CHEMISTRY

BOOKS - MTG CHEMISTRY (BENGALI ENGLISH)

QUESTION PAPER 2021

Chemistry Category I

1. The exact order of boiling points of the compounds n-pentane, isopentane, butanone

and 1-butanol is

A. n -pentane lt isopentane lt butanone lt 1-butanol

B. isopentane lt n - pentane lt butanone lt 1 - butanol

C. butanone lt n - pentane lt isopentane lt 1 - butanol

D. 1-butanol lt butanone lt n - pentane lt isopentane

Answer: 1-butanol lt butanone lt n - pentane lt

isopentane

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2. The maximum number of atoms that can be in one plane in the molecule p - nitrobenzonitrile are

A. 6

B. 12

C. 13

D. 15

Answer:

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3. Cyclo [18] carbon is an allotrope of carbon with molecular formula C_{18}. It is a ring of 18 carbon atoms, connected by single and triple bonds. The total number of triple bonds present in this cyclocarbon are

A. 9

B. 10

C. 12

D. 6

Answer:

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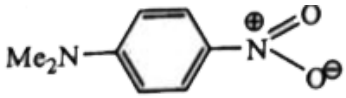
4. p - nitro - N, N - dimetylaniline cannot be represented by the resonating structures



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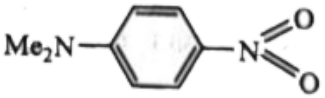

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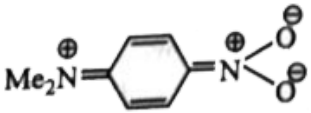

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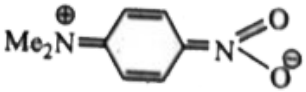

(IV)

A. I and II

B. II and IV

C. I and III

D. III and IV

Answer: II and IV

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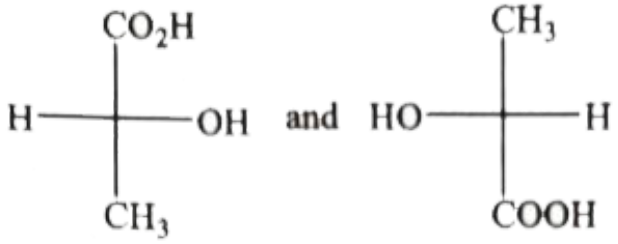
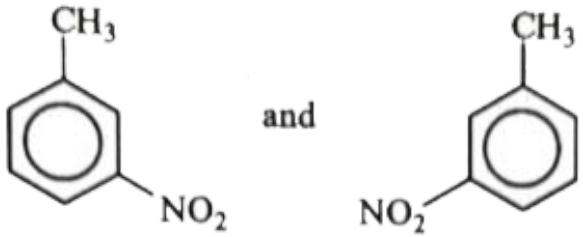
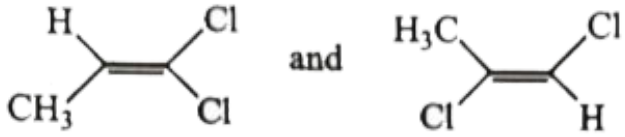
1. 

2. 

3. 

5.

The relationship between the pair of compounds shown above are respectively

A. Homomer (identical), enantiomer and constitutional isomer

B. Enantiomer, enantiomer and diastereomer

C. Homomer (identical), homomer (identical) and constitutional isomer

D. Eannitromer, homomer (identical) and gometrical isomer

Answer:

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6. The exact order of acidity of the compounds p-nitrophenol, acetic acid, acetylene a ethanol is

A. p-nitrophenol lt acetic acid lt acetylene lt ethanol

B. acetic acid lt p - nitrophenol lt acetylene lt ethanol

C. acetylene lt p - nitrophenol lt ethanol lt acetic acid

D. acetylene lt ethanol lt p - nitrophenol lt acetic acid

Answer: acetylene lt ethanol lt p - nitrophenol lt acetic acid

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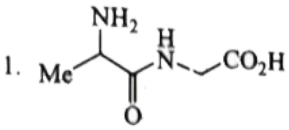
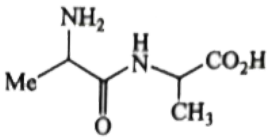
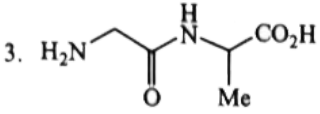
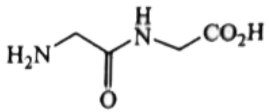
7.

1. 

2. 

3. 

4. 

The dipeptides which may be obtained from

the amino acids glycine and alanine are

A. only 1

B. only 2

C. both 1 and 2

D. all of them

Answer:

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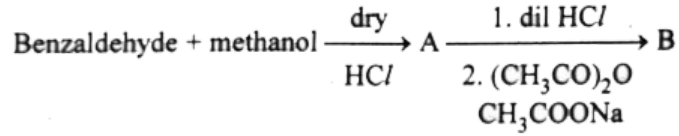
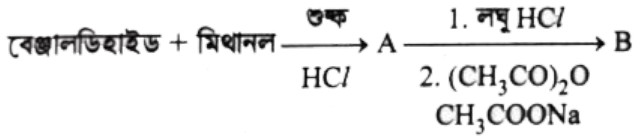
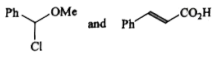
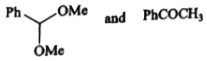
8.

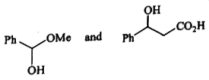


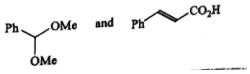


The compounds A and B above are repectivley

A. 

B. 

C. 

D. 

Answer:

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9. For a spontaneous reaction at all temperatures which of the following is correct ?

A. Both ΔH and ΔS are positive

B. ΔH is positive and ΔS is negative

C. ΔH is negative and ΔS is positive

D. Both ΔH and ΔS are negative

Answer:

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10. A given amount of Fe^{2+} is oxidized by x mol of MnO_4^- in acidic medium. The number of mole of $Cr_2O_7^{2-}$ required to oxidize the same amount of Fe^{2+} in acidic medium is

A. x

B. 0.83 x

C. 2.0 x

D. 1.2 x

Answer:

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11. An element crystallizes in a body centred cubic lattice. The edge length of the unit cell is 200 pm and the density of the element is $5.0\ \mathrm{g\ cm^{-3}}$. Calculate the number of atoms in 100 g of this element.

A. 2.5×10^{23}

B. 2.5×10^{24}

C. 5.0×10^{23}

D. 5.0×10^{24}

Answer:

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12. Molecular velocities of two gases at the same temperature (T) are u_1 and u_2. Their masses are m_1 and m_2 respectively. Which of the following expressions is correct at temperature T ?

A. $\frac{m_1}{u_1^2} = \frac{m_2}{u_2^2}$

B. $m_1 u_1 = m_2 u_2$

C. $\frac{m_1}{u_1} = \frac{m_2}{u_2}$

D. $m_1 u_1^2 = m_2 u_2^2$

Answer:

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13. When 20 g of naphthoic acid $(C_{11}H_8O_2)$ is dissolved in 50 g of benzene , a freezing point

depression of 2K is observed. The vant Hoff factor (i) is $[K_f = 1.72\ \mathrm{K\ kg\ mol^{-1}}]$

A. 0.5

B. 1.0

C. 2.0

D. 3.0

Answer:

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14. The equilibrium constant for the reaction $N_2(g) + O_2(g) \Leftrightarrow 2NO(g)$ is 4×10^{-4} at 2000 K. In presence of a catalyst the equilibrium is attained 10 times faster . Therefore , the equilibrium constant , in presence of the catalyst at 2000 K is

A. 4×10^{-4}

B. 4×10^{-3}

C. 4×10^{-5}

D. 2.5×10^{-4}

Answer:

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15. Under the same reaction conditions , initial concentration of 1.386 mol dm^{-3} of a substance becomes half in 40 s and 20 s through first-order and zero-order kinetics respectively. Ratio $\left(\frac{k_1}{k_0}\right)$ of the rate constants for first order (k_1) and zero-order (k_0) of the reactions is

A. $0.5\ \text{mol}^{-1}\text{dm}^3$

B. $0.5\ \text{mol dm}^{-3}$

C. $1.0\ \text{mol dm}^{-3}$

D. $2.0\ \text{mol}^{-1}\text{dm}^3$

Answer:

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16. Which one of the following solutions will have highest conductivity ?

A. 0.1 M CH_3COOH

B. 0.1 M NaCl

C. 0.1 M KNO_3

D. 0.1 M HCl

Answer:

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17. Indicate the products (X) and (Y) in the following reactions :

$Na_2S + nS(n = 1 - 8) \rightarrow (X)$

$Na_2SO_3 + S \rightarrow (Y)$

A. $\underset{Na_2S_2O_3}{(X)} \quad \underset{Na_2S_2}{(Y)}$

B. $\underset{Na_2S_{(n+1)}}{(X)} \quad \underset{Na_2S_2O_3}{(Y)}$

C. $\underset{Na_2S_n}{(X)} \quad \underset{Na_2S_2O_3}{(Y)}$

D. $\underset{Na_2S_5}{(X)} \quad \underset{Na_2S_2O_4}{(Y)}$

Answer:

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18. 2.5 ml 0.4 (M) weak monoacidic base ($k_b = 1 \times 10^{-12}$ at 25° C) is titrated with $\frac{2}{15}(M)$ HCl in water at $25^\circ C$. The concentration of H^+ at equivalence point is ($K_w = 1 \times 10^{-14}$, at $25^\circ C$)

A. 3.7×10^{-13} (M)

B. 3.2×10^{-7} (M)

C. 3.2×10^{-2} (M)

D. 2.7×10^{-2} (M)

Answer:

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19. Solubility products (K_{sp}) of the salts of types MX, MX_2 and M_3X at temperature T are 4.0×10^{-8}, 3.2×10^{-14} and 2.7×10^{-15} respectively. Solubilities (in mol dm^{-3}) of the salts at temperature T are in the order

A. $MX > MX_2 > M_3X$

B. $M_3X > MX_2 > MX$

C. $MX_2 > M_3X > MX$

D. $MX > M_3X > MX_2$

Answer:

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20. The reduction potential of hydrogen half-cell with be negative if

A. $p(H_2)$ = 1 atm and $\left[H^+\right]$ = 1.0 M

B. $p(H_2)$= 1 atm and $\left[H^+\right]$ =2.0 M

C. $p(H_2)$ = 2 atm and $\left[H^+\right]$ = 1.0 M

D. $p(H_2)$ = 2 atm and $\left[H^+\right]$ = 2.0 M

Answer:

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21. A saturated solution of $BaSO_4$ at $25^\circ C$ is 4×10^{-5}M. The solubility of $BaSO_4$ in 0.1 M Na_2SO_4 at this temperature will be

A. $1.6 \times 10^{-9} M$

B. $1.6 \times 10^{-8} M$

C. $4 \times 10^{-6} M$

D. $4 \times 10^{-4} M$

Answer:

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22. A solution is made by a concentrated solution of $Co(NO_3)_2$, with a concentrated solution of $NaNO_2$ in 50% acetic acid. A solution of a salt containing metal M is added

to the mixture, when a yellow precipitate is formed. Metal 'M' is:

A. Magnesium

B. Sodium

C. Potassium

D. Zinc

Answer:

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23. Extraction of a metal (M) from its sulfide ore (M_2S) involves the following chemical reactions :

$$2M_2S + 3O_2 \xrightarrow{\text{heat}} 2M_2O + 2SO_2 \uparrow$$

$$M_2S + 2M_2O \xrightarrow{\text{heat}} 6M + SO_2 \uparrow$$

The metal (M) may be

A. Zn

B. Cu

C. Fe

D. Ca

Answer: Cu

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24. The white precipitate (Y), obtained on passing colourless and odourless gas (X) through an ammoniacal solution of NaCl, loses about 37% of its weight on heating and a white residue (Z) of basic nature is left. Identify (X), (Y) and (Z) from following sets.

A.

(X)	(Y)	(Z)
N_2	$(NH_4)_2CO_3$	NH_4Cl

B. $\begin{matrix}(X) & (Y) & (Z) \\ O_2 & NaNH_4CO_3 & NaHCO_3\end{matrix}$

C. $\begin{matrix}(X) & (Y) & (Z) \\ CO_2 & NH_4HCO_3 & (NH_4)_2CO_3\end{matrix}$

D. $\begin{matrix}(X) & (Y) & (Z) \\ CO_2 & NaHCO_3 & Na_2CO_3\end{matrix}$

Answer:

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25. Which structure has delocalised π-electrons ?

A. O_3

B. CO

C. HCN

D. O_3 and HCN

Answer: O_3

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26. The H_3O^+ ion has the following shape

A. Tetrahedral

B. Pyramidal

C. Triangular planar

D. "T" shaped

Answer:

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27. For the reaction $^{14}N(\alpha, p)^{17}O, 1.16MeV$ (Mass equivalent = 0.00124 amu) of energy is absorbed. Mass on the reactant side is 18.00567 amu and proton mass = 1.00782 amu. The atomic mass of ^{17}O will be

A. 17.0044 amu

B. 16.9991 amu

C. 17.0114 amu

D. 16.9966 amu

Answer:

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28. A solution of $NaNO_3$, when treated with a mixture of Zn dust and 'A' yields ammonia. 'A' can be

A. caustic soda

B. dilute sulphuric acid

C. concentrated sulphuric acid

D. sodium carbonate

Answer:

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29. Indicate the number of unpaired electrons in $K_3[Fe(CN)_6]$ and $K_4[Fe(CN)_6]$

A. $K_3[Fe(CN)_6]$ $K_4[Fe(CN)_6]$
1 0

B. $K_3[Fe(CN)_6]$ $K_4[Fe(CN)_6]$
5 6

C. $K_3[Fe(CN)_6]$ $K_4[Fe(CN)_6]$
6 5

D. $K_3[Fe(CN)_6]$ $K_4[Fe(CN)_6]$
0 1

Answer:

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30. Which of the following compounds have magnetic moment identical with $[Cr(H_2O)_6]^{3+}$?

A. $\left[Cu(H_2O)_6\right]^{2+}$

B. $\left[Mn(H_2O)_6\right]^{3+}$

C. $\left[Fe(H_2O)_6\right]^{3+}$

D. $\left[Mn(H_2O)_6\right]^{4+}$

Answer:

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31. Among the following chlorides the compounds which will be hydrolysed more most easily and slowly in aqueous NaOH

solution are respectively

1. Methoxymethyl chloride

2. Benzyl chloride

3. Neopentyl chloride

4. Propyl chloride

A. 1 and 3

B. 2 and 3

C. 2 and 4

D. 3 and 1

Answer: 2 and 3

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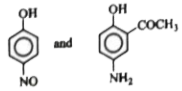
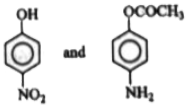
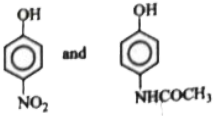
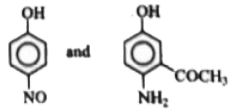
32. The products $\underline{X}$ and $\underline{Y}$ which are formed in the following sequence of reactions are respectively

Phenol $\xrightarrow{\text{dil } HNO_3} \underline{X} \xrightarrow[2.\,(CH_3CO)_2O(1 \text{ equiv.})]{1.\,Zn/HCl,\,\Delta} \underline{Y}$

A. 

B. 

C. 

D. 

Answer:

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33. The atomic masses of helium and neon are 4.0 and 20.0 amu respectively. The value of the de Broglie wavelength of helium gas at $-73^{\circ}C$ is M times the de Broglie wavelength of neon at $727^{\circ}C$. The value of M is

A. 5

B. 25

C. $\frac{1}{5}$

D. $\frac{1}{25}$

Answer:

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34. The mole fraction of a solute in a binary solution is 0.1. At 298 K, molarity of this solution is same as its molality. Density of this

solution at 298 K is 2.0 g cm^{-3}. The ratio of molecular weights of the solute and the solvent $(M_{\text{solute}} / M_{\text{solvent}})$ is

A. 9

B. $\frac{1}{9}$

C. 4.5

D. $\frac{1}{4.5}$

Answer:

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35. 5.75 mg of sodium vapour is converted to sodium ion. If the ionisation energy of sodium is 490 kJ mol^{-1} and atomic weight is 23 units, the amount of energy needed for this conversion will be

A. 1.96 kJ

B. 1960 kJ

C. 122.5 kJ

D. 0.1225 kJ

Answer:

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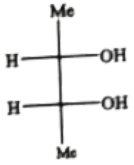
36. The product(s) in the following sequence of reactions will be

$$Me - C \equiv C - Me \xrightarrow[\text{2. dil. alkaline } KMnO_4]{\substack{1.\, Na / NH_3\,(\text{liq.}) \\ \text{ethanol}, -33^\circ C}}$$

Product (s)

A.



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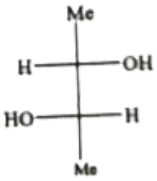
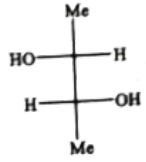
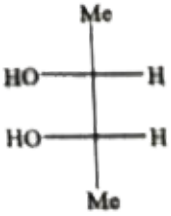


C. 

D. 

Answer:

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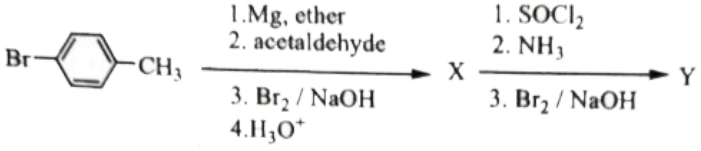
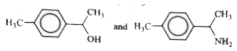
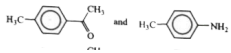
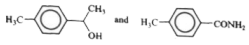
37. The compounds X and Y are respectively



A. 

B. 

C. 

D. 

Answer:

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38. Aqueous solution of HNO_3, KOH, CH_3COOH and CH_3COONa of identical concentration are provided. The

pair (s) of solutions which form a buffer upon mixing is (are)

A. HNO_3 and CH_3COOH

B. KOH and CH_3COONa

C. HNO_3 and CH_3COONa

D. CH_3COOH and CH_3COONa

Answer:

39. Reaction of silver nitrate solution with phosphorous acid produces:

A. Silver phosphite

B. Phosphoric acid

C. Metallic silver

D. Silver phosphate

Answer:

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40. N_2H_4 and H_2O_2 show similarity in

A. Density

B. Reducing nature

C. Oxidising nature

D. Hybridisation of central atoms

Answer:

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