Sample Paper

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Chemistry

Q.No. 1 The reaction, MgO(s) +C(s) >Mg(s) +CO(g), for which $\Delta_r H^\circ = +491.1 \quad kJ \quad mol^{-1}$ and $\Delta_r S^\circ = 198.0 JK^{-1} mol^{-1}$, is not feasible at 298 K. Temperature above which reaction will be feasible is :

(A) 2380.5 K

(B) 2480.3 K

(C) 2040.5 K

(D) 1890.0 K

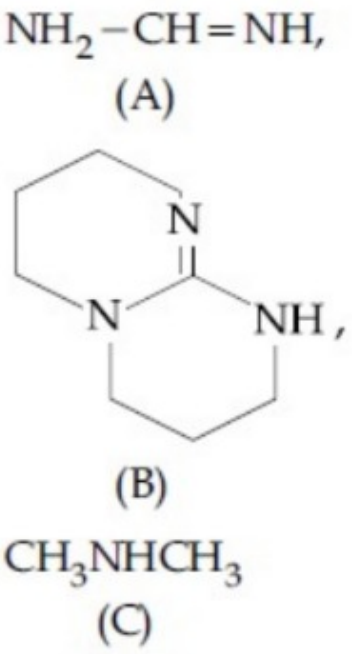
Q.No. 2 The standard reaction Gibbs energy for a chemical reaction at an absolute temperature T is given by $\Delta_r G^o = A - BT$. Where A and B are non-zero constants. Which of the following is TRUE about this reaction ?

(A) Endothermic if A<0 and B>O

(B) Exothermic if B<0

(C) Endothermic if A>0

(D) Exothermic if A>O and B<0



Q.No. 3 The increasing order of pK_b for the following compounds will be :

(A) (B) < (C) < (A)

(B) (A) < (B) < (C)

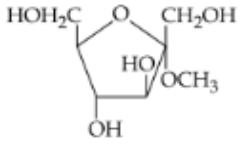
(C) (C) < (A) < (B)

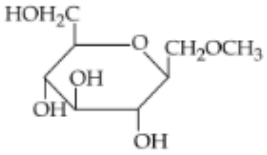
(D) (B) < (A) < (C)

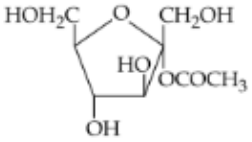
Q.No. 4 Which of the following compounds will behave as a reducing sugar in an aqueous KOH solution ?

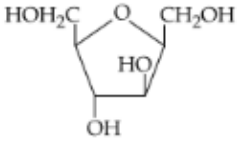
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(A) 

(B) 

(C) 

(D) 

Q.No. 5 For the reaction, 2A +B → products, when the concentrations of A and B both were doubled, the rate of the reaction increased from $0.3 mol L^{-1} s^{-1}$ to $2.4 mol L^{-1} s^{-1}$. When the concentration of A alone is doubled, the rate increased from 0.3 mol $L^{-1} s^{-1}$ to $0.6 mol L^{-1} s^{-1}$. Which one of the following statements is correct?

(A) Order of the reaction with respect to B is 2

(B) Order of the reaction with respect to B is 1

(C) Order of the reaction with respect to A is 2

(D) Total order of the reaction is 4

Q.No. 6 The two monomers for the synthesis of Nylon 6, 6 are :

(A) $HOOC(CH_2)_6COOH$
$H_2N(CH_2)_6NH_2$

(B) $HOOC(CH_2)_6COOH$
$H_2N(CH_2)_4NH_2$

(C) $HOOC(CH_2)_4COOH$
$H_2N(CH_2)_6NH_2$

(D) $HOOC(CH_2)_4COOH$
$H_2N(CH_2)_4NH_2$

Q.No. 7 Total number of lone pair of electrons in I_3^- ion is:

(A) 3

(B) 6

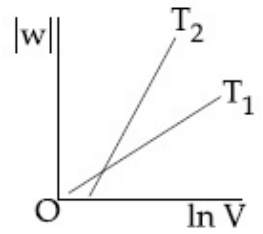
(C) 9

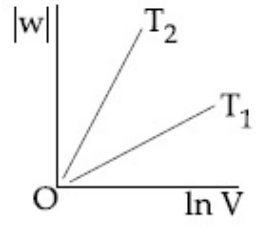
(D) 12

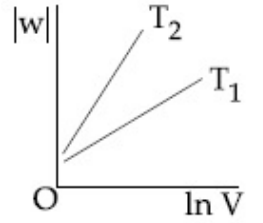
Q.No. 8 Consider the reversible isothermal expansion of an ideal gas in a closed system at two different temperatures T_1 and T_2 ($T_1 < T_2$). The correct graphical depiction of the dependence of work done (w) on the final

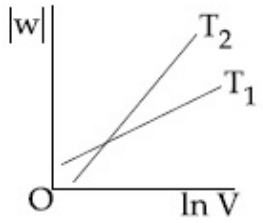
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volume (V) is :

(A) 

(B) 

(C) 

(D) 

Q.No. 9 The compound that does not produce nitrogen gas by the thermal decomposition is :

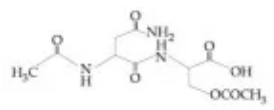
(A) $Ba(N_3)_2$

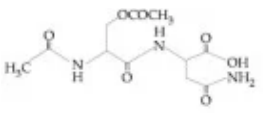
(B) $(NH_4)_2Cr_2O_7$

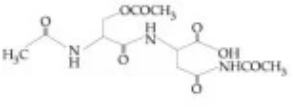
(C) NH_4NO_2

(D) $(NH_4)_2SO_4$

Q.No. 10 The correct structure of product 'p' in the following reaction is : $\mathrm{Asn-Ser+(GH_3CO)_2O \overset{NEt_1}{\rightarrow}, P}$

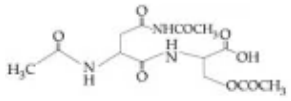
(A) 

(B) 

(C) 

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(D) 

Q.No. 11 The element that shows greater ability to form $p\mathbb{F} - p\pi$ multiple bonds, is :

(A) C

(B) Ge

(C) Sn

(D) Si

Q.No. 12 The correct match between Item-I and Item-II is :

	Item-I (drug)		Item-II (test)
A	Chloroxylenol	P	Carbylamine test
B	Norethindrone	Q	Sodium hydrogen-carbonate test
C	Sulphapyridine	R	Ferric chloride test
D	Penicillin	S	Bayer's test

(A) A→Q; B→P; C→S; D→R

(B) A→R; B→S; C→P; D→Q

(C) A→R; B→P; C→S; D→Q

(D) A→Q; B→S; C→P; D→R

Q.No. 13 The relative stability of +1 oxidation state of group 13 elements follows the order :

(A) Tl < In < Ga < Al

(B) Al < Ga < Tl < In

(C) Ga < Al < In < TI

(D) Al < Ga < In < TI

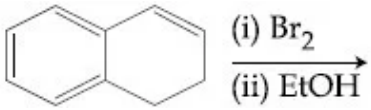
Q.No. 14 An alkali is titrated against an acid with methyl orange as indicator, which of the following is a correct combination?

(A) Base - Weak Acid - Strong End Point - Colourless to pink

(B) Base - Strong Acid - Strong End Point - Pinkish red to yellow

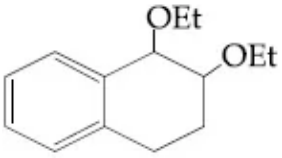
(C) Base - Weak Acid - Strong End Point - Yellow to pinkish red

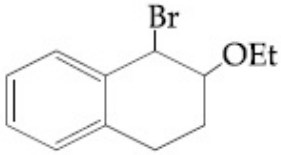
(D) Base - Strong Acid - Strong End Point - Pink to colourless

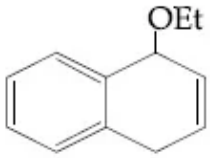
Q.No. 15 The major product of the following reaction is : 

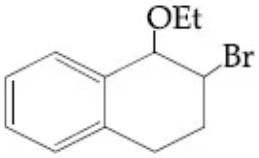
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(A) 

(B) 

(C) 

(D) 

Q.No. 16 Given

$C_{(graphite)} + O_2(g) \rightarrow CO_2(g)$;
$\Delta_r H^\circ = -393.5 \text{ kJ mol}^{-1}$

$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$;
$\Delta_r H^\circ = -285.8 \text{ kJ mol}^{-1}$

$CO_2(g) + 2H_2O(l) \rightarrow CH_4(g) + 2O_2(g)$;
$\Delta_r H^\circ = +890.3 \text{ kJ mol}^{-1}$

Based on the above thermochemical equations, the value of $\Delta_r H^\circ$ at 298 K for the reaction

$C_{(graphite)} + 2H_2(g) \rightarrow CH_4(g)$ will be :

(A) $-74.8 \text{ kJ mol}^{-1}$

(B) $-144.0 \text{ kJ mol}^{-1}$

(C) 74.8 KJ mol^{-1}

(D) $144.0 \text{ KJ mol}^{-1}$

Q.No. 17 The hardness of a water sample (in terms of equivalents of CaCO3) containing 10^{-3} M $CaSO_4$ is: (molar mass of $CaSO_4$ = 136 g mol^{-1})

(A) 10 ppm

(B) 100 ppm

(C) 50 ppm

(D) 90 ppm

Q.No. 18 A water sample has ppm level concentration of following anions F^- =10 ; SO_4^{2-} =100 ; NO_3^- =50 The anion/anions that make/makes the water sample unsuitable for drinking is/ are :

(A) only F^-

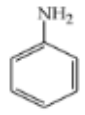
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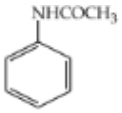
(B) only SO_4^{2-}

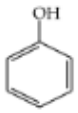
(C) only NO_3^-

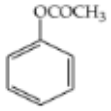
(D) both SO_4^{2-} and NO_3^-

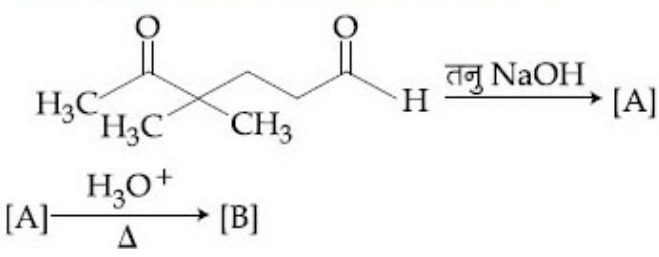
Q.No. 19 Which of the following compounds will form significant amount of meta product during mono-nitration reaction ?

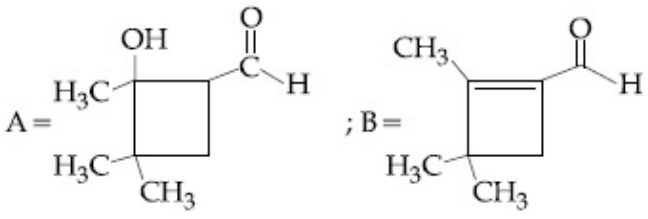
(A) 

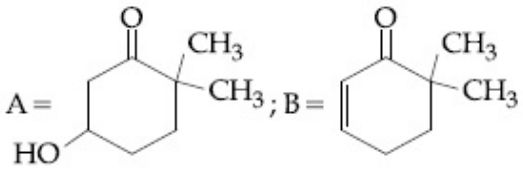
(B) 

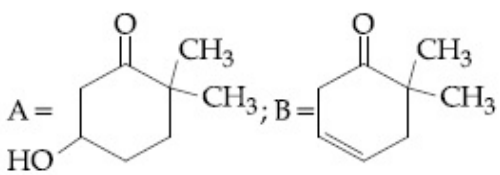
(C) 

(D) 

Q.No. 20 The main product of the reaction 

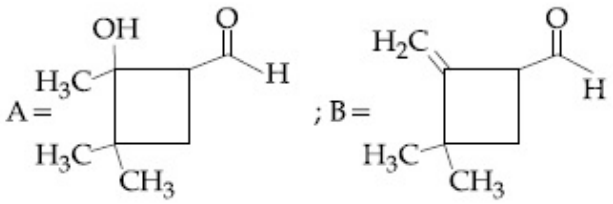
(A) 

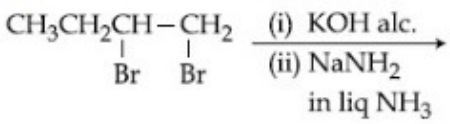
(B) 

(C) 

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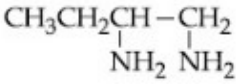
(D) 



Q.No. 21 The major product of the following reaction is :

(A) $CH_3CH{=}C{=}CH_2$

(B) $CH_3CH_2C{\equiv}CH$

(C) 

(D) $CH_3CH{=}CHCH_2NH_2$

Q.No. 22 3-Methyl-pent-2-ene on reaction with HBr in presence of peroxide forms an addition product. The number of possible stereoisomers for the product is :

(A) Two

(B) four

(C) six

(D) zero

Q.No. 23 Match the following items in column I with the corresponding items in column II.

	Column I		Column II
(i)	$Na_2CO_3 \cdot 10\,H_2O$	(A)	Portland cement ingredient
(ii)	$Mg(HCO_3)_2$	(B)	Castner-Kellner process
(iii)	NaOH	(C)	Solvay process
(iv)	$Ca_3Al_2O_6$	(D)	Temporary hardness

(A) (i) $\rightarrow$ (D); (ii) $\rightarrow$ (A); (ii) $\rightarrow$ (B); (iv) $\rightarrow$ (C)

(B) (i) $\rightarrow$ (C); (ii) $\rightarrow$ (B); (ii) $\rightarrow$ (D); (iv) $\rightarrow$ (A)

(C) (i) $\rightarrow$ (C); (ii) $\rightarrow$ (D); (ii) $\rightarrow$ (B); (iv) $\rightarrow$ (A)

(D) (i) $\rightarrow$ (B); (ii) $\rightarrow$ (C); (ii) $\rightarrow$ (A); (iv) $\rightarrow$ (D)

Q.No. 24 The radius of the largest sphere which fits properly at the centre of the edge of a body centred cubic unit cell is : (Edge length is represented by 'a')

(A) 0.047 a

(B) 0.134 a

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(C) 0.027 a

(D) 0.067 a

Q.No. 25 The chemical nature of hydrogen peroxide is :

(A) Oxidising and reducing agent in both acidic and basic medium.

(B) Oxidising and reducing agent in acidic medium, but not in basic medium.

(C) Reducing agent in basic medium, but not in acidic medium.

(D) Oxidising agent in acidic medium, but not in basic medium

Q.No. 26 In the following [A] and [B], respectively, are (Hot and Conc)$NaOH + Cl_2 \rightarrow$[A] + side products (Dry) $Ca(OH) + Cl_2 \rightarrow$ [B] + side products

(A) $NaClO_3$ and $Ca(OCl)_2$

(B) $NaClO_3$ and $Ca(ClO_3)_2$

(C) NaOCl and $Ca(OCl)_2$

(D) NaOCl and $CaClO_3)_2$

Q.No. 27 Decomposition of X exhibits a rate constant of 0.05 μg/year. How many years are required for the decomposition of 5 μg of X into 2.5 μg?

(A) 25

(B) 50

(C) 20

(D) 10

Q.No. 28 A compound with molecular mass 180 is acylated with CH_3COCl to get a compound with molecular mass 390. The number of amino groups present per molecule of the former compound is:

(A) 5

(B) 6

(C) 4

(D) 2

Q.No. 29 Hydrogen peroxide oxidises $[Fe(CN)_6]^{4-}$ to $[Fe(CN)_6]^{3-}$ in acidic medium but reduces $[Fe(CN)_6]^{3-}$ to $[Fe(CN)_6]^{4-}$ in alkaline medium. The other products formed are, respectively :

(A) (H_2O+O_2) and H_2O

(B) (H_2O+O_2) and (H_2O+OH^-)

(C) H_2O and (H_2O+O_2)

(D) H_2O and (H_2O+OH^-)

Q.No. 30 The isotopes of hydrogen are :

(A) Protium, deuterium and tritium

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(B) Protium and deuterium only

(C) Deuterium and tritium only

(D) Tritium and protium only

Q.No. 31 An aqueous solution contains 0.10 M H_2S and 0.20 M HCl. If the equilibrium constants for the formation of HS^- from H_2S is 1.0×10^{-7} and that of S^{2-} from HS^- ions is 1.2×10^{-13} then the concentration of S^{2-} ions in aqueous solution is:

(A) 5×10^{-8}

(B) 3×10^{-20}

(C) 6×10^{-21}

(D) 5×10^{-19}

Q.No. 32 The de Broglie wavelength (λ) associated with a photoelectron varies with the frequency (ν) of the incident radiation as, [ν_0 is threshold frequency]:

(A) $\lambda \propto \frac{1}{(v-v_0)}$

(B) $\lambda \propto \frac{1}{(v-v_0)^{\frac{1}{4}}}$

(C) $\lambda \propto \frac{1}{(v-v_0)^{\frac{1}{2}}}$

(D) $\lambda \propto \frac{1}{(v-v_0)^{\frac{3}{2}}}$

Q.No. 33 The temporary hardness of water is due to :

(A) Na_2SO_4

(B) $CaCl_2$

(C) $Ca(HCO_3)_2$

(D) Nacl

Q.No. 34 For 1 molal aqueous solution of the following compounds, which one will show the highest freezing point ?

(A) $[Co(H_2O)_6]Cl_3$

(B) $[Co(H_2O)_5Cl]Cl_2 . H_2O$

(C) $[Co(H_2O)_4Cl_2]Cl . 2H_2O$

(D) $[Co(H_2O)_3Cl_3]. 3H_2O$

Q.No. 35 1 gram of a carbonate (M_2CO_3) on treatment with excess HCl produces 0.01186 mole of CO_2. The molar mass of M_2CO_3 in g mol^{-1} is :

(A) 118.6

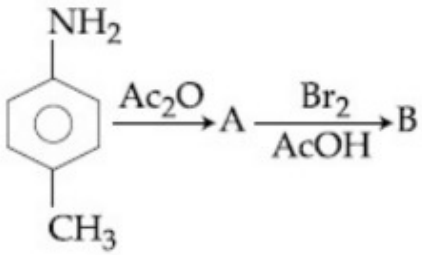
(B) 11.86

(C) 1186

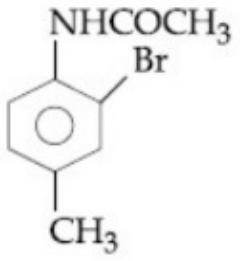
(D) 84.3

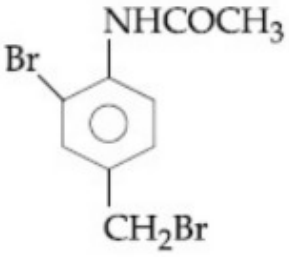
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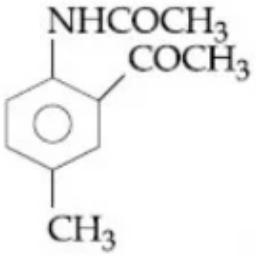
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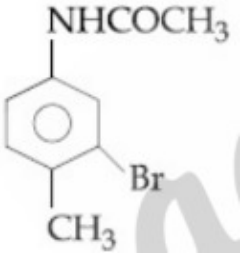


Q.No. 36 In the following reaction sequence, The major product B is :

(A)


(B)


(C)


(D)


Q.No. 37 K_2HgI_4 is 40% ionised in aqueous solution. The value of its van't Hoff factor (i) is :

(A) 1.8

(B) 2.2

(C) 1.6

(D) 2.0

Q.No. 38 At 100°C, copper (Cu) has FCC unit cell structure with cell edge length of x Å . What is the approximate density of Cu in $g\left(cm^{-3}\right)$ at this temperature ? [Atomic Mass of Cu=63.55 u)

(A) $\frac{205}{x^3}$

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(B) $\frac{211}{x^3}$

(C) $\frac{105}{x^3}$

(D) $\frac{422}{x^3}$

Q.No. 39 An unknown alcohol is treated with the "Lucas reagent" to determine whether the alcohol is primary, secondary or tertiary. Which alcohol reacts fastest and by what mechanism:

(A) tertiary alcohol by S_N1

(B) tertiary alcohol by S_N2

(C) secondary alcohol by S_N2

(D) secondary alcohol by S_N1

Q.No. 40 Among the colloids cheese (C), milk (M) and smoke (S), the correct combination of the dispersed phase and dispersion medium, respectively is:

(A) C: solid in liquid; M: liquid in liquid; S: gas in solid

(B) C : liquid in solid; M : liquid in liquid; S:solid in gas

(C) C: liquid in solid; M: liquid in solid; S:solid in gas

(D) C:solid in liquid; M: solid in liquid; S:solid in gas

Answer Sheet

Q.No	Answer
Q.No. 1	(B)
Q.No. 2	(C)
Q.No. 3	(D)
Q.No. 4	(C)
Q.No. 5	(A)
Q.No. 6	(C)
Q.No. 7	(C)
Q.No. 8	(A)
Q.No. 9	(D)
Q.No. 10	(A)
Q.No. 11	(A)
Q.No. 12	(B)
Q.No. 13	(D)
Q.No. 14	(C)
Q.No. 15	(D)
Q.No. 16	(A)
Q.No. 17	(B)
Q.No. 18	(A)

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Q.No. 19	(A)
Q.No. 20	(B)
Q.No. 21	(B)
Q.No. 22	(B)
Q.No. 23	(C)
Q.No. 24	(D)
Q.No. 25	(D)
Q.No. 26	(A)
Q.No. 27	(B)
Q.No. 28	(A)
Q.No. 29	(C)
Q.No. 30	(A)
Q.No. 31	(B)
Q.No. 32	(C)
Q.No. 33	(C)
Q.No. 34	(D)
Q.No. 35	(D)
Q.No. 36	(A)
Q.No. 37	(A)
Q.No. 38	(D)
Q.No. 39	(A)
Q.No. 40	(B)

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