# KCET - 2021 TEST PAPER WITH ANSWE KEY

## Chemistry

**1.** For the reaction,

$A(g) + B(g) \rightleftharpoons C(g) + D(g);\ \Delta H = Q\text{kJ}$

The equilibrium constant cannot be disturbed by

(a) addition of $A$

(b) addition of $D$

(c) increasing of pressure

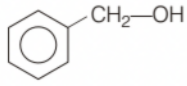
(d) increasing of temperature

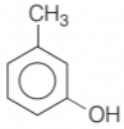
**2.** An organic compound $X$ on treatment with PCC in dichloromethane gives the compound $Y$. Compound $Y$ reacts with $I_2$ and alkali to form yellow precipitate of triiodomethane. The compound $X$ is

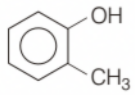
(a) $CH_3CHO$ (b) $CH_3COCH_3$

(c) $CH_3CH_2OH$ (d) $CH_3COOH$

**3.** A compound '$A$' ($C_7H_8O$) is insoluble in $NaHCO_3$ solution but dissolve in NaOH and give a characteristic colour with neutral $FeCl_3$ solution. When treated with bromine water compound '$A$' forms the compound $B$ with the formula $C_7H_5OBr_3$. '$A$' is

(a) 

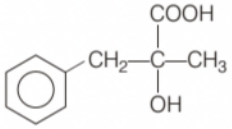
(b) 

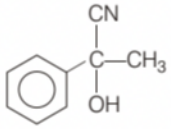
(c) 

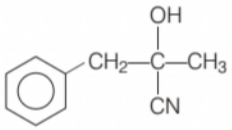
(d) 

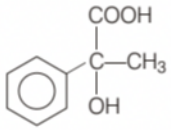
**4.** In set of reactions, identify $D$

$$CH_3COOH \xrightarrow{SOCl_2} A \xrightarrow[\text{Anhy. } AlCl_3]{\text{Benzene}} B \xrightarrow{HCN} C \xrightarrow{H_2O} D$$

(a) 

(b) 

(c) 

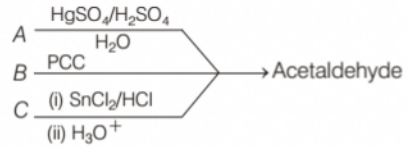
(d) 

**5.** $K_a$ values for acids $H_2SO_3$, $HNO_2$,$CH_3COOH$ and HCN are respectively $1.3 \times 10^{-2}$, $4 \times 10^{-4}$, $1.8 \times 10^{-5}$ and $4 \times 10^{-10}$, which of the above acids produces stronger conjugate base in aqueous solution?

(a) $H_2SO_3$ (b) $HNO_2$

(c) $CH_3COOH$ (d) HCN

**6.**




$A$, $B$ and $C$ respectively are

(a) ethanol, ethane nitrile and ethyne

(b) ethane nitrile, ethanol and ethyne

(c) ethyne, ethanol and ethane nitrile

(d) ethyne, ethane nitrile and ethanol

**7.** The reagent which can do the conversion $CH_3COOH \longrightarrow CH_3—CH_2—OH$ is

(a) $LiAlH_4$/ ether (b) $H_2$ , Pt

(c) $NaBH_4$ (d) Na and $C_2H_5OH$

**8.** $CH_3CHO \xrightarrow[(ii)\ H_3O^+]{(i)\ CH_3MgBr} A \xrightarrow[\Delta]{\text{Conc.}H_2SO_4}$

$$B \xrightarrow[(ii)\ H_2O,\ OH^-]{(i)\ B_2H_6} C$$

$A$ and $C$ are

(a) Identical (b) Position isomers

(c) Functional (d) Optical isomers

**9.** Which of the following is not true for oxidation?

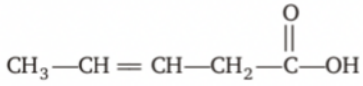
(a) Addition of oxygen

(b) Addition of electronegative element

(c) Removal of hydrogen

(d) Removal of electronegative element

**10.** Which is the most suitable reagent for the following conversion ?

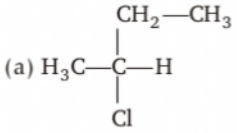
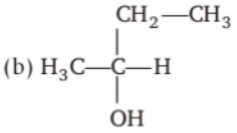
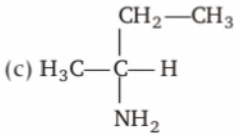
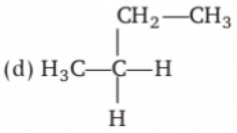
(a) Tollen's reagent
(b) Benzoyl peroxide
(c) $I_2$ and NaOH solution with subsequent acidification
(d) Sn and NaOH solution

**11.** $C_6H_5CH_2Cl \xrightarrow{\text{Alc. } NH_3} A \xrightarrow{2CH_3Cl} B.$
The product $B$ is
(a) N, N-dimethylphenylmethanamine
(b) N, N-dimethylbenzenamine
(c) N-benzyl-N-methylmethanamine
(d) phynyl-N-N-dimethylmethanamine

**12.** The method by which aniline cannot be prepared is
(a) nitration of benzene followed by reduction with Sn and conc. HCl
(b) degradation of benzamide with bromine in alkaline solution
(c) reduction of nitrobenzene with $H_2$/Pd is ethanol
(d) potassium salt of phthalimide treated with chlorobenzene followed by the hydrolysis with aqueous NaOH solution

**13.** Permanent hardness cannot be removed by
(a) using washing soda (b) Calgon's method
(c) Clark's method (d) ion exchange method

**14.** A hydrocarbon $A(C_4H_8)$ on reaction with HCl gives a compound $B(C_4H_9Cl)$ which on reaction with 1 mol of $NH_3$ gives compound $C(C_4H_{10}N)$. On reacting with $NaNO_2$ and HCl followed by treatment with water, compound $C$ yields an optically active compound $D$. The compound $D$ is

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

**15.** RNA and DNA are chiral molecules, their chirality is due to the presence of
(a) D-sugar component
(b) L-sugar component
(c) chiral bases
(d) chiral phosphate ester unit

**16.** The property of the alkaline earth metals that increases with their atomic number is
(a) ionisation enthalpy
(b) electronegativity
(c) solubility of their hydroxide in water
(d) solubility of their sulphate in water

**17.** Primary structure in a nucleic acid contains bases as GATGC ... The chain which is complementary to this chain is
(a) G G T G A... (b) T G A A G ...
(c) C T A C G... (d) T T T A G ...

**18.** In the detection of II group acid radical, the salt containing chloride is treated with concentrated sulphuric acid, the colourless gas is liberated. The name of the gas is
(a) hydrogen chloride gas
(b) chlorine gas
(c) sulphur dioxide gas
(d) hydrogen gas

**19.** The number of six membered and five membered rings in Buckminster fullerene respectively is
(a) 20, 12 (b) 12, 20
(c) 14, 18 (d) 14, 11

**20.** In chrysoberyl, a compound containing beryllium, aluminium and oxygen, oxide ions form cubic close packed structure. Aluminium ions occupy $\frac{1}{4}$ th of octahedral voids. The formula of the compound is
(a) $BeAlO_4$ (b) $BeAl_2O_4$
(c) $Be_2AlO_2$ (d) $BeAlO_2$

**21.** The correct statement regarding defects in solid is
(a) Frenkel defect is a vacancy defect
(b) Schottky defect is a dislocation defect
(c) Trapping of an electron in the lattice leads to the formation of F-centre
(d) Schottky defect has no effect on density

**22.** A metal crystallises in bcc lattice with unit cell edge length of 300 pm and density 6.15 $gcm^{-3}$. The molar mass of the metal is
(a) 50 $gmol^{-1}$ (b) 60 $gmol^{-1}$
(c) 40 $gmol^{-1}$ (d) 70 $gmol^{-1}$

**23.** Henry's law constant for the solubility of $N_2$ gas in water at 298K is $1.0 \times 10^5$ atm. The mole fraction of $N_2$ in air is 0.8. The number of moles of $N_2$ from air dissolved in 10 moles of water at 298K and 5 atm pressure is

(a) $4.0 \times 10^{-4}$ (b) $4.0 \times 10^{-5}$
(c) $5.0 \times 10^{-4}$ (d) $4.0 \times 10^{-6}$

**24.** A pure compound contains 2.4g of C, $1.2 \times 10^{23}$ atoms of H, 0.2 moles of oxygen atoms. Its empirical formula is

(a) $C_2HO$ (b) $C_2H_2O_2$
(c) $CH_2O$ (d) CHO

**25.** Choose the correct statement.

(a) $K_H$ value is same for a gas in any solution.
(b) Higher the $K_H$ value more the solubility of gas.
(c) $K_H$ value increases on increasing the temperature of the solution.
(d) Easily liquefiable gases usually has lesser $K_H$ values.

**26.** The $K_H$ value (K bar) of argon (I), carbondioxide (II), formaldehyde (III) and methane (IV) are respectively 40.3, 167, $1.83 \times 0^{-5}$ and 0.413 at 298 K. The increasing order of solubility of gas in liquid is

(a) I < II < IV < III (b) III < IV < II < I
(c) I < III < II < IV (d) I < IV < II < III

**27.** The vapour pressure of pure liquids $A$ and $B$ are 450 and 700 mm of Hg at 350 K respectively. If the total vapour pressure of the mixture is 600 mm of Hg, the composition of the mixture in the solution is

(a) $\chi_A = 0.4, \chi_B = 0.6$ (b) $\chi_A = 0.6, \chi_B = 0.4$
(c) $\chi_A = 0.3, \chi_B = 0.7$ (d) $\chi_A = 0.7, \chi_B = 0.3$

**28.** Consider the following electrodes

$P = Zn^{2+}(0.0001\ M)/Zn$, $Q = Zn^{2+}(0.1\ M)/Zn$
$R = Zn^{2+}(0.01\ M)/Zn$, $S = Zn^{2+}(0.001\ M)/Zn$
$E^{\circ}(Zn/Zn^{2+}) = -0.76$ V electrode potentials of the above electrodes in volts are in the order

(a) $P > S > R > Q$ (b) $S > R > Q < P$
(c) $Q > R > S > P$ (d) $P > Q > R > S$

**29.** The number of angular and radial nodes in $3p$ orbital respectively are

(a) 3, 1 (b) 1, 1 (c) 2, 1 (d) 2, 3

**30.** The resistance of 0.01m KCl solution at 298 K is 1500 Ω. If the conductivity of 0.01 m KCl solution at 298 K is $0.1466 \times 10^{-3}$ S $cm^{-1}$. The cell constant of the conductivity cell in $cm^{-1}$ is

(a) 0.219 (b) 0.291
(c) 0.301 (d) 0.194

**31.** $H_2(g) + 2AgCl(s) \rightleftharpoons 2Ag(s) + 2HCl(aq)$

$E^{\circ}_{cell}$ at 25°C for the cell is 0.22 V. The equilibrium constant at 25°C is

(a) $2.8 \times 10^7$ (b) $5.2 \times 10^8$
(c) $2.8 \times 10^5$ (d) $5.2 \times 10^4$

**32.** For a reaction, $A + 2B \rightarrow$ Products, when concentration of $B$ alone is increased half-life remains the same. If concentration of $A$ alone is doubled, rate remains the same. The unit of rate constant for the reaction is

(a) $s^{-1}$ (b) L $mol^{-1}s^{-1}$
(c) mol $L^{-1}s^{-1}$ (d) $atm^{-1}$

**33.** The third ionisation enthalpy is highest in

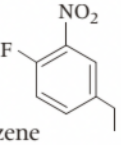
(a) alkali metals (b) alkaline earth metals
(c) chalcogens (d) pnictogens

**34.** If the rate constant for a first order reaction is $k$, the time($t$) required for the completion of 99% of the reaction is given by

(a) $t = \frac{4.606}{k}$ (b) $t = \frac{2303}{k}$
(c) $t = \frac{0.693}{k}$ (d) $t = \frac{6.909}{k}$

**35.** The rate of a gaseous reaction is given by the expression $k[A][B]^2$. If the volume of vessel is reduced to one half of the initial volume, the reaction rate as compared to original rate is

(a) $\frac{1}{16}$ (b) $\frac{1}{8}$ (c) 8 (d) 16

**36.** The correct IUPAC name of 


(a) 4-ethyl-1-fluoro-2-nitrobenzene
(b) 1-ethyl-4-fluoro-3-nitrobenzene
(c) 3-ethyl-6-fluoronitrobenzene
(d) 5-ethyl-2-fluoronitrobenzene

**37.** Higher order (>3) reactions are rare due to
(a) shifting of equilibrium towards reactants due to elastic collisions
(b) loss of active species on collision
(c) low probability of simultaneous collision of all reacting species
(d) increase in entropy as more molecules are involved

**38.** Arrange benzene, *n*-hexane and ethyne in decreasing order of their acidic behaviour.
(a) Benzene > *n*-hexane > Ethyne
(b) *n*-hexane > Benzene > Ethyne
(c) Ethyne > *n*-hexane > Benzene
(d) Ethyne > Benzene > *n*-hexane

**39.** A colloidal solution is subjected to an electric field than colloidal particles more towards anode. The amount of electrolytes of $BaCl_2$, $AlCl_3$ and NaCl required to coagulate the given colloid is in the order
(a) $NaCl > BaCl_2 > AlCl_3$ (b) $BaCl_2 < AlCl_3 > NaCl$
(c) $AlCl_3 = NaCl = BaCl_2$ (d) $AlCl_3 > BaCl_2 > NaCl$

**40.** Which of the following is an incorrect statement?
(a) Hydrogen bonding is stronger than dispersion forces
(b) Sigma bonds are stronger than π-bonds
(c) Ionic bonding is non-directional
(d) σ-electrons are referred to as mobile electrons

**41.** Zeta potential is
(a) potential required to bring about coagulation of a colloidal sol.
(b) potential required to give the particle a speed of 1 $cm\ s^{-1}$
(c) potential difference between fixed charged layer and the diffused layer having opposite charges
(d) potential energy of the colloidal particles.

**42.** Which of the following compound on heating gives $N_2O$ ?
(a) $Pb(NO_3)_2$ (b) $NH_4NO_3$
(c) $NH_4NO_2$ (d) $NaNO_3$

**43.** Which of the following property is true for the given sequence?
$NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$?
(a) Reducing property (b) Thermal stability
(c) Bond angle (d) Acidic character

**44.** The correct order of boiling point in the following compounds is
(a) $HF > H_2O > NH_3$
(b) $H_2O > HF > NH_3$
(c) $NH_3 > H_2O > HF$
(d) $NH_3 > HF > H_2O$

**45.** $XeF_6$ on partial hydrolysis gives a compound *X*, which has square pyramidal geometry '*X*' is
(a) $XeO_3$ (b) $XeO_4$ (c) $XeOF_4$ (d) $XeO_2F_2$

**46.** A colourless, neutral, paramagnetic oxide of nitrogen '*P*' on oxidation gives reddish brown gas *Q*. *Q* on cooling gives colourless gas *R*. *R* on reaction with *P* gives blue solid *S*. Identify *P*, *Q*, *R*, *S* respectively
(a) $N_2O$, NO, $NO_2$, $N_2O_5$
(b) $N_2O$, $NO_2$, $N_2O_4$, $N_2O_3$
(c) NO, $NO_2$, $N_2O_4$, $N_2O_3$
(d) NO, NO, $N_2O_4$, $N_2O_5$

**47.** Which of the following does not represent property stated against it?
(a) $CO^{2+} < Fe^{2+} < Mn^{2+}$ - Ionic size
(b) Ti < V < Mn - Number of oxidation states
(c) $Cr^{2+} < Mn^{2+} < Fe^{2+}$ - Paramagnetic behaviour
(d) Sc > Cr > Fe - Density

**48.** Which one of the following is correct for all elements from Sc to Cu?
(a) The lowest oxidation state shown by them is + 2
(b) 4*s* orbital is completely filled in the ground state
(c) 3*d* orbital is not completely filled in the ground state
(d) The ions in + 2 oxidation states are paramagnetic

**49.** When the absolute temperature of ideal gas is doubled and pressure is halved, the volume of gas
(a) will be half of original volume
(b) will be 4 times the original volume
(c) will be 2 times the original volume
(d) will be 1/4th times the original volume

**50.** Which of the following pairs has both the ions coloured in aqueous solution? [Atomic numbers of
Sc = 21, Ti = 22, Ni = 28, Cu = 29, Mn = 25]
(a) $Sc^{3+}$, $Mn^{2+}$ (b) $Ni^{2+}$, $Ti^{4+}$
(c) $Ti^{3+}$, $Cu^{+}$ (d) $Mn^{2+}$, $Ti^{3+}$

**51.** For the crystal field splitting in octahedral complexes,

(a) the energy of the $e_g$ orbitals will decrease by $(3/5)\Delta_o$ and that of the $t_{2g}$ will increase by $(2/5)\Delta_o$

(b) the energy of the $e_g$ orbitals will increase by $(3/5)\Delta_o$ and that of the $t_{2g}$ will decrease by $(2/5)\Delta_o$

(c) the energy of the $e_g$ orbitals will increase by $(3/5)\ \Delta_o$ and that of the $t_{2g}$ will increase by $(2/5)\ \Delta_o$

(d) the energy of the $e_g$ orbitals will decrease by $(3/5)\Delta_o$ and that of the $t_{2g}$ will decrease by $(2/5)\Delta_o$

**52.** Peroxide effect is observed with the addition of HBr but not with the addition of HI to unsymmetrical alkene because

(a) H—I bond is stronger than H—Br and is not cleaved by the free radical

(b) H—I bond is weaker than H—Br bond so that iodine free radicals combine to form iodine molecules

(c) Bond strength of HI and HBr are same but free radicals are formed in HBr

(d) All of the above

**53.** The IUPAC name of $[Co(NH_3)_5(CO_3)]Cl$ is

(a) pentaamminecarbonatocobalt (III) chloride

(b) carbonatopentamminecobalt (III) chloride

(c) pentaamminecarbonatocobaltate (III) chloride

(d) pentaammine cobalt (III) carbonate chloride

**54.** Homoleptic complexes among the following are

(A) $K_3[Al(C_2O_4)_3]$ (B) $[CoCl_2(en)_2]^+$

(C) $K_2[Zn(OH)_4]$

(a) A only (b) A and B only

(c) A and C only (d) C only

**55.** The correct order for wavelengths of light absorbed in the complex ions $[CoCl(NH_3)_5]^{2+}$, $[Co(NH_3)_6]^{3+}$ and $[Co(CN)_6]^{3-}$ is

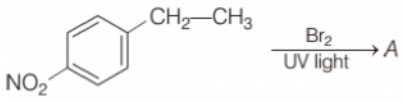
(a) $[CoCl(NH_3)_5]^{2+} > [Co(NH_3)_6]^{3+} > [Co(CN)_6]^{3-}$

(b) $[Co(NH_3)_6]^{3+} > [Co(CN)_6]^{3-} > [CoCl(NH_3)_5]^{2+}$

(c) $[Co(CN)_6]^{3-} > [CoCl(NH_3)_5]^{2+} > [Co(CN)_6]^{3-}$

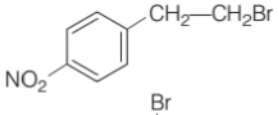
(d) $[Co(NH_3)_6]^{3+} > [CoCl(NH_3)_5]^{2+} > [Co(CN)_6]^{3-}$

**56.**




The compound $A$ (major product) is

(a)

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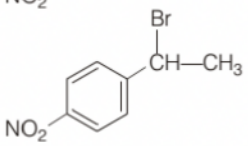


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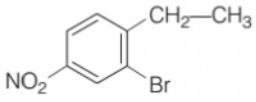


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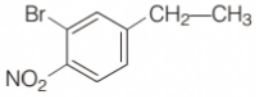


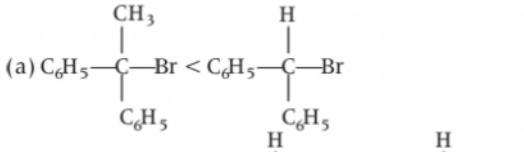

**57.** Bond enthalpies of $A_2$, $B_2$ and $AB$ are in the ratio 2 : 1 : 2. If bond enthalpy of formation of $AB$ is $-100$ kJ mol$^{-1}$. The bond enthalpy of $B_2$ is

(a) 100 kJ mol$^{-1}$ (b) 50 kJ mol$^{-1}$

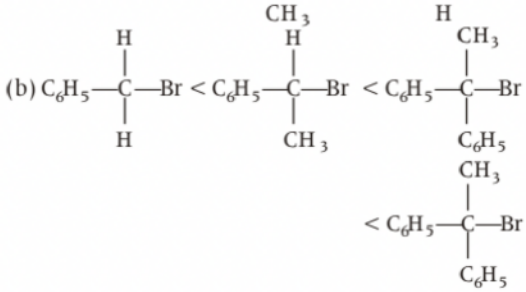
(c) 200 kJ mol$^{-1}$ (d) 150 kJ mol$^{-1}$

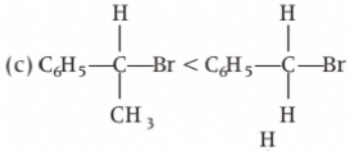
**58.** The order of reactivity of the compounds $C_6H_5CH_2Br$, $C_6H_5CH(C_6H_5)Br$, $C_6H_5CH(CH_3)Br$ and $C_6H_5C(CH_3)(C_6H_5)Br$ in $S_N2$ reaction is

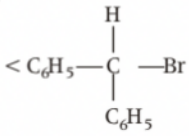
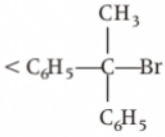
(a)

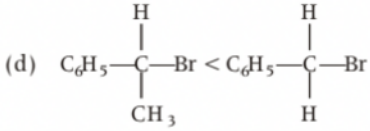


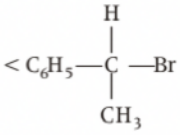
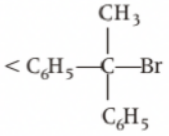

(b)



(c)  < 

<  < 

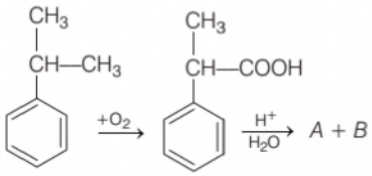
(d) 

<  < 

**59.** The major product of the following reaction is

$CH_2 = CH—CH_2—OH \xrightarrow[\text{Excess}]{HBr}$ Product

(a) $CH_3—CHBr—CH_2Br$
(b) $CH_2 = CH—CH_2Br$
(c) $CH_3—CHBr—CH_2—OH$
(d) $CH_3—CHOH—CH_2OH$

**60.** 

The product '*A*' gives white precipitate when treated with bromine water. The product '*B*' is treated with barium hydroxide to give the product *C*. The compound *C* is heated strongly to form product *D*. The product *D* is

(a) 4-methylpent-3-en-2-one
(b) but-2 enal
(c) 3-methylpent-3-en-2-one
(d) 2-methylbut-2-enal