

國立中興大學 111 學年度學士後醫學系招生考試試題

科目：化學

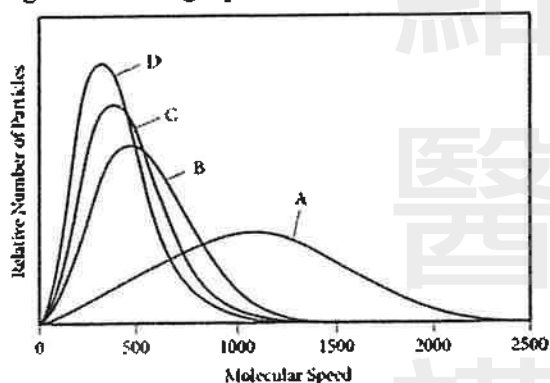
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每題 2 分

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- Which of the following statements is FALSE?
A) Halogens are very reactive elements. B) The alkali metals are fairly unreactive. C) Sulfur is a main group element. D) Noble gases do not usually form ions. E) Zn is a transition metal.
- Write the name for $\text{Sn}(\text{SO}_4)_2$. Remember that Sn forms several ions.
A) tin (I) sulfite B) tin (IV) sulfate C) tin sulfide D) tin (II) sulfite E) tin (I) sulfate
- What is the chemical formula for magnesium hydride?
A) MgH_2 B) MgOH C) MgH D) MgOH_2 E) $\text{Mg}(\text{OH})_2$
- Which of the following compounds is soluble in water?
A) CaS B) MgCO_3 C) PbCl_2 D) BaSO_4 E) None of these compounds is soluble in water.
- Which of the gases in the graph below has the largest molar mass?



- A) A B) B C) C D) D E) There is not enough information to determine.
- Which of the following statement is TRUE?
A) State functions do not depend on the path taken to arrive at a particular state.
B) ΔE_{rxn} can be determined using constant volume calorimetry.
C) Energy is neither created nor destroyed, excluding nuclear reactions.
D) ΔH_{rxn} can be determined using constant pressure calorimetry.
E) All of the above are true.
 - Which of the following statement is TRUE?
A) We can sometimes know the exact location and speed of an electron at the same time.
B) All orbitals in a given atom are roughly the same size.
C) Since electrons have mass, we must always consider them to have particle properties and never wavelike properties.
D) Atoms are roughly spherical because when all of the different shaped orbitals are overlapped, they take on a spherical shape.
E) All of the above are true.

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8. Choose the valence orbital diagram that represents the Si.

- A) $\begin{array}{|c|} \hline \uparrow\downarrow \\ \hline 3s \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline 1 & 1 & \\ \hline 3p \\ \hline \end{array}$
- B) $\begin{array}{|c|} \hline \uparrow\downarrow \\ \hline 3s \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline \uparrow\downarrow & 1 & 1 \\ \hline 3p \\ \hline \end{array}$
- C) $\begin{array}{|c|} \hline \\ \hline 4s \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline 1 & 1 & \\ \hline 4p \\ \hline \end{array}$
- D) $\begin{array}{|c|} \hline \uparrow\downarrow \\ \hline 4s \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline \uparrow\downarrow & 1 & 1 \\ \hline 4p \\ \hline \end{array}$
- E) $\begin{array}{|c|} \hline \uparrow\downarrow \\ \hline 4s \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline \uparrow\downarrow & \uparrow\downarrow & \uparrow\downarrow \\ \hline 4p \\ \hline \end{array}$

9. Predict the charge for the most stable ion of nitrogen

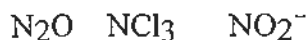
- A) -3 B) -2 C) 1 D) 0 E) +3

10. Choose the compound below that should have the highest melting point according to the ionic bonding model.

- A)
- SrI_2
- B)
- MgF_2
- C)
- CaCl_2
- D)
- SrF_2
- E)
- SrBr_2

11. Draw the Lewis structure for NO_2^- including any valid resonance structures. Which of the following statements is TRUE?

- A) The nitrite ion contains one N-O single bond and one N=O double bond.
 B) The nitrite ion contains two N-O bonds that are equivalent to 1.5 bonds.
 C) The nitrite ion contains two N=O double bonds.
 D) The nitrite ion contains two N-O single bonds.
 E) None of the above are true.

12. Place the following in order of **decreasing** X-A-X bond angle, where A represents the central atom and X represents the outer atoms in each molecule.

- A) $\text{NCl}_3 > \text{NO}_2^- > \text{N}_2\text{O}$
 B) $\text{NO}_2^- > \text{N}_2\text{O} > \text{NCl}_3$
 C) $\text{N}_2\text{O} > \text{NO}_2^- > \text{NCl}_3$
 D) $\text{NCl}_3 > \text{N}_2\text{O} > \text{NO}_2^-$
 E) $\text{N}_2\text{O} > \text{NCl}_3 > \text{NO}_2^-$

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13. Draw the Lewis structure for BrF_4^- . What is the hybridization on the Br atom?

- A)
- sp^3d^2
- B)
- sp^3d
- C)
- sp^3
- D)
- sp^2
- E) sp

14. Using the VSEPR model, the molecular geometry of the central atom in SO_2 is _____.

- A) linear B) trigonal planar C) tetrahedral D) bent E) trigonal pyramidal

15. Place the following substances in order of **increasing** vapor pressure at a given temperature.

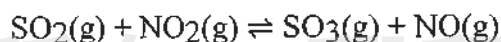
- A) $\text{NH}_3 < \text{NF}_3 < \text{BCl}_3$
 B) $\text{NF}_3 < \text{NH}_3 < \text{BCl}_3$
 C) $\text{BCl}_3 < \text{NF}_3 < \text{NH}_3$
 D) $\text{NH}_3 < \text{BCl}_3 < \text{NF}_3$
 E) $\text{BCl}_3 < \text{NH}_3 < \text{NF}_3$

16. Which of the following compounds exhibits only dispersion and dipole-dipole intermolecular interactions?

- A)
- H_2
- B) HI C)
- CO_2
- D)
- CH_3NH_2
- E)
- CH_3OH

17. Which of the following statements is TRUE?

- A) The solubility of a solid is not dependent on either temperature or pressure.
 B) The solubility of a solid is highly dependent on pressure.
 C) The solubility of a solid is highly dependent on both pressure and temperature.
 D) The solubility of a solid is highly dependent on temperature.
 E) None of the above.

18. Consider the following reaction at equilibrium. What will happen if we add more SO_3 in the system?

- A) The reaction will shift in the direction of products.
 B) The reaction will shift to decrease the pressure.
 C) No change will occur since SO_3 is not included in the equilibrium expression.
 D) The reaction will shift in the direction of reactants.
 E) The equilibrium constant will decrease.

19. Which Brønsted-Lowry acid is not considered to be a strong acid in water?

- A) HI B) HBr C)
- H_2SO_3
- D)
- HNO_3
- E) HCl

20. Which of the following is a Lewis acid?

- A) BCl_3
 B) CH_4
 C) NH_3
 D) CHCl_3
 E) None of the above are Lewis acids.

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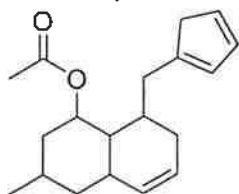
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21. When titrating a weak monoprotic acid with NaOH at 25°C, the
- pH will be less than 7 at the equivalence point.
 - pH will be equal to 7 at the equivalence point.
 - pH will be greater than 7 at the equivalence point.
 - titration will require more moles of base than acid to reach the equivalence point.
 - titration will require more moles of acid than base to reach the equivalence point.
22. Which of the following statements is TRUE?
- Entropy is not a state function.
 - Endothermic processes decrease the entropy of the surroundings, at constant T and P.
 - Endothermic processes are never spontaneous.
 - Exothermic processes are always spontaneous.
 - None of the above are true.
23. What statement is NOT true about standard electrode potentials?
- E°_{cell} is positive for spontaneous reactions.
 - Electrons will flow from more negative electrode to more positive electrode.
 - The electrode potential of the standard hydrogen electrode is exactly zero.
 - E°_{cell} is the difference in voltage between the anode and the cathode.
 - The electrode in any half-cell with a greater tendency to undergo reduction is positively charged relative to the standard hydrogen electrode and therefore has a positive E° .
24. What will happen during gamma ray emission.
- The mass number and atomic number decrease.
 - The mass number and atomic number increase.
 - The mass number is unchanged and the atomic number decreases.
 - The mass number is unchanged and the atomic number increases.
 - The mass number and atomic number do not change.
25. Identify the element that is not used as a radioactive tracer.
- iron-59
 - phosphorus-32
 - thallium-201
 - iodine-131
 - carbon-13

26. How many chiral centers are there in the following molecule?



- (A) 4 (B) 5 (C) 6 (D) 7

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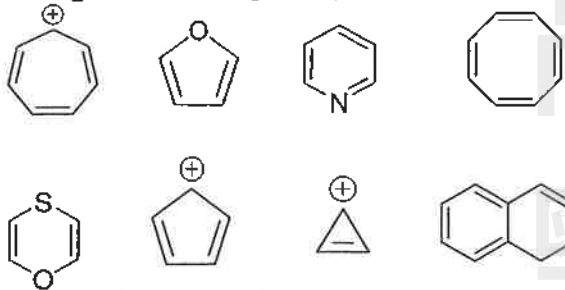
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27. Which of compounds can be reduced by sodium borohydride?

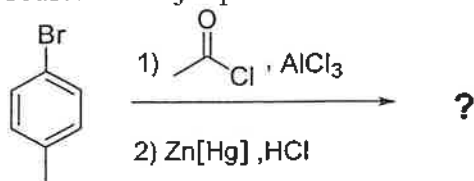
- (A) 2-butanol
 (B) butyric acid
 (C) 2-butene
 (D) 3-pentanone

28. Among the following compounds, how many are aromatic?



- (A) 4 (B) 5 (C) 6 (D) 7

29. Predict the major product of the following reaction:



- (A) (B) (C) (D)

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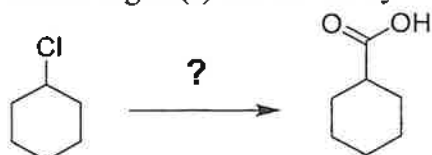
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30. Which reagent(s) are necessary to carry out the following reaction ?



(A)

- 1) Mg, Et₂O
- 2) CO₂
- 3) H₃O⁺

(B)

- 1) PCC
- 2) CO₂

(C)

- 1) H₂, Pt
- 2) CO₂

(D)

- 1) BH₃, THF
- 2) H₂O₂, OH⁻

31. Which of the following reagents would convert 2-butanol into 2-bromobutane ?

- (A) Br₂/CCl₄
- (B) Br₂/light; heat
- (C) PBr₃/pyridine
- (D) CuBr₂/MeOH

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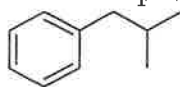
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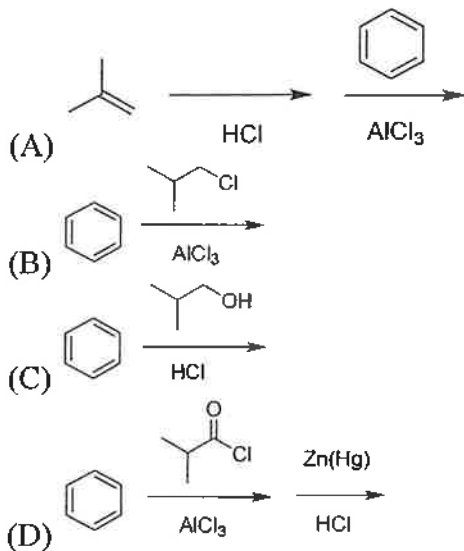
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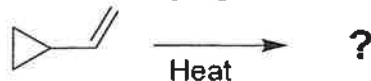
32. Choose the possible process to produce Isobutylbenzene.



Isobutylbenzene

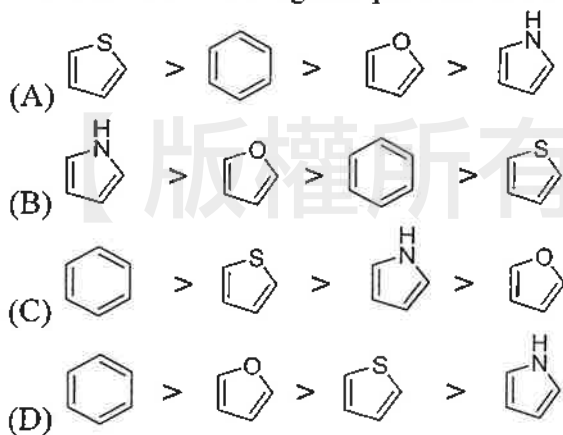


33. Which is major product of following reaction?



- (A) (B) (C) (D) all of above is incorrect

34. Please order following compounds with aromaticity.



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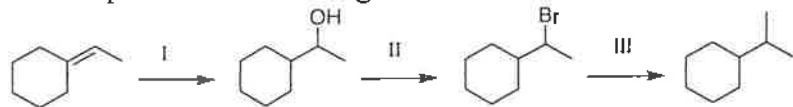
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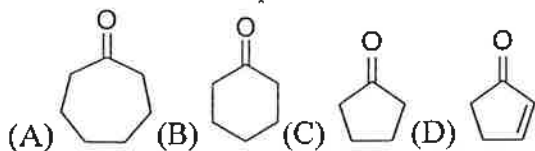
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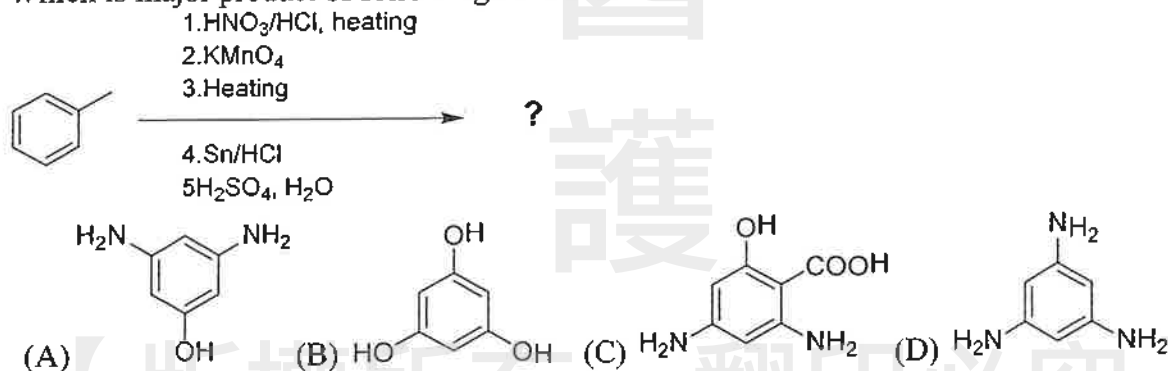
35. Which process of following reaction is incorrect ?



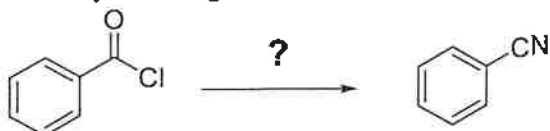
- (A) I should be $\xrightarrow[2. \text{CsOH}]{1. \text{LAH}}$
- (B) II should be $\xrightarrow{\text{PBr}_3}$
- (C) III should be $\xrightarrow{(\text{CH}_3)_2\text{CuLi}}$
- (D) all of above is correct

36. There is a IR absorption at 1747 cm^{-1} , what structure would you expect?

37. Which is major product of following reaction ?



38. Identify the reagents of the following transformation:



- (A) 1) Excess NH_3 2) LAH 3) H_2O (B) 1) Excess NH_3 2) NaOH, heat 3) H_3O^+
- (C) 1) Excess NH_3 2) SOCl_2 (D) 1) NaCN 2) LAH 3) H_2O

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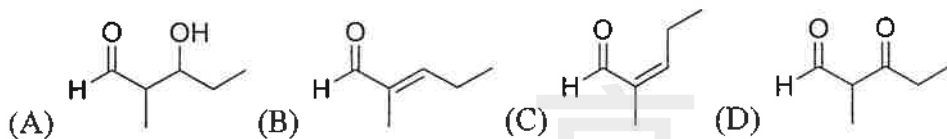
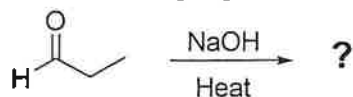
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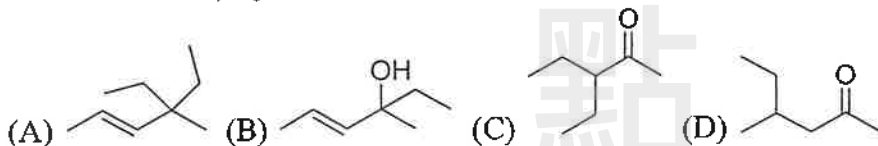
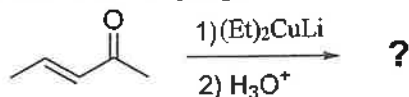
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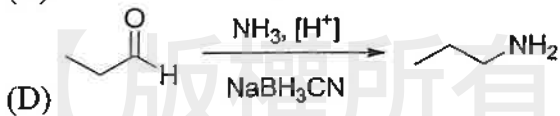
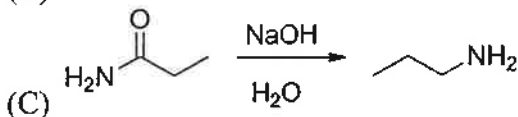
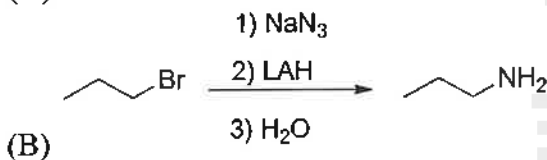
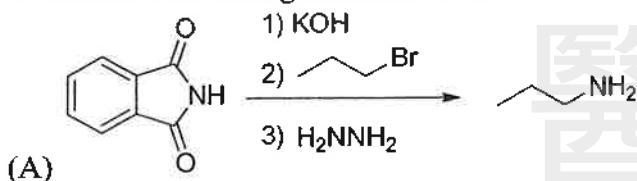
39. Predict the major product of the following reaction:



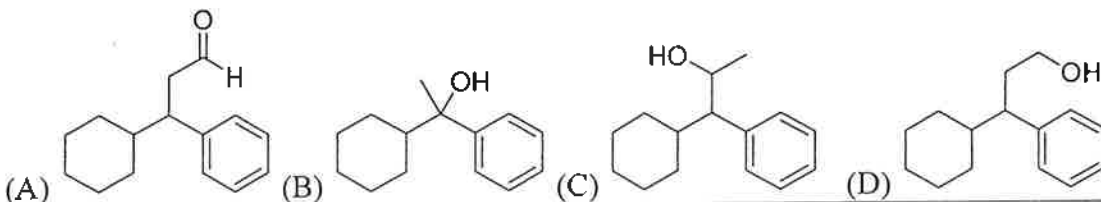
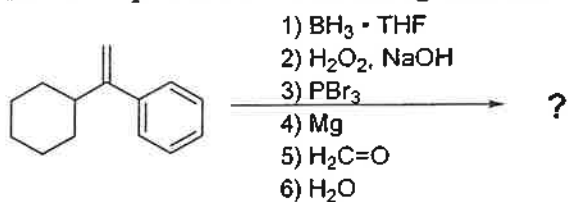
40. Predict the major product of the following reaction:



41. Which of the following reactions is not correct ?



42. Predict the product of the following reaction:



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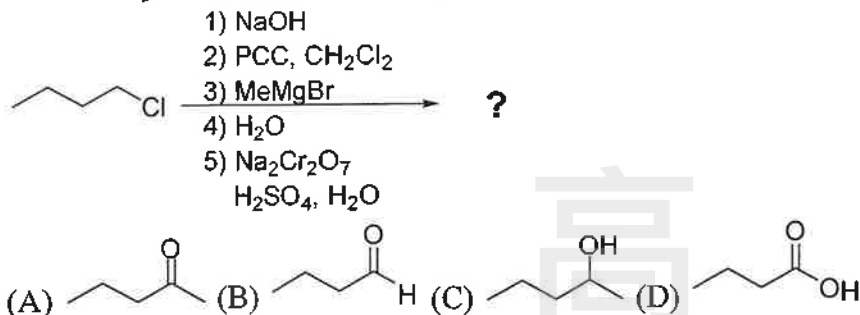
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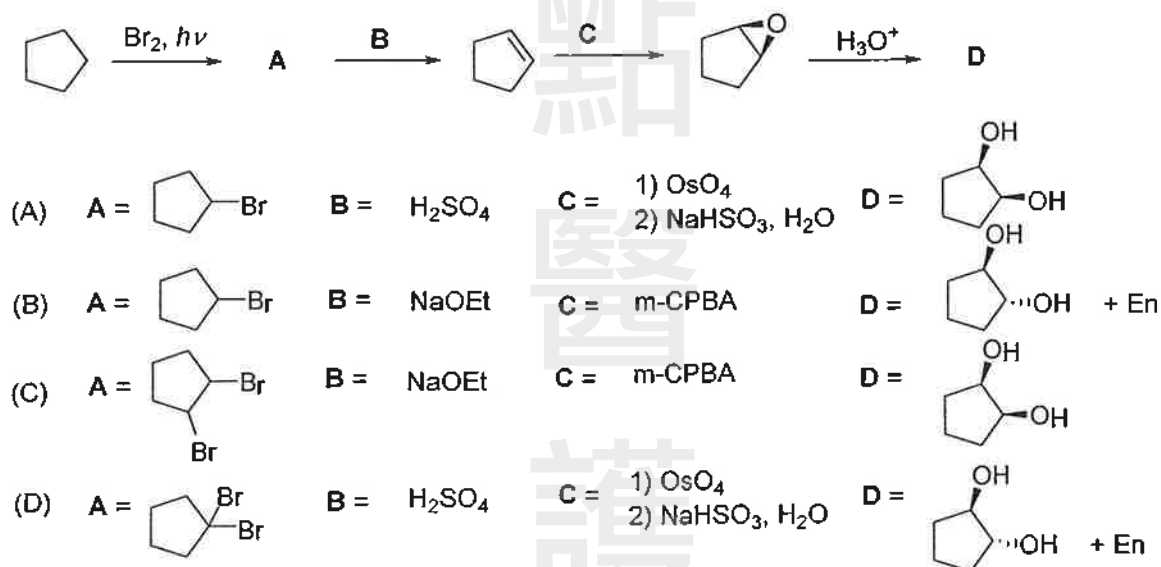
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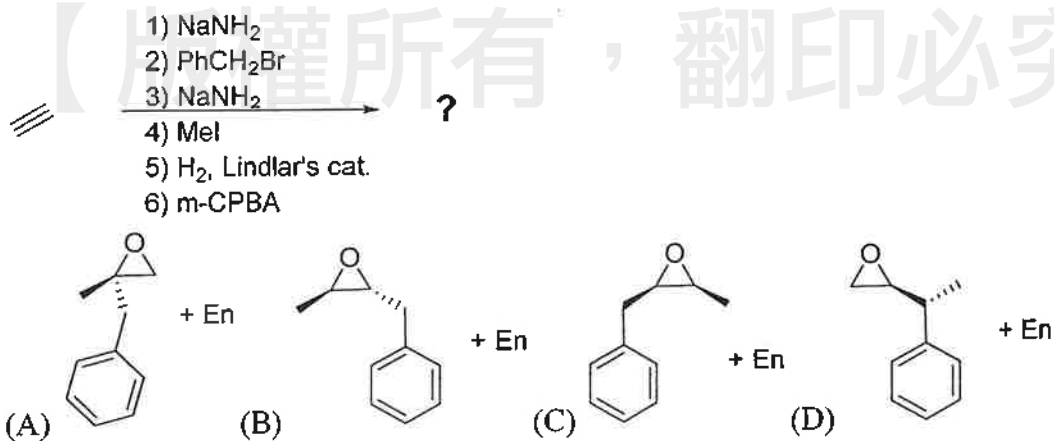
43. Predict the product of the following reaction:



44. Identify the reagents and products of the following transformation:



45. Predict the products of the following reaction:



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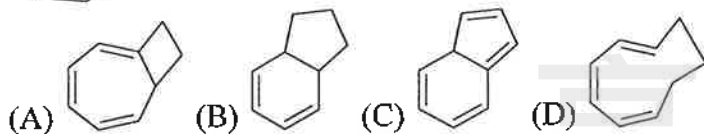
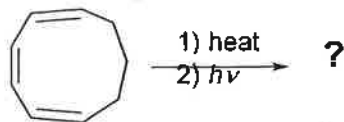
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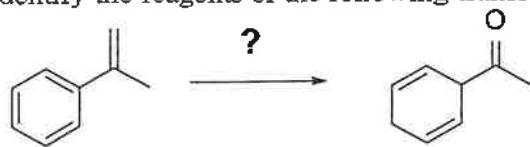
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46. Predict the product of the following reaction:

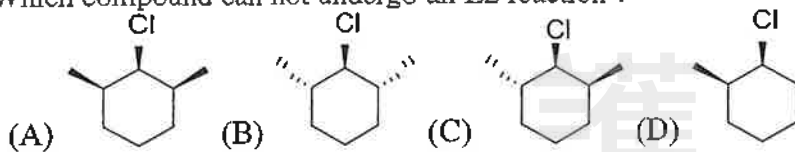


47. Identify the reagents of the following transformation:



- (A) 1) O_3
2) DMS
3) Na, NH_3
MeOH
- (B) 1) OsO_4
2) $NaHSO_3, H_2O$
3) O_3
4) DMS
- (C) 1) HBr
2) H_2SO_4
3) O_3
4) DMS
- (D) 1) 9-BBN
2) $H_2O_2, NaOH$
3) Na, NH_3
MeOH

48. Which compound can not undergo an E2 reaction ?



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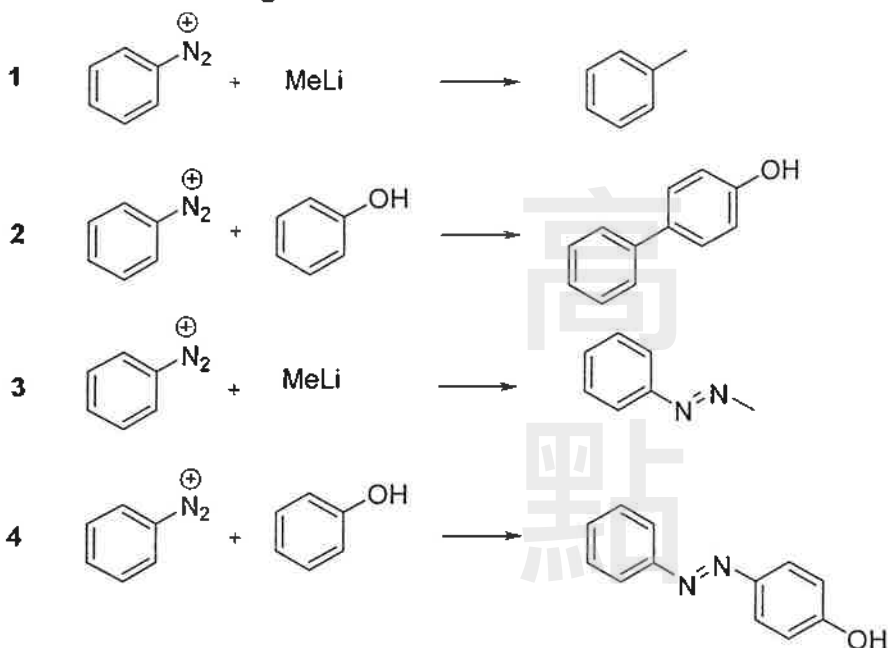
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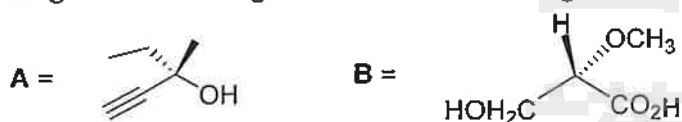
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49. Which of the following reactions is correct ?



(A) 1、2 (B) 1、4 (C) 3、4 (D) 2、3

50. Assign R or S configuration in the following molecules.



- (A) A = R ; B = S
 (B) A = S ; B = S
 (C) A = S ; B = R
 (D) A = R ; B = R

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題號	答案	題號	答案	題號	答案	題號	答案	題號	答案
1.	B	2.	B	3.	A	4.	A	5.	D
6.	E	7.	D	8.	A	9.	A	10.	B
11.	B	12.	C	13.	A	14.	D	15.	A
16.	B	17.	D	18.	D	19.	C	20.	A
21.	C	22.	B	23.	D	24.	E	25.	E
26.	B	27.	D	28.	B	29.	C	30.	A
31.	C	32.	D	33.	C	34.	C	35.	A
36.	C	37.	B	38.	C	39.	B	40.	D
41.	C	42.	D	43.	A	44.	B	45.	C
46.	D	47.	A	48.	B	49.	B	50.	B

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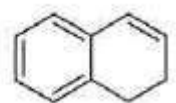
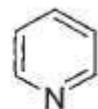
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孫彥儒老師提供

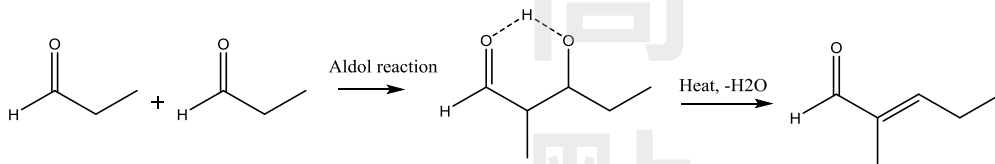
精選試題解析

1. B, 鹼金族反應性非常強
2. B, Sn 為四價陽離子
3. A, Hydride 為負一價
4. A, Ca^{2+} 為硬酸、 S^{2-} 為軟鹼, 根據軟硬酸鹼學說易溶於水
5. D, 同溫底下越重的氣體分子速率越慢
6. E, 全對
7. D, A 測不準原理知道位置動量都存在不確定; B 主量子數會使軌域大小不同; C 電子具二象性
8. A
9. A
10. B, 根據庫倫靜電力公式可知道兩離子距離越近靜電吸引力越強→選最小離子
11. A
12. C, N_2O 為 120 度、 NO_2 的 N 有 LP 故 ONO 角度略小、 NCl_3 為 sp^3
13. A
14. D
15. A
16. B
17. D, 氣體溶解度才會與壓力有關(亨利定律)
18. D, 兩邊係數相同, 反應往左或右壓力都不變
19. C
20. A
21. C
22. E
23. D, 標準還原電位是測定的電極與標準氫電極的電位差
24. E
25. E
26. B
27. D, NaBH_4 主要還原醛酮

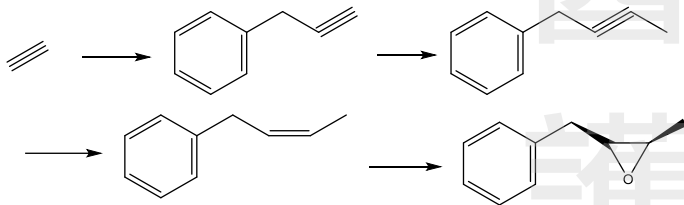


28. B, 芳香性必須滿足全平面及 $4n+2$ rule
29. C
30. A

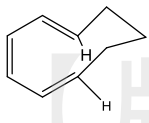
- 31. C
- 32. D
- 33. C
- 34. C
- 35. A
- 36. C
- 37. B
- 38. C
- 39. B



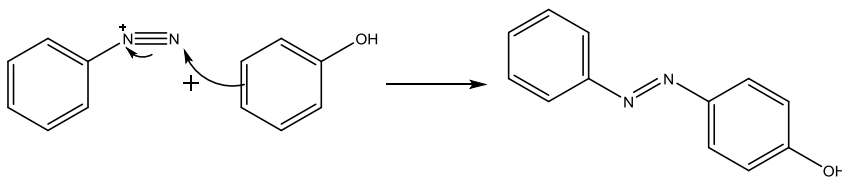
- 40. D, 有機銅鋰 1,4 加成
- 41. C, OH 基取代-NH₂ 變成酸; A 為 Gabriel amine synthesis, B 為 amine reduction, D 為 amide reduction
- 42. D
- 43. A
- 44. B
- 45. C



- 46. D, 第一次加熱條件為 disrotatory, 第二次照光條件為 retro-conrotatory 會讓兩個 H 同向



- 47. A
- 48. B
- 49. B, Diazonium coupling. 遇到帶有活化基的 benzene 會有親電加成



- 50. B

化學

梁傑(梁家榮)老師提供

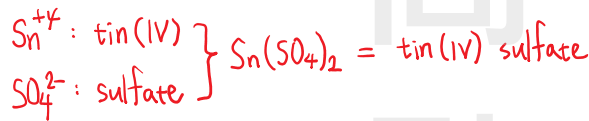
B

1. Which of the following statements is FALSE?
 A) Halogens are very reactive elements. B) The alkali metals are fairly unreactive. C) Sulfur is a main group element. D) Noble gases do not usually form ions. E) Zn is a transition metal.

alkali metal 也是活性元素，它們容易發生氧化，是很不錯的還原劑

B

2. Write the name for $\text{Sn}(\text{SO}_4)_2$. Remember that Sn forms several ions.
 A) tin (I) sulfite B) tin (IV) sulfate C) tin sulfide D) tin (II) sulfite E) tin (I) sulfate



A

3. What is the chemical formula for magnesium hydride?
 A) MgH_2 B) MgOH C) MgH D) MgOH_2 E) $\text{Mg}(\text{OH})_2$



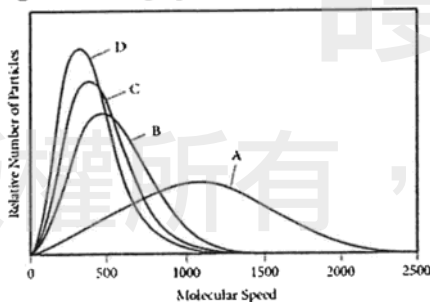
A

4. Which of the following compounds is soluble in water?
 A) CaS B) MgCO_3 C) PbCl_2 D) BaSO_4 E) None of these compounds is soluble in water.

2A族陽離子的硫化物通常都可溶於水

5. Which of the gases in the graph below has the largest molar mass?

D or E



- A) A B) B C) C D) D E) There is not enough information to determine.

分子量較大者，其圖形高且窄，答案應選(D)
 但後來有同學認為題意不清而爭取釋疑(但筆者認為無爭議)
 釋疑後出題老師竟然同意答案改成(D)、(E)皆可

送分

6. Which of the following statement is TRUE?
 A) State functions do not depend on the path taken to arrive at a particular state.
 B) ΔE_{rxn} can be determined using constant volume calorimetry.
 C) Energy is neither created nor destroyed, excluding nuclear reactions.
 D) ΔH_{rxn} can be determined using constant pressure calorimetry.
 E) All of the above are true.

(C)選項說明：核反應遵守質能守恆，質量減少可釋放能量

本題其實正確答案應選(E)，但因為(B)選項將 ΔE_{rxn} 誤植為 DE_{rxn} 因此釋疑後本題送分

7. Which of the following statement is TRUE?

D

- A) We can sometimes know the exact location and speed of an electron at the same time.
- B) All orbitals in a given atom are roughly the same size.
- C) Since electrons have mass, we must always consider them to have particle properties and never wavelike properties.
- D) Atoms are roughly spherical because when all of the different shaped orbitals are overlapped, they take on a spherical shape.
- E) All of the above are true.

(A)錯誤，依據測不準原理，我們無法同時準確得到電子的位置和速度

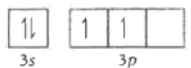
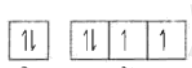
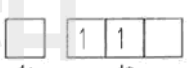
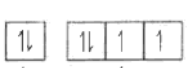
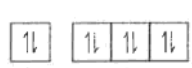
(B)錯誤，不同 n 值的軌域大小不同，n 值越大，軌域的半徑通常越大

(C)錯誤，依照 de Broglie 的物質波概念，電子也具有波動的性質

(D)正確

8. Choose the valence orbital diagram that represents the Si.

A

- A)  B)  C)  D)  E) 

Si 是第三週期的 4A 族元素，其價電子的組態為： $3s^2 3p^2$

9. Predict the charge for the most stable ion of nitrogen

A

- A) -3 B) -2 C) 1 D) 0 E) +3

nitrogen 是 5A 族，可產生穩定的 -3 價 anion

10. Choose the compound below that should have the highest melting point according to the ionic bonding model.

B or D

- A) SrI_2 B) MgF_2 C) $CaCl_2$ D) SrF_2 E) $SrBr_2$

依照題意應以 ionic bonding model，半徑小價數高的 ionic cpd 通常有較高熔點，因此答案應該選(B)

但真正的熔點 MgF_2 (1263°C) 其實小於 SrF_2 (1477°C)，因此出題老師認為有爭議，釋疑後本題答案改(B)或(D)

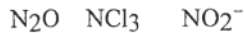
11. Draw the Lewis structure for NO_2^- including any valid resonance structures. Which of the following statements is TRUE?

B

- A) The nitrite ion contains one N-O single bond and one N=O double bond.
- B) The nitrite ion contains two N-O bonds that are equivalent to 1.5 bonds.
- C) The nitrite ion contains two N=O double bonds.
- D) The nitrite ion contains two N-O single bonds.
- E) None of the above are true.

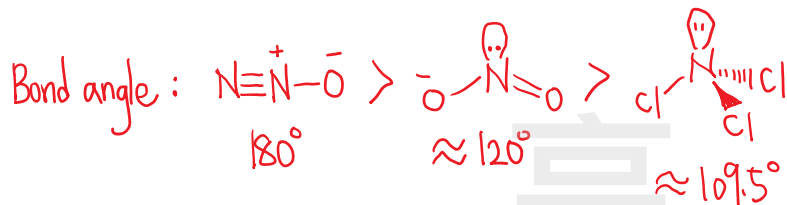


12. Place the following in order of **decreasing** X-A-X bond angle, where A represents the central atom and X represents the outer atoms in each molecule.



C

- A) $NCl_3 > NO_2^- > N_2O$
- B) $NO_2^- > N_2O > NCl_3$
- C) $N_2O > NO_2^- > NCl_3$
- D) $NCl_3 > N_2O > NO_2^-$
- E) $N_2O > NCl_3 > NO_2^-$



13. Draw the Lewis structure for BrF_4^- . What is the hybridization on the Br atom?

A

- A) sp^3d^2 B) sp^3d C) sp^3 D) sp^2 E) sp



14. Using the VSEPR model, the molecular geometry of the central atom in SO_2 is _____.

D

- A) linear B) trigonal planar C) tetrahedral D) bent E) trigonal pyramidal



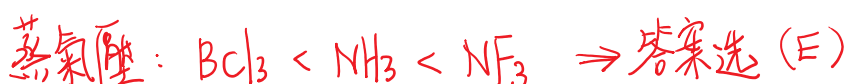
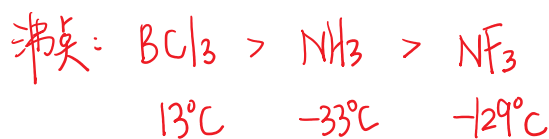
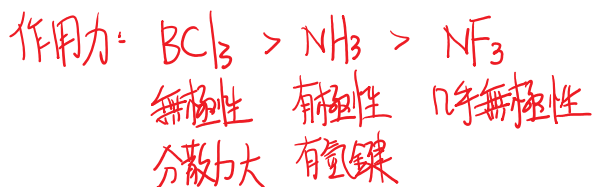
15. Place the following substances in order of **increasing** vapor pressure at a given temperature.



A or E

- A) $NH_3 < NF_3 < BCl_3$
- B) $NF_3 < NH_3 < BCl_3$
- C) $BCl_3 < NF_3 < NH_3$
- D) $NH_3 < BCl_3 < NF_3$
- E) $BCl_3 < NH_3 < NF_3$

分子間作用力越大者，沸點越高、蒸氣壓越小



出題老師認為 NH₃ 還是有 H-bonding 的影響

在某個溫度時 NH₃ 的蒸氣壓會「低於」BCl₃，因此本題答案釋疑後改成(A)、(E)皆可

B

16. Which of the following compounds exhibits only dispersion and dipole-dipole intermolecular interactions?

- A) H₂ B) HI C) CO₂ D) CH₃NH₂ E) CH₃OH

D

17. Which of the following statements is TRUE?

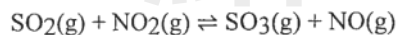
- A) The solubility of a solid is not dependent on either temperature or pressure.
 B) The solubility of a solid is highly dependent on pressure.
 C) The solubility of a solid is highly dependent on both pressure and temperature.
 D) The solubility of a solid is highly dependent on temperature.
 E) None of the above.

固體的溶解度通常會受溫度影響，但不受壓力影響

而氣體的溶解度則同時受到溫度和壓力影響

D

18. Consider the following reaction at equilibrium. What will happen if we add more SO₃ in the system?



- A) The reaction will shift in the direction of products.
 B) The reaction will shift to decrease the pressure.
 C) No change will occur since SO₃ is not included in the equilibrium expression.
 D) The reaction will shift in the direction of reactants.
 E) The equilibrium constant will decrease.

依據勒沙特列原理，加入產物(SO₃)會使平衡往起始物方向移動(向左)

C

19. Which Brønsted-Lowry acid is not considered to be a strong acid in water?

- A) HI B) HBr C) H₂SO₃ D) HNO₃ E) HCl

H₂SO₄ 才是強酸，H₂SO₃ 是弱酸

A

20. Which of the following is a Lewis acid?

- A) BCl₃
 B) CH₄
 C) NH₃
 D) CHCl₃
 E) None of the above are Lewis acids.

3A 族的硼原子具有空軌域，屬於 Lewis acid

C

21. When titrating a weak monoprotic acid with NaOH at 25°C, the

- A) pH will be less than 7 at the equivalence point.
 B) pH will be equal to 7 at the equivalence point.
 C) pH will be greater than 7 at the equivalence point.
 D) titration will require more moles of base than acid to reach the equivalence point.
 E) titration will require more moles of acid than base to reach the equivalence point.

弱酸被 NaOH 滴定達當量點，水溶液會呈現弱鹼性，此時 pH > 7

22. Which of the following statements is TRUE?

B

- A) Entropy is not a state function.
- B) Endothermic processes decrease the entropy of the surroundings, at constant T and P.
- C) Endothermic processes are never spontaneous.
- D) Exothermic processes are always spontaneous.
- E) None of the above are true.

(A)錯誤 · entropy屬於狀態函數

(B)正確

(C)、(D)錯誤 · 吸放熱與是否自發無關

23. What statement is NOT true about standard electrode potentials?

C or D

- A) E°_{cell} is positive for spontaneous reactions.
- B) Electrons will flow from more negative electrode to more positive electrode.
- C) The electrode potential of the standard hydrogen electrode is exactly zero.
- D) E°_{cell} is the difference in voltage between the anode and the cathode.
- E) The electrode in any half-cell with a greater tendency to undergo reduction is positively charged relative to the standard hydrogen electrode and therefore has a positive E° .

(C)錯誤 · 標準氫電極是「定義」為零 · 而非本身的 electrode potential = 0

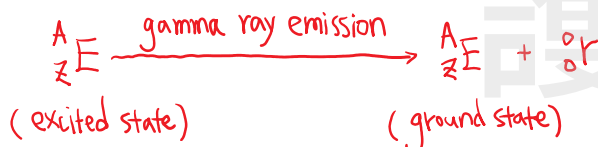
(D)錯誤 · anode 和 cathode 都在標準狀態下的電位差才是 E°_{cell}

本題原本答案給(D) · 但釋疑後更改為 (C)和(D)皆給分

24. What will happen during gamma ray emission.

E

- A) The mass number and atomic number decrease.
- B) The mass number and atomic number increase.
- C) The mass number is unchanged and the atomic number decreases.
- D) The mass number is unchanged and the atomic number increases.
- E) The mass number and atomic number do not change.



25. Identify the element that is not used as a radioactive tracer.

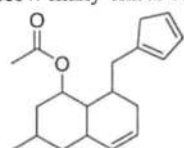
E

- A) iron-59
- B) phosphorus-32
- C) thallium-201
- D) iodine-131
- E) carbon-13

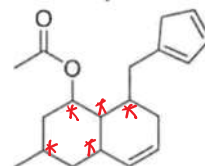
通常使用 ^{14}C 或 ^{11}C 當作 radioactive tracer

26. How many chiral centers are there in the following molecule?

B



(A) 4 (B) 5 (C) 6 (D) 7



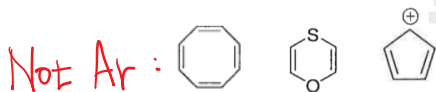
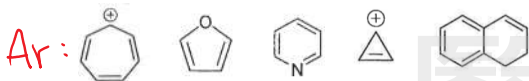
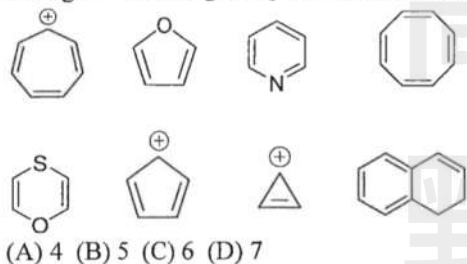
27. Which of compounds can be reduced by sodium borohydride ?
 (A) 2-butanol
 (B) butyric acid
 (C) 2-butene
 (D) 3-pentanone

D



28. Among the following compounds, how many are aromatic?

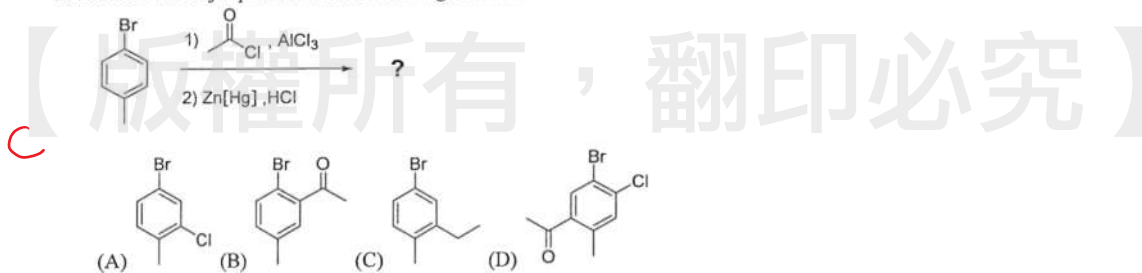
A or B



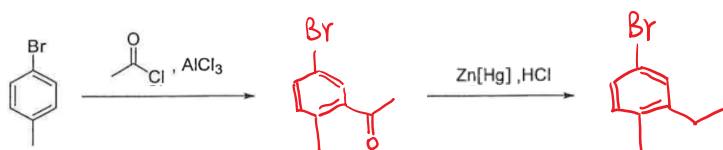
出題老師認為 結構是否具有芳香性有爭議(但筆者認為無爭議，應為芳香性)

此結構選或不選皆給分，釋疑後更改答案為(A)或(B)皆給分

29. Predict the major product of the following reaction:

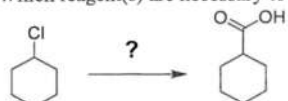


C

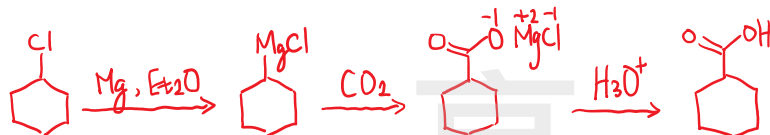


30. Which reagent(s) are necessary to carry out the following reaction ?

A



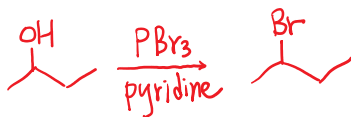
- (A) 1) Mg, Et₂O
2) CO₂
3) H₃O⁺
- (B) 1) PCC
2) CO₂
- (C) 1) H₂, Pt
2) CO₂
- (D) 1) BH₃, THF
2) H₂O₂, OH⁻



31. Which of the following reagents would convert 2-butanol into 2-bromobutane ?

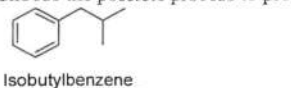
C

- (A) Br₂/CCl₄
(B) Br₂/light; heat
(C) PBr₃/pyridine
(D) CuBr₂/MeOH



32. Choose the possible process to produce Isobutylbenzene.

D



- (A)
- (B)
- (C)
- (D)

(A)(B)(C)的碳骨架會重排成 tert-butyl group · 得到 tert-butylbenzene

33. Which is major product of following reaction?

C

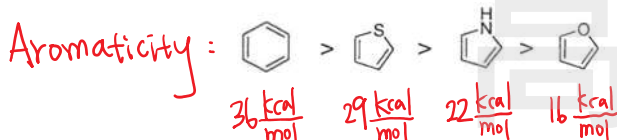


- (A)
- (B)
- (C)
- (D) all of above is incorrect



34. Please order following compounds with aromaticity.

- C
- (A) c1ccsc1 > c1ccccc1 > c1ccoc1 > c1cc[nH]1
- (B) c1cc[nH]1 > c1ccoc1 > c1ccccc1 > c1ccsc1
- (C) c1ccccc1 > c1ccsc1 > c1cc[nH]1 > c1ccoc1
- (D) c1ccccc1 > c1ccoc1 > c1ccsc1 > c1cc[nH]1

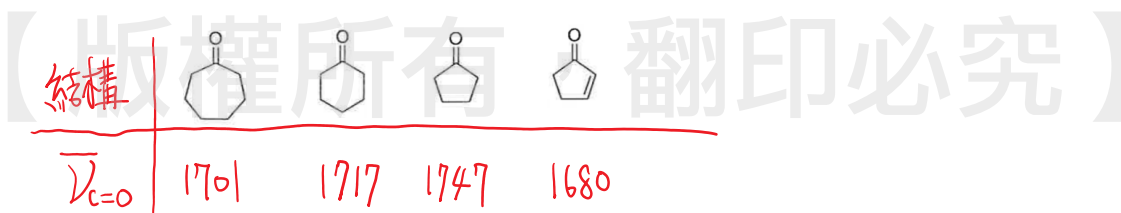
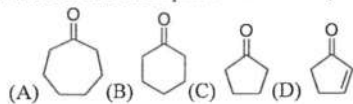


35. Which process of following reaction is incorrect?

- A
- C=C1CCCCC1 $\xrightarrow{\text{I}}$ OC1CCCCC1 $\xrightarrow{\text{II}}$ BrC1CCCCC1 $\xrightarrow{\text{III}}$ CC1CCCCC1
- (A) I should be $\xrightarrow[2. \text{CsOH}]{1. \text{LAH}}$
- (B) II should be $\xrightarrow{\text{PBr}_3}$
- (C) III should be $\xrightarrow{(\text{CH}_3)_2\text{CuLi}}$
- (D) all of above is correct

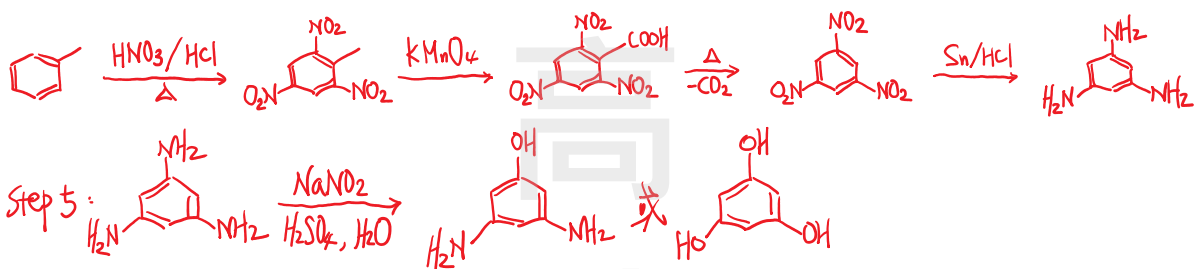
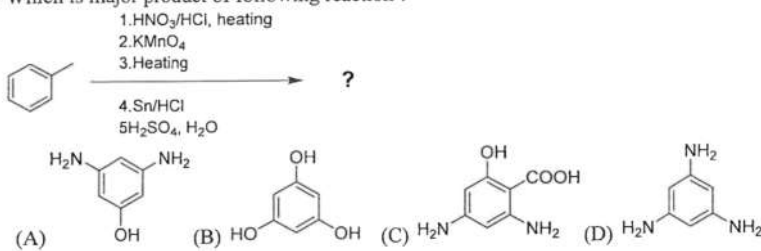
step I 應該進行 hydroboration-oxidation 才能得到相對應的產物

36. There is a IR absorption at 1747 cm^{-1} , what structure would you expect?



37. Which is major product of following reaction ?

送分

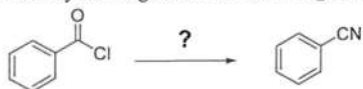


因第 5 個步驟之反應得到的產物可能為(A)或(B)，但因爭議較大，經討論過後此題送分。

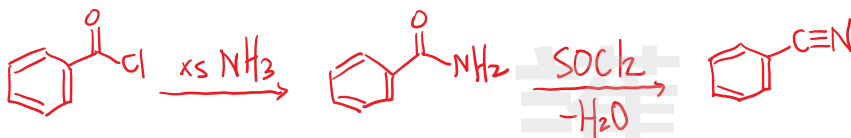
(出題老師沒有注意到 step 5 少打 NaNO₂)

38. Identify the reagents of the following transformation:

C

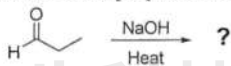


- (A) 1) Excess NH₃ 2) LAH 3) H₂O (B) 1) Excess NH₃ 2) NaOH, heat 3) H₃O⁺
(C) 1) Excess NH₃ 2) SOCl₂ (D) 1) NaCN 2) LAH 3) H₂O



39. Predict the major product of the following reaction:

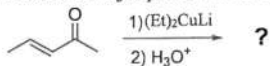
B



- (A)
- (B)
- (C)
- (D)

此反應為 aldol reaction · 加熱條件下 · 通常寫到脫水產物

40. Predict the major product of the following reaction:

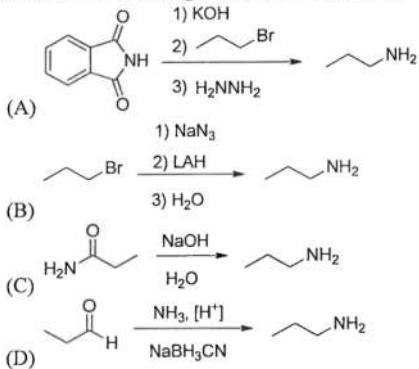


D

- (A)
- (B)
- (C)
- (D)

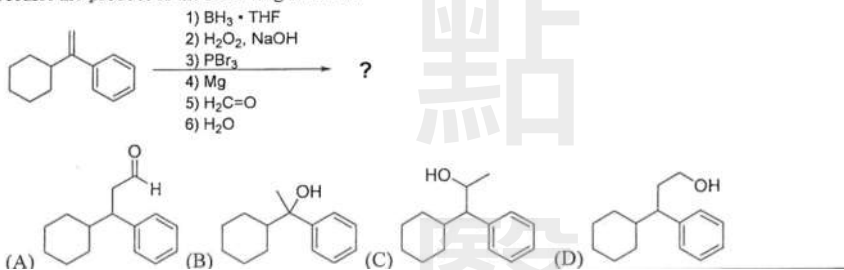
有機銅鋰主要進行 1,4-addition

41. Which of the following reactions is not correct ?

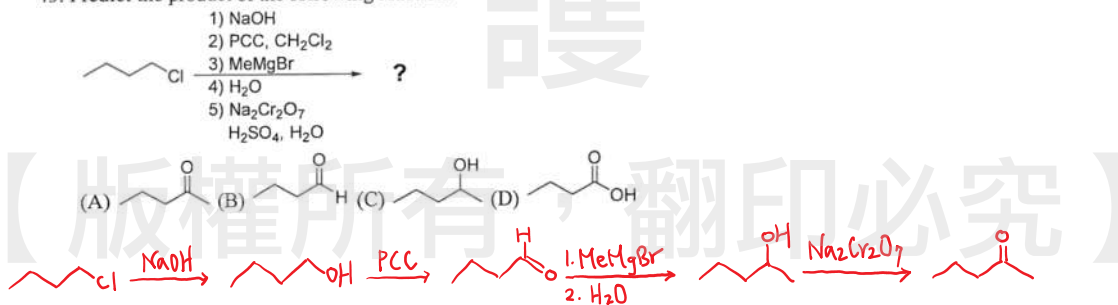


(C) 錯誤，反應藥劑要改為 LiAlH_4 才能順利將 amide 還原成 amine

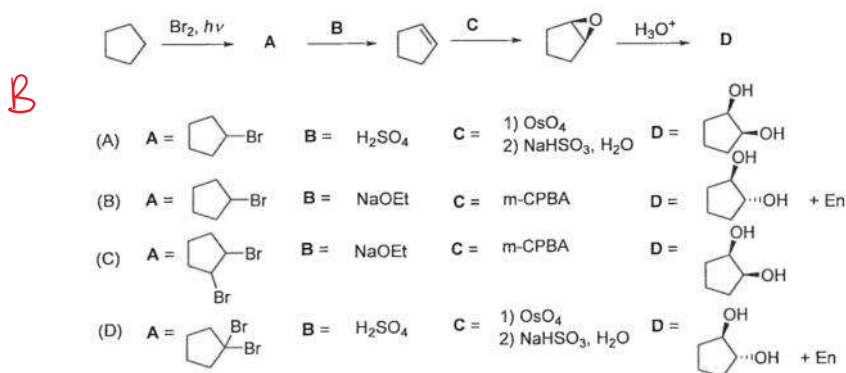
42. Predict the product of the following reaction:



43. Predict the product of the following reaction:



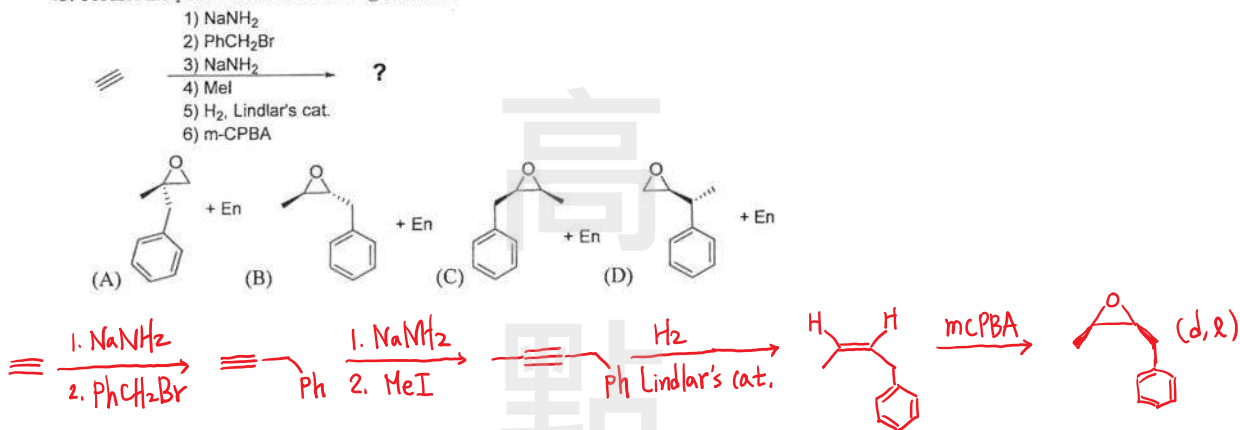
44. Identify the reagents and products of the following transformation:



- step A 進行自由基取代反應
- step B 利用 NaOEt 進行 E2 反應
- step C 利用 m-CPBA 進行 epoxidation
- 產物D 為 epoxide 水解開環形成的 trans-diol

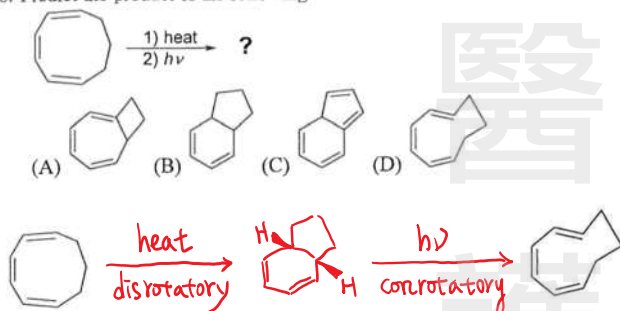
45. Predict the products of the following reaction:

C



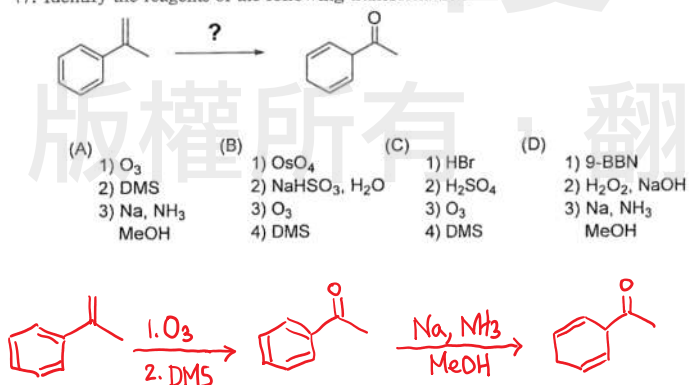
46. Predict the product of the following reaction:

D



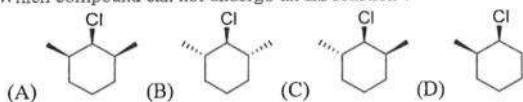
47. Identify the reagents of the following transformation:

A



48. Which compound can not undergo an E2 reaction ?

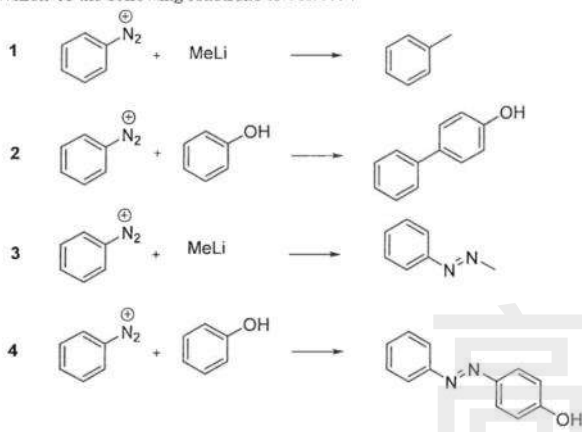
B



LVG 旁邊沒有反向共平面的 β-H 的鹵烷不能進行 E2 reaction

49. Which of the following reactions is correct ?

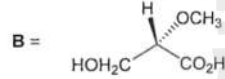
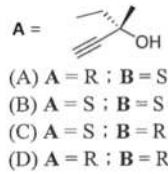
B



(A) 1、2 (B) 1、4 (C) 3、4 (D) 2、3

50. Assign R or S configuration in the following molecules.

B



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