



CHEMISTRY

BOOKS - KVPY PREVIOUS YEAR

SOLVED PAPER 2019

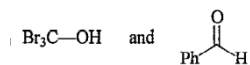
Example

1. The major products of the following reaction

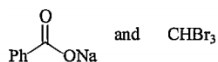


are

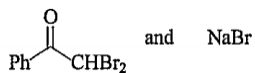
A.



B.



C.

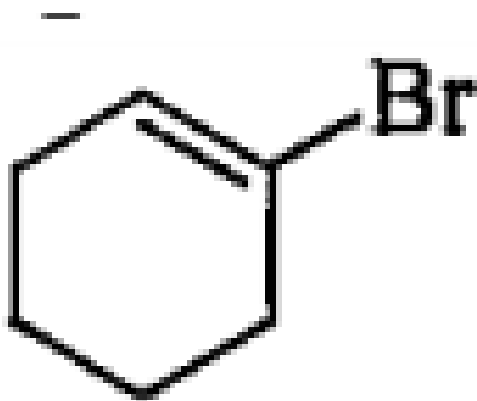


D. PhH and CBr_3CO_2Na

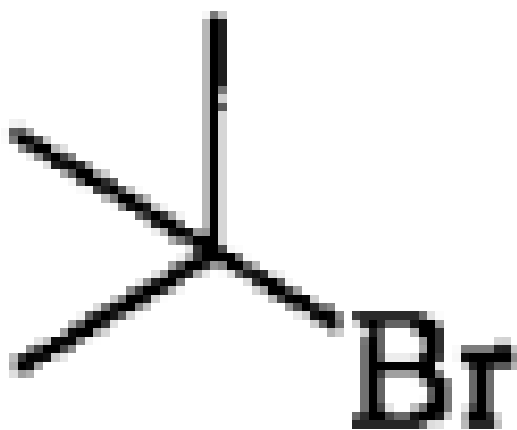
Answer:

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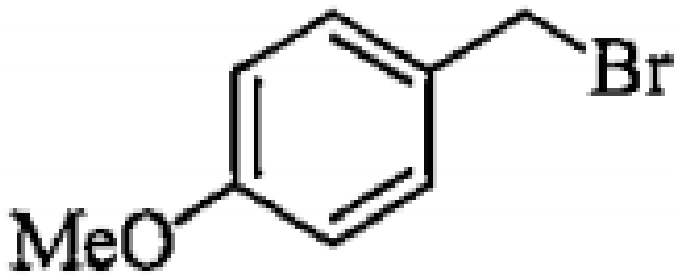
2. Among the following



I



II



III



IV

the

compounds which can undergo an S_N1 reaction in an aqueous solution, are

A. I and IV only

B. II and IV only

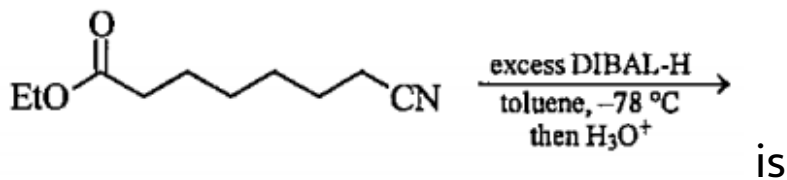
C. II and III only

D. II,III and IV only

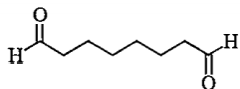
Answer:

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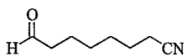
3. The major products of the following reaction



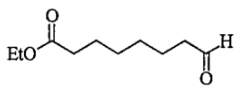
A.



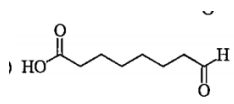
B.



C.



D.



Answer:



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4. Permanent hardness of water can be removed by

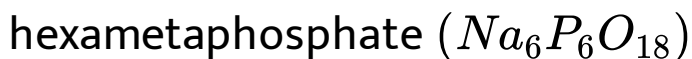
A. heating

B. treating with sodium acetate



C. treating with $Ca(HCO_3)_2$

D. treatment with sodium

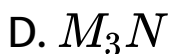
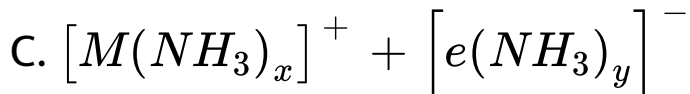


Answer:



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5. Alkali metals (M) dissolve in liquid NH_3 to give

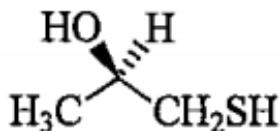
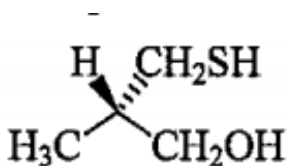


Answer:



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6. The absolute configurations of the following compounds



respectively, are

A. R and R

B. S and S

C. R and S

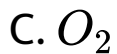
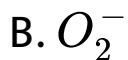
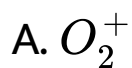
D. S and R

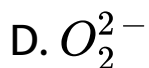
Answer:



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7. Which of the species is diamagnetic ?



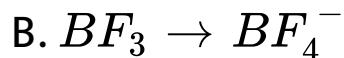
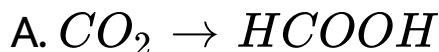


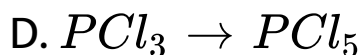
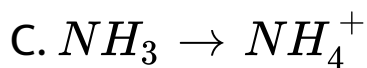
Answer:



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8. Among the following transformations, the hybridization of the central atom remains unchanged in





Answer:



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9. For an octahedral complex MX_4Y_2 (M=a transition metal, X and Y are monodentate achiral ligands), the correct statement, among the following, is

A. MX_4Y_2 has 2 geometrical isomers one of which is chiral

B. MX_4Y_2 has 2 geometrical isomers both of which are achiral

C. MX_4Y_2 has 4 geometrical isomers all of which are achiral

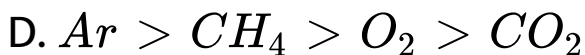
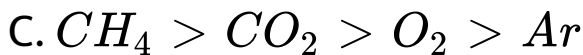
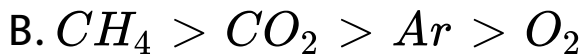
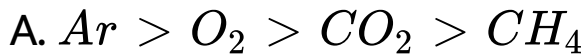
D. MX_4Y_2 has 4 geometrical isomers two of which are chiral

Answer:



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10. The values of the Henry's law constant of Ar, CO_2 , CH_4 , and O_2 in water at $25^\circ C$ are 40.30, 1.67, 0.41 and 34.86 kbar, respectively, The order of their solubility in water at the same temperature and pressure is



Answer:



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11. Thermal decomposition of N_2O_5 occurs as per the equation below

$$2N_2O_5 \rightarrow 4NO_2 + O_2$$

The correct statement is

A. O_2 production rate is four times the NO_2 production rate.

B. O_2 production rate is the same as the rate of disappearance of N_2O_5 .

C. rate of disappearance of N_2O_5 is one-fourth of NO_2 production rate.

D. rate of disappearance of N_2O_5 is twice the O_2 production rate.

Answer:



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12. For a I^{st} order chemical reaction,

A. the product formation rate is independent of reactant concentration

B. the time taken for the completion of half of the reaction ($t_{1/2}$ is 69.3% of the rate constant (k).

C. the dimension of Arrhenis pre-exponential factor is reciprocal of time.

D. The concentration vs time plot for the reactant should be linear with a negative slope

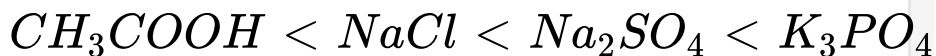
Answer:



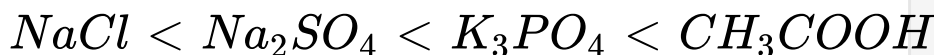
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13. The boiling point of 0.001 M aqueous solutions of NaCl , Na_2SO_4 , K_3PO_4 and CH_3COOH should follow the order

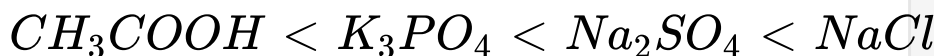
A.



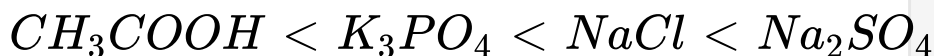
B.



C.



D.



Answer:



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14. An allotrope carbon which exhibits only two types of C-C bond distance of 143.5 pm and 138.3 pm, is

A. charcoal

B. graphite

C. diamond

D. fullerene

Answer:



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15. Nylon-2-nylon-6 is a co-polymer of 6-aminohexanoic and

A. glycine

B. valine

C. alanine

D. leucine

Answer:



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16. A solid is hard and brittle. It is an insulator in solid state but conducts electricity in molten state. The solid is a

A. molecular solid

B. ionic solid

C. metallic solid

D. covalent solid

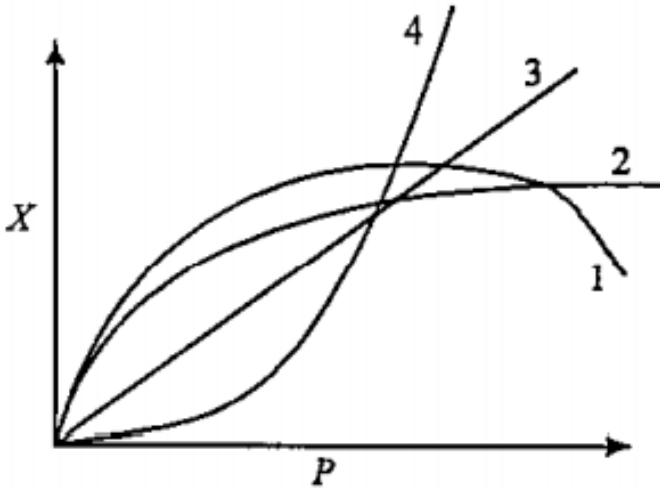
Answer:



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17. The curve that best describes the adsorption of a gas (X g) on 1.0 g of a solid substrate as a

function of pressure (p) at a fixed temperature



is

A. 1

B. 2

C. 3

D. 4

Answer:



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18. $CoSO_4Cl.5NH_3$ exists in two isomeric forms 'A' and 'B'. Isomer 'A' reacts with $AgNO_3$ to give white precipitate, but does not react with $BaCl_2$. Isomer 'B' gives white precipitate with $BaCl_2$ but does not react with $AgNO_3$.

Answer the following questions.

- Identify 'A' and 'B' and write their structural formulae.
- Name the type of isomerism involved.
- Give the IUPAC name of 'A' and 'B'.

A. ionization isomers

B. linkage isomers

C. coordination isomers

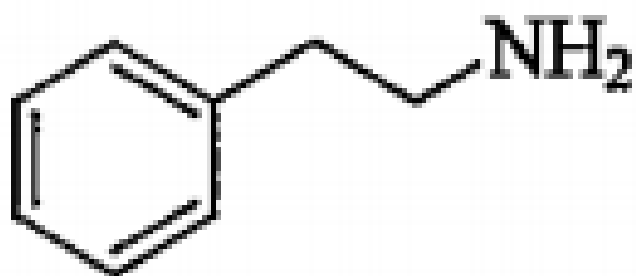
D. solvate isomers

Answer:

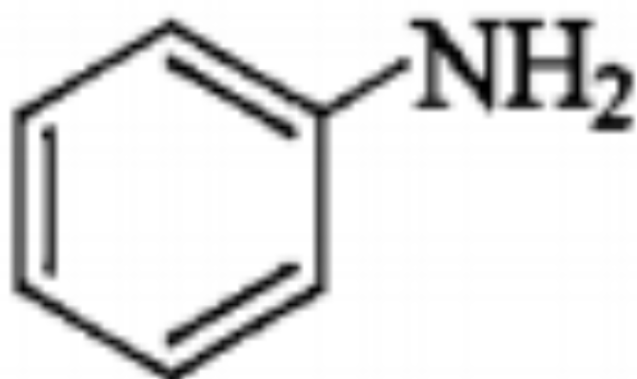


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19. The correct order of basicity of the following amines



I



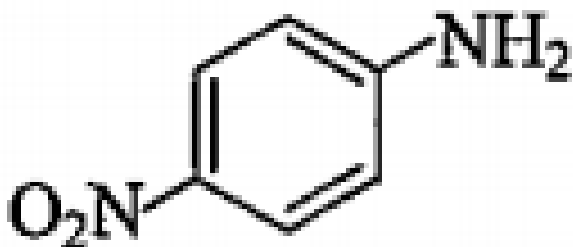
II

I



III

,



IV

is

A. $I > II > III > IV$

B. $I > III > II > IV$

C. $III > II > I > IV$

D. $IV > III > II > I$

Answer:



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20. Electrolysis of a concentrated aqueous solution of NaCl results in

A. Increase in pH of the solution

B. decrease in pH of the solution

C. O_2 liberation at the cathode

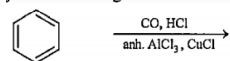
D. H_2 liberation at the anode

Answer:

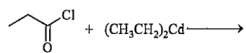
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21. The product of which of the following reactions forms a reddish brown precipitate when subjected to Fehling's test?

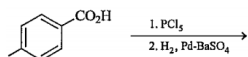
A.



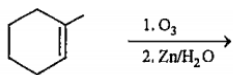
B.



C.



D.

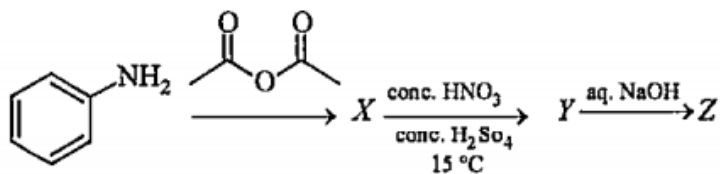


Answer:



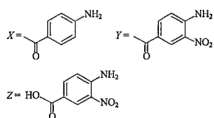
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22. The major products X, Y and Z in the following sequence of transformations

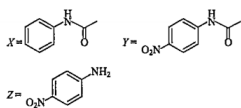


are

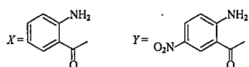
A.



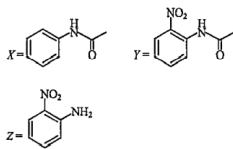
B.



C.




D.



Answer:

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23. In the following reaction, P gives two products Q and R, each in 40% yield

 If the reaction is carried out with 420 mg of P, the reaction yields 108.8 mg of Q. The amount of R produced in the reaction is closer to

A. 97.6 mg

B. 108.8 mg

C. 84.8 mg

D. 121.6 mg

Answer:



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24. Solubility products of CuI and Ag_2CrO_4 have almost the same value ($\sim 4 \times 10^{-12}$). The

ratio of solubilities of two salts

($CuI : Ag_2CrO_4$) is closest to

A. 0.01

B. 0.02

C. 0.03

D. 0.10

Answer:



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25. Given that the molar combustion enthalpy of benzene, cyclohexane, and hydrogen are x , y , and z , respectively, the molar enthalpy of hydrogenation of benzene to cyclohexane is

A. $x-y+z$

B. $x-y+3z$

C. $y-x+z$

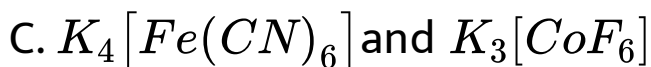
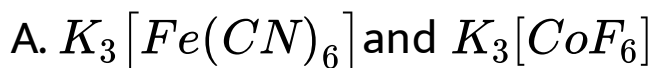
D. $y-x+3z$

Answer:



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26. Among the following, the pair of paramagnetic complexes is

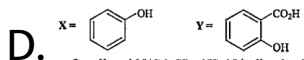
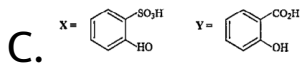
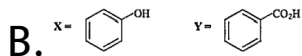
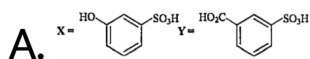
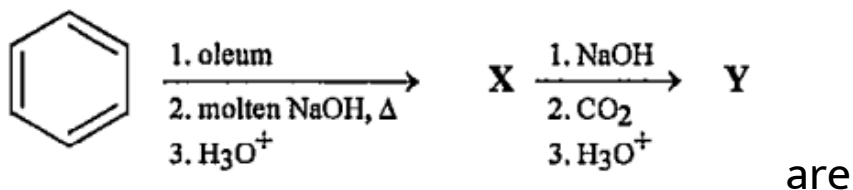


Answer:



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27. The major products X and Y in the following sequence of transformations



Answer:



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28. 3.0 g of oxalic acid $[(CO_2H)_2 \cdot 2H_2O]$ is dissolved in a solvent to prepare a 250 mL solution. The density of the solution is 1.9g/mL. The molality and normality of the solution, respectively, are closest to

A. 0.10 and 0.38

B. 0.10 and 0.19

C. 0.05 and 0.19

D. 0.05 and 0.09

Answer:



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29. In a titration experiment, 10 mL of an $FeCl_2$ solution consumed 25 mL of a standard $K_2Cr_2O_7$ solution to reach the equivalent point. The standard $K_2Cr_2O_7$ solution is prepared by dissolving 1.225 g of $K_2Cr_2O_7$ in 250 mL water. The concentration of the $FeCl_2$ solution is closest to [Given: molecular weight of $K_2Cr_2O_7 = 294\text{g mol}^{-1}$]

A. 0.25 N

B. 0.50 N

C. 0.10 N

D. 0.04 N

Answer:



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30. Atoms of an element Z form hexagonal closed pack (hcp) lattice and atoms of element

X occupy all the tetrahedral voids. The formula of the compound is

A. XZ

B. XZ_2

C. X_2Z

D. X_4Z_3

Answer:



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