is



19. Match the following

**Column-A**

Complexs (fac isomers)

(A)  $\text{Mo}(\text{CO})_3$  dien

(B)  $\text{Mo}(\text{CO})_3(\text{PPh}_3)_3$

(C)  $\text{Mo}(\text{CO})_3\text{P}(\text{OMe})_3$

(D)  $\text{Mo}(\text{CO})_3(\text{PF}_3)_3$

(E)  $\text{Mo}(\text{CO})_3(\text{PCl}_3)_3$

(a) A-5, B-4, C-2, D-1, E-3

(c) A-5, B-4, C-3, D-1, E-2

**Column-B**

$\nu_{\text{CO}} \text{ cm}^{-1}$

(I) 2090, 2055

(II) 2040, 1991

(III) 1977, 1888

(IV) 1934, 1835

(V) 1898, 1758

(b) A-4, B-2, C-5, D-1, E-3

(d) A-3, B-2, C-5, D-1, E-5

20. The electron count, formal oxidation state, and  $d^n$  configuration of following respectively are

$\left[ (\text{R}_3\text{P})_3\text{Ru}(\mu-\text{Cl})_3\text{Ru}(\text{PR}_3)_3 \right]^+$ ,  $\text{ReH}_9^{2-}$ ,  $\text{MeReO}_3$

(a)  $16 e^-$  (VII),  $d^0$

(b)  $16 e^-$  (VII),  $d^5$

(c)  $18 e^-$  (VII),  $d^0$

(d)  $18 e^-$  (VIII),  $d^0$





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M.M. : 60

**INSTRUCTION :**

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2. There is negative marking, @ 25% will be deducted for each wrong answer.
3. Attempt all the questions, use of calculator is not allowed.

**[ANSWERS]**

**PART-A**

- |        |        |         |        |        |        |        |
|--------|--------|---------|--------|--------|--------|--------|
| 1. (d) | 2. (c) | 3. (b)  | 4. (d) | 5. (c) | 6. (b) | 7. (b) |
| 8. (c) | 9. (a) | 10. (d) |        |        |        |        |

**PART-B**

- |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| 11. (d) | 12. (c) | 13. (c) | 14. (c) | 15. (a) | 16. (b) | 17. (a) |
| 18. (b) | 19. (c) | 20. (c) |         |         |         |         |

