ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)
path to success

Chapter Contents 02

JEE (MAIN) TOPICWISE TEST PAPERS JANUARY & APRIL 2019

CHEMISTRY

PHYSICAL CHEMISTRY

ORGANIC CHEMISTRY

ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)
path to success

Chapter 02 Contents

JEE (MAIN) TOPICWISE TEST PAPERS JANUARY & APRIL 2019

ORGANIC CHEMISTRY

INORGANIC CHEMISTRY

JANUARY & APRIL 2019 ATTEMPT (PC)

ATOMIC STRUCTURE

1. What is the work function of the metal if the light of wavelength 4000 Å generates photoelectrons of velocity 6×10^5 ms^{-1} form it ?
(Mass of electron = 9×10^{-31} kg
Velocity of light = 3×10^8 ms^{-1}
Planck's constant = 6.626×10^{-34} Js
Charge of electron = 1.6×10^{-19} JeV^{-1})

(1) 0.9 eV (2) 4.0 eV
(3) 2.1 eV (4) 3.1 eV

2. If the de Broglie wavelength of the electron in n^{th} Bohr orbit in a hydrogenic atom is equal to $1.5\ \pi a_0$(a_0 is Bohr radius), then the value of n/z is :

(1) 1.0 (2) 0.75
(3) 0.40 (4) 1.50

3. The upper stratosphere consisting of the ozone layer protects us from the sun's radiation that falls in the wavelength region of :

(1) 600-750 nm (2) 0.8-1.5 nm
(3) 400-550 nm (4) 200-315 nm

4. Heat treatment of muscular pain involves radiation of wavelength of about 900 nm. Which spectral line of H-atom is suitable for this purpose ?
[$R_H = 1 \times 10^5$ cm^{-1}, $h = 6.6 \times 10^{-34}$ Js, $c = 3 \times 10^8$ ms^{-1}]

(1) Paschen, $5 \rightarrow 3$
(2) Paschen, $\infty \rightarrow 3$
(3) Lyman, $\infty \rightarrow 1$
(4) Balmer, $\infty \rightarrow 2$

5. The de Broglie wavelength (λ) associated with a photoelectron varies with the frequency (v) of the incident radiation as, [v_0 is thershold frequency] :

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

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

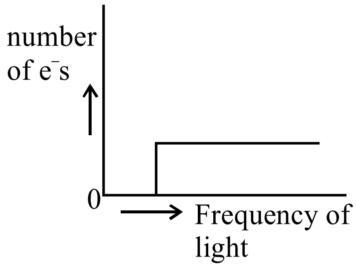
6. The ground state energy of hydrogen atom is –13.6 eV. The energy of second excited state He^+ ion in eV is :

(1) –6.04 (2) –27.2
(3) –54.4 (4) –3.4

7. Among the following, the energy of 2s orbital is lowest in :

(1) K (2) Na (3) Li (4) H

8. Which of the graphs shown below does not represent the relationship between incident light and the electron ejected form metal surface ?

(1)


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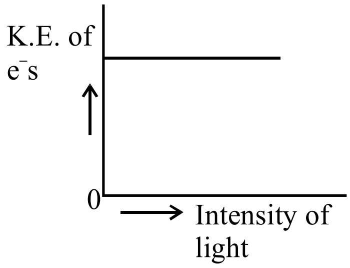

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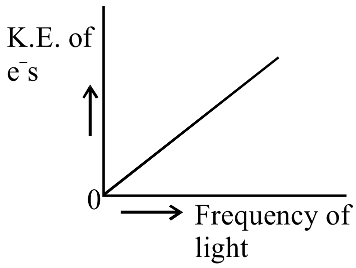

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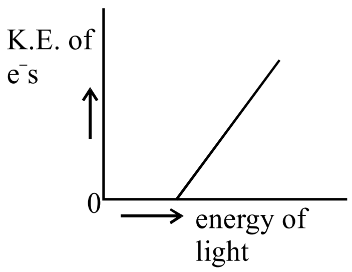


9. Which of the following combination of statements is true regarding the interpretation of the atomic orbitals ?

(a) An electron in an orbital of high angular momentum stays away from the nucleus than an electron in the orbital of lower angular momentum.

(b) For a given value of the principal quantum number, the size of the orbit is inversely proportional to the azimuthal quantum number.

(c) According to wave mechanics, the ground state angular momentum is equal to $\frac{h}{2\pi}$.

(d) The plot of ψ Vs r for various azimuthal quantum numbers, shows peak shifting towards higher r value.

(1) (b), (c) (2) (a), (d)
(3) (a), (b) (4) (a), (c)

10. For emission line of atomic hydrogen from $n_i = 8$ to $n_f = n$ the plot of wave number $(\bar{v})$ against $\left(\frac{1}{n^2}\right)$ will be (The Rydberg constant, R_H is in wave number unit).

(1) Linear with slope - R_H
(2) Linear with intercept - R_H
(3) Non linear
(4) Linear with slope R_H

11. If p is the momentum of the fastest electron ejected from a metal surface after the irradiation of light having wavelength λ, then for 1.5 p momentum of the photoelectron, the wavelength of the light should be:
(Assume kinetic energy of ejected photoelectron to be very high in comparison to work function)

(1) $\frac{1}{2}\lambda$ (2) $\frac{3}{4}\lambda$
(3) $\frac{2}{3}\lambda$ (4) $\frac{4}{9}\lambda$

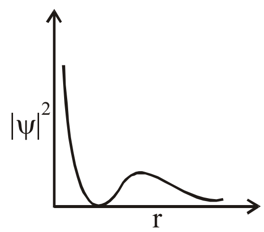
12. For any given series of spectral lines of atomic hydrogen, let $\Delta\bar{v} = \bar{v}_{max} - \bar{v}_{min}$ be the difference in maximum and minimum frequencies in cm^{-1}. The ratio $\Delta\bar{v}_{Lyman} / \Delta\bar{v}_{Balmer}$ is :

(1) 27 : 5 (2) 4 : 1
(3) 5 : 4 (4) 9 : 4

13. Which one of the following about an electron occupying the 1s orbital in a hydrogen atom is incorrect ?
(The Bohr radius is represented by a_0)

(1) The electron can be found at a distance $2a_0$ from the nucleus
(2) The probability density of finding the electron is maximum at the nucleus.
(3) The magnitude of potential energy is double that of its kinetic energy on an average.
(4) The total energy of the electron is maximum when it is at a distance a_0 from the nucleus.

14. The graph betweeen $|\psi|^2$ and r(radial distance) is shown below. This represents :-

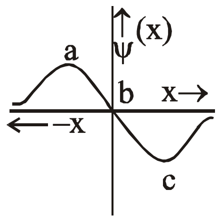


(1) 3s orbital (2) 1s orbital
(3) 2p orbital (4) 2s orbital

15. The ratio of the shortest wavelength of two spectral series of hydrogen spectrum is found to be about 9. The spectral series are:

(1) Paschen and P fund
(2) Lyman and Paschen
(3) Brackett and Piund
(4) Balmer and Brackett

16. The electrons are more likely to be found



(1) in the region a and b
(2) in the region a and c
(3) only in the region c
(4) only in the region a

CHEMICAL KINETICS

1. 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 ?

(1) 50 (2) 25

(3) 20 (4) 40

2. If a reaction follows the Arrhenius equation, the plot lnk vs $\frac{1}{(RT)}$ gives straight line with a gradient (–y) unit. The energy required to activate the reactant is :

(1) y unit (2) –y unit

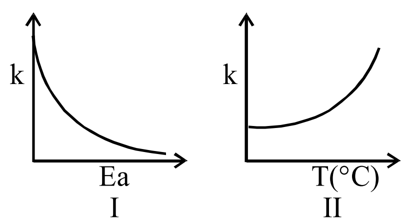
(3) yR unit (4) y/R unit

3. The reaction $2X \rightarrow B$ is a zeroth order reaction. If the initial concentration of X is 0.2 M, the half-life is 6 h. When the initial concentration of X is 0.5 M, the time required to reach its final concentration of 0.2 M will be :-

(1) 18.0 h (2) 7.2 h

(3) 9.0 h (4) 12.0 h

4. Consider the given plots for a reaction obeying Arrhenius equation (0°C < T < 300°C) : (k and E_a are rate constant and activation energy, respectively)



Choose the correct option :

(1) Both I and II are wrong

(2) I is wrong but II is right

(3) Both I and II are correct

(4) I is right but II is wrong

5. For an elementary chemical reaction, $A_2 \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} 2A$, the expression for $\frac{d[A]}{dt}$ is :

(1) $2k_1[A_2]-k_{-1}[A]^2$

(2) $k_1[A_2]-k_{-1}[A]^2$

(3) $2k_1[A_2]-2k_{-1}[A]^2$

(4) $k_1[A_2]+k_{-1}[A]^2$

6. For the reaction, $2A + B \rightarrow$ products, when the concentrations of A and B both wrere 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 $L^{-1}s^{-1}$ to0.6 mol $L^{-1}s^{-1}$ Which one of the following statements is correct ?

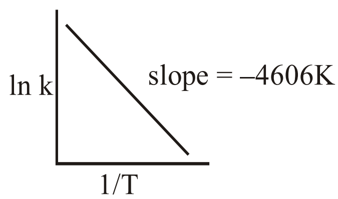
(1) Order of the reaction with respect to Bis2

(2) Order of the reaction with respect to Ais2

(3) Total order of the reaction is 4

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

7. For a reaction, consider the plot of ln k versus 1/T given in the figure. If the rate constant of this reaction at 400 K is 10^{-5} s^{-1}, then the rate constant at 500 K is :



(1) 2×10^{-4} s^{-1} (2) 10^{-4} s^{-1}

(3) 10^{-6} s^{-1} (4) 4×10^{-4} s^{-1}

8. The following results were obtained during kinetic studies of the reaction :

$2A + B \rightarrow$ Products

Experment	[A] (in mol L^{-1})	[B] (in mol L^{-1})	Initial Rate of reaction (in mol L^{-1} min^{-1})
(I)	0.10	0.20	6.93×10^{-3}
(II)	0.10	0.25	6.93×10^{-3}
(III)	0.20	0.30	1.386×10^{-2}

The time (in minutes) required to consume half of A is :

(1) 10 (2) 5 (3) 100 (4) 1

9. For the reaction $2A + B \rightarrow C$, the values of initial rate at different reactant concentrations are given in the table below. The rate law for the reaction is :

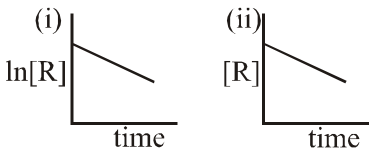
[A] (mol L^{-1})	[B] (mol L^{-1})	Initial Rate (mol $L^{-1}s^{-1}$)
0.05	0.05	0.045
0.10	0.05	0.090
0.20	0.10	0.72

(1) Rate = k [A][B]
(2) Rate = k $[A]^2[B]^2$
(3) Rate = k $[A][B]^2$
(4) Rate = k $[A]^2[B]$

10. For a reaction scheme $A \xrightarrow{k_1} B \xrightarrow{k_2} C$, if the rate of formation of B is set to be zero then the concentration of B is given by :

(1) $\left(\frac{k_1}{k_2}\right)[A]$ (2) $(k_1 + k_2)$ [A]
(3) $k_1k_2[A]$ (4) $(k_1 - k_2)$ [A]

11. The given plots represent the variation of the concentration of a reactant R with time for two different reactions (i) and (ii). The respective orders of the reactions are :



(1) 1,0 (2) 1,1 (3) 0,1 (4) 0,2

12. For the reaction of H_2 with I_2, the rate constant is $2.5 \times 10^{-4} dm^3 mol^{-1} s^{-1}$ at 327°C and 1.0 $dm^3 mol^{-1} s^{-1}$ at 527°C. The activation energy for the reaction, in kJ mol^{-1} is:
($R = 8.314 J K^{-1} mol^{-1}$)

(1) 72 (2) 166 (3) 150 (4) 59

13. In the following reaction; $xA \rightarrow yB$

$$\log_{10}\left[-\frac{d[A]}{dt}\right] = \log_{10}\left[\frac{d[B]}{dt}\right] + 0.3010$$

'A' and 'B' respectively can be :
(1) n-Butane and Iso-butane
(2) C_2H_4 and C_4H_8
(3) N_2O_4 and NO_2
(4) C_2H_2 and C_6H_6

14. NO_2 required for a reaction is produced by the decomposition of N_2O_5 in CCl_4 as per the equation

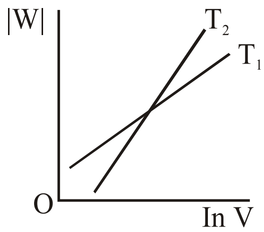
$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$.

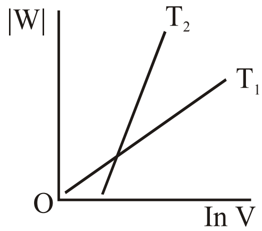
The initial concentration of N_2O_5 is 3.00 mol L^{-1} and it is 2.75 mol L^{-1} after 30 minutes. The rate of formation of NO_2 is :

(1) 2.083×10^{-3} mol L^{-1} min^{-1}
(2) 4.167×10^{-3} mol L^{-1} min^{-1}
(3) 8.333×10^{-3} mol L^{-1} min^{-1}
(4) 1.667×10^{-2} mol L^{-1} min^{-1}

THERMODYNAMICS-01

1. 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 volume (V) is:

(1)


(2)


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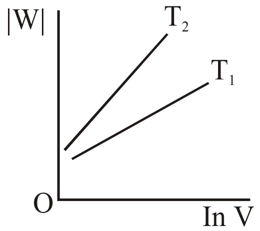

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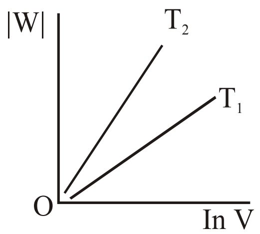


2. An ideal gas undergoes isothermal compression from 5 m^3 to 1 m^3 against a constant external pressure of 4 Nm^{-2}. Heat released in this process is used to increase the temperature of 1 mole of Al. If molar heat capacity of Al is 24 J mol^{-1} K^{-1}, the temperature of Al increases by :

(1) $\frac{3}{2}$K (2) $\frac{2}{3}$K

(3) 1 K (4) 2 K

3. Which one of the following equations does not correctly represent the first law of thermodynamics for the given processes involving an ideal gas ? (Assume non-expansion work is zero)

(1) Cyclic process : q = – w

(2) Isothermal process : q = – w

(3) Adiabatic process : $\Delta U = -w$

(4) Isochoric process : $\Delta U = q$

4. For silver, $C_p(JK^{-1}mol^{-1}) = 23 + 0.01T$. If the temperature (T) of 3 moles of silver is raised from 300K to 1000 K at 1 atm pressure, the value of ΔH will be close to

(1) 21 kJ (2) 16 kJ

(3) 13 kJ (4) 62 kJ

5. 5 moles of an ideal gas at 100 K are allowed to undergo reversible compression till its temperature becomes 200 K.

If $C_V = 28\ JK^{-1}mol^{-1}$, calculate ΔU and ΔpV for this process. (R = 8.0 JK^{-1} mol^{-1}]

(1) ΔU = 14 kJ; $\Delta(pV)$ = 4 kJ

(2) ΔU = 14 kJ; $\Delta(pV)$ = 18 kJ

(3) ΔU = 2.8 kJ; $\Delta(pV)$ = 0.8 kJ

(4) ΔU = 14 kJ; $\Delta(pV)$ = 0.8 kJ

6. Among the following, the set of parameters that represents path function, is :

(A) q + w (B) q

(C) w (D) H–TS

(1) (A) and (D) (2) (B), (C) and (D)

(3) (B) and (C) (4) (A), (B) and (C)

7. During compression of a spring the work done is 10kJ and 2kJ escaped to the surroundings as heat. The change in internal energy, ΔU(inkJ) is:

(1) 8 (2) 12

(3) – 12 (4) –8

8. An ideal gas is allowed to expand from 1 L to 10 L against a constant external pressure of 1bar. The work done in kJ is :

(1) –9.0 (2) +10.0

(3) –0.9 (4) –2.0

THERMODYNAMICS-02

1. Two blocks of the same metal having same mass and at temperature T_1 and T_2, respectively. are brought in contact with each other and allowed to attain thermal equilibrium at constant pressure. The change in entropy, ΔS, for this process is :

(1) $2C_P \ln\left(\frac{T_1+T_2}{4T_1T_2}\right)$ (2) $2C_P \ln\left[\frac{(T_1+T_2)^{\frac{1}{2}}}{T_1T_2}\right]$

(3) $C_P \ln\left[\frac{(T_1+T_2)^2}{4T_1T_2}\right]$ (4) $2C_P \ln\left[\frac{T_1+T_2}{2T_1T_2}\right]$

2. For the chemical reaction $X \rightleftharpoons Y$, the standard reaction Gibbs energy depends on temperature T (in K) as :

$$\Delta_r G^o \text{ (in kJ mol}^{-1}) = 120 - \frac{3}{8}T$$

The major component of the reaction mixture at T is :

(1) X if T = 315 K

(2) X if T = 350 K

(3) Y if T = 300 K

(4) Y if T = 280 K

3. The INCORRECT match in the following is
(1) $\Delta G^o < 0, K < 1$ (2) $\Delta G^o = 0, K = 1$
(3) $\Delta G^o > 0, K < 1$ (4) $\Delta G^o < 0, K > 1$

4. A process will be spontaneous at all temperatures if :-
(1) $\Delta H > 0$ and $\Delta S < 0$
(2) $\Delta H < 0$ and $\Delta S > 0$
(3) $\Delta H > 0$ and $\Delta S > 0$
(4) $\Delta H < 0$ and $\Delta S < 0$

5. For the equilibrium,

$2H_2O \rightleftharpoons H_3O^+ + OH^-$, the value of ΔG^o at 298 K is approximately :-
(1) –80 kJ mol^{-1}
(2) –100 kJ mol^{-1}
(3) 100 kJ mol^{-1}
(4) 80 kJ mol^{-1}

6. 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 ?
(1) Exothermic if $B < 0$
(2) Exothermic if $A > 0$ and $B < 0$
(3) Endothermic if $A < 0$ and $B > 0$
(4) Endothermic if $A > 0$

7. The reaction, $MgO(s) + C(s) \rightarrow Mg(S) + CO(g)$, for which $\Delta_r H^o = +491.1$ kJ mol^{-1} and $\Delta_r S^o = 198.0$ JK^{-1} mol^{-1}, is not feasible at 298 K. Temperature above which reaction will be feasible is :-
(1) 1890.0 K (2) 2480.3 K
(3) 2040.5 K (4) 2380.5 K

8. A process has $\Delta H = 200$ Jmol^{-1} and $\Delta S = 40$ JK^{-1}mol^{-1}. Out of the values given below, choose the minimum temperature above which the process will be spontaneous :
(1) 5 K (2) 4 K (3) 20 K (4) 12 K

9. The entropy change associated with the conversion of 1 kg of ice at 273 K to water vapours at 383 K is :

(Specific heat of water liquid and water vapour are 4.2 kJ K^{-1} kg^{-1} and 2.0 kJ K^{-1} kg^{-1} ; heat of liquid fusion and vapourisation of water are 344 kJ kg^{-1} and 2491 kJ kg^{-1}, respectively).

(log 273 = 2.436, log 373 = 2.572, log 383 = 2.583)
(1) 7.90 kJ kg^{-1} K^{-1} (2) 2.64 kJ kg^{-1} K^{-1}
(3) 8.49 kJ kg^{-1} K^{-1} (4) 9.26 kJ kg^{-1} K^{-1}

IONIC EQUILIBRIUM

1. If K_{sp} of Ag_2CO_3 is 8×10^{-12}, the molar solubility of Ag_2CO_3 in 0.1M $AgNO_3$ is :
(1) 8×10^{-12} M (2) 8×10^{-10} M
(3) 8×10^{-11} M (4) 8×10^{-13} M

2. 25 ml of the given HCl solution requires 30 mL of 0.1 M sodium carbonate solution. What is the volume of this HCl solution required to titrate 30 mL of 0.2 M aqueous NaOH solution?
(1) 25 mL (2) 50 mL
(3) 12.5 mL (4) 75 mL

3. A mixture of 100 m mol of $Ca(OH)_2$ and 2g of sodium sulphate was dissolved in water and the volume was made up to 100 mL. The mass of calcium sulphate formed and the concentration of OH^- in resulting solution, respectively, are : (Molar mass of $Ca(OH)_2$, Na_2SO_4 and $CaSO_4$ are 74, 143 and 136 g mol^{-1}, respectively; K_{sp} of $Ca(OH)_2$ is 5.5×10^{-6})
(1) 1.9 g, 0.14 mol L^{-1}
(2) 13.6 g, 0.14 mol L^{-1}
(3) 1.9 g, 0.28 mol L^{-1}
(4) 13.6 g, 0.28 mol L^{-1}

4. The pH of rain water, is approximately :

(1) 6.5 (2) 7.5

(3) 5.6 (4) 7.0

5. 20 mL of 0.1 M H_2SO_4 solution is added to 30 mL of 0.2 M NH_4OH solution. The pH of the resulatant mixture is :

[pk_b of NH_4OH = 4.7].

(1) 9.4 (2) 5.0

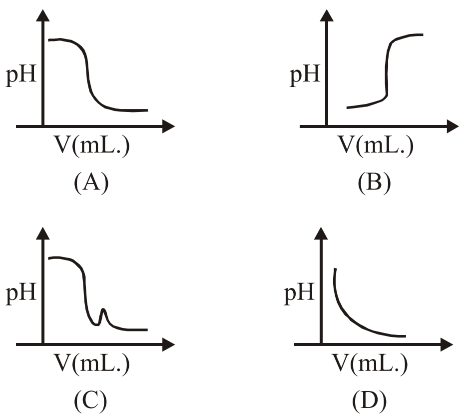
(3) 9.0 (4) 5.2

6. If solubility product of $Zr_3(PO_4)_4$ is denoted by K_{sp} and its molar solubility is denoted by S, then which of the following relation between S and K_{sp} is correct

(1) $S=\left(\frac{K_{sp}}{929}\right)^{1/9}$ (2) $S=\left(\frac{K_{sp}}{216}\right)^{1/7}$

(3) $S=\left(\frac{K_{sp}}{144}\right)^{1/6}$ (4) $S=\left(\frac{K_{sp}}{6912}\right)^{1/7}$

7. In an acid-base titration, 0.1 M HCl solution was added to the NaOH solution of unknown strength. Which of the following correctly shows the change of pH of the titraction mixture in this experiment?



(1) (A) (2) (C) (3) (D) (4) (B)

8. Consider the following statements

(a) The pH of a mixture containing 400 mL of 0.1 M H_2SO_4 and 400 mL of 0.1 M NaOH will be approximately 1.3.

(b) Ionic product of water is temperature dependent.

(c) A monobasic acid with $K_a = 10^{-5}$ has a pH = 5. The degree of dissociation of this acid is 50%.

(d) The Le Chatelier's principle is not applicable to common-ion effect.

the correct statement are :

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

(3) (a) and (b) (4) (b) and (c)

9. The pH of a 0.02M NH_4Cl solution will be [given $K_b(NH_4OH)=10^{-5}$ and log2=0.301]

(1) 4.65 (2) 5.35

(3) 4.35 (4) 2.65

10. What is the molar solubility of $Al(OH)_3$ in 0.2 M NaOH solution ? Given that, solubility product of $Al(OH)_3 = 2.4 \times 10^{-24}$:

(1) 12×10^{-23} (2) 12×10^{-21}

(3) 3×10^{-19} (4) 3×10^{-22}

11. The molar solubility of $Cd(OH)_2$ is 1.84×10^{-5} M in water. The expected solubility of $Cd(OH)_2$ in a buffer solution of pH = 12 is :

(1) 6.23×10^{-11} M (2) 1.84×10^{-9} M

(3) $\frac{2.49}{1.84}\times 10^{-9}$ M (4) 2.49×10^{-10} M

REAL GAS

1. The volume of gas A is twice than that of gas B. The compressibility factor of gas A is thrice than that of gas B at same temperature. The pressures of the gases for equal number of moles are :

(1) $2P_A = 3P_B$ (2) $P_A = 3P_B$

(3) $P_A = 2P_B$ (4) $3P_A = 2P_B$

2. Consider the van der Waals constants, a and b, for the following gases.

Gas	Ar	Ne	Kr	Xe
a/ (atm dm^6 mol^{-2})	1.3	0.2	5.1	4.1
b/ (10^{-2} dm^3 mol^{-1}	3.2	1.7	1.0	5.0

Which gas is expected to have the highest critical temperature?

(1) Kr (2) Ne

(3) Ar (4) Xe

3. At a given temperature T, gases Ne, Ar, Xe and Kr are found to deviate from ideal gas behaviour. Their equation of state is given as

$p = \frac{RT}{V-b}$ at T.

Here, b is the van der Waals constant. Which gas will exhibit steepest increase in the plot of Z (compression factor) vs p?

(1) Ne (2) Ar

(3) Xe (4) Kr

4. Consider the following table :

Gas	a/(k Pa dm^6 mol^{-1})	b/(dm^3 mol^{-1})
A	642.32	0.05196
B	155.21	0.04136
C	431.91	0.05196
D	155.21	0.4382

a and b are vander waals constant. The correct statement about the gases is :

(1) Gas C will occupy lesser volume than gas A; gas B will be lesser compressible than gas D

(2) Gas C will occupy more volume than gas A; gas B will be lesser compressible than gas D

(3) Gas C will occupy more volume than gas A; gas B will be more compressible than gas D

(4) Gas C will occupy lesser volume than gas A; gas B will be more compressible than gas D

LIQUID SOLUTION

1. Freezing point of a 4% aqueous solution of X is equal to freezing point of 12% aqueous solution of Y. If molecular weight of X is A, then molecular weight of Y is :-

(1) A (2) 3A

(3) 4A (4) 2A

2. Molecules of benzoic acid (C_6H_5COOH) dimerise in benzene. 'w' g of the acid dissolved in 30 g of benzene shows a depression in freezing point equal to 2K. If the percentage association of the acid to form dimer in the solution is 80, then w is :

(Given that K_f = 5 K kg mol^{-1}, Molar mass of benzoic acid = 122 g mol^{-1})

(1) 1.8 g (2) 2.4 g

(3) 1.0 g (4) 1.5 g

3. The freezing point of a diluted milk sample is found to be –0.2°C, while it should have been –0.5°C for pure milk. How much water has been added to pure milk to make the diluted sample ?

(1) 2 cups of water to 3 cups of pure milk

(2) 1 cup of water to 3 cups of pure milk

(3) 3 cups of water to 2 cups of pure milk

(4) 1 cup of water to 2 cups of pure milk

4. K_2HgI_4 is 40% ionised in aqueous solution. The value of its van't Hoff factor (i) is :-

(1) 1.8 (2) 2.2 (3) 2.0 (4) 1.6

5. Liquids A and B form an ideal solution in the entire composition range. At 350 K, the vapor pressures of pure A and pure B are 7×10^3 Pa and 12×10^3 Pa, respectively. The composition of the vapor in equilibrium with a solution containing 40 mole percent of A at this temperature is :

(1) $x_A = 0.37$; $x_B = 0.63$

(2) $x_A = 0.28$; $x_B = 0.72$

(3) $x_A = 0.76$; $x_B = 0.24$

(4) $x_A = 0.4$; $x_B = 0.6$

6. A solution containing 62 g ethylene glycol in 250 g water is cooled to –10°C. If K_f for water is 1.86 K kg mol^{-1}, the amount of water (in g) separated as ice is :

(1) 32 (2) 48 (3) 16 (4) 64

7. Which one of the following statements regarding Henry's law is not correct ?

(1) The value of K_H increases with increase of temperatrue and K_H is function of the nature of the gas

(2) Higher the value of K_H at a given pressure, higher is the solubility of the gas in the liquids.

(3) The partial pressure of the gas in vapour phase is proportional to the mole fraction of the gas in the solution.

(4) Different gases have different K_H (Henry's law constant) values at the same temperature.

8. Elevation in the boiling point for 1 molal solution of glucose is 2 K. The depression in the freezing point of 2 molal solutions of glucose in the same solvent is 2 K. The relation between K_b and K_f is:

(1) $K_b = 0.5\ K_f$ (2) $K_b = 2\ K_f$

(3) $K_b = 1.5\ K_f$ (4) $K_b = K_f$

9. The vapour pressures of pure liquids A and B are 400 and 600 mmHg, respectively at 298K. On mixing the two liquids, the sum of their initial volumes is equal to the volume of the final mixture. The mole fraction of liquid B is 0.5 in the mixture. The vapour pressure of the final solution, the mole fraction of components A and B in vapour phase, respectively are-

(1) 500 mmHg, 0.5, 0.5

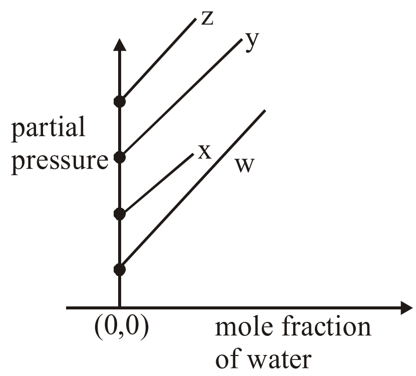
(2) 450 mmHg, 0.4, 0.6

(3) 450 mmHg, 0.5, 0.5

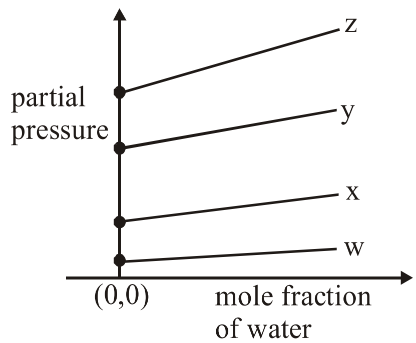
(4) 500 mmHg, 0.4, 0.6

10. For the solution of the gases w, x, y and z in water at 298K, the Henrys law constants (K_H) are 0.5, 2, 35 and 40 kbar, respectively. The correct plot for the given data is :-

(1)



(2)



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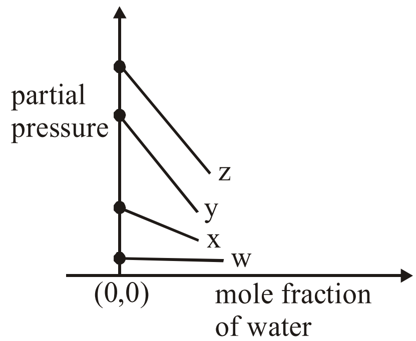

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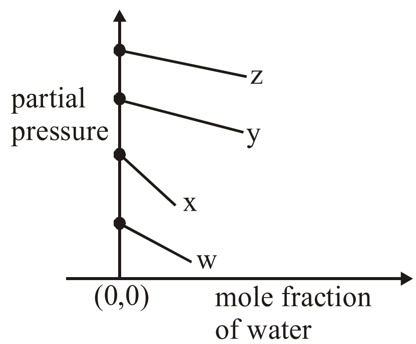


11. The osmotic pressure of a dilute solution of an ionic compound XY in water is four times that of a solution of 0.01 M $BaCl_2$ in water. Assuming complete dissociation of the given ionic compounds in water, the concentration of XY (in mol L^{-1}) in solution is :

(1) 6×10^{-2} (2) 4×10^{-4}

(3) 16×10^{-4} (4) 4×10^{-2}

12. Liquid 'M' and liquid 'N' form an ideal solution. The vapour pressures of pure liquids 'M' and 'N' are 450 and 700 mmHg, respectively, at the same temperature. Then correct statement is:

(x_M= Mole fraction of 'M' in solution ;
x_N = Mole fraction of 'N' in solution ;
y_M= Mole fraction of 'M' in vapour phase ;
y_N = Mole fraction of 'N' in vapour phase)

(1) $(x_M - y_M) < (x_N - y_N)$ (2) $\frac{x_M}{x_N} < \frac{y_M}{y_N}$

(3) $\frac{x_M}{x_N} > \frac{y_M}{y_N}$ (4) $\frac{x_M}{x_N} = \frac{y_M}{y_N}$

13. Molal depression constant for a solvent is 4.0 kg mol^{-1}. The depression in the freezing point of the solvent for 0.03 mol kg^{-1} solution of K_2SO_4 is :

(Assume complete dissociation of the electrolyte)

(1) 0.12 K (2) 0.36 K

(3) 0.18 K (4) 0.24 K

14. At room temperature, a dilute soluton of urea is prepared by dissolving 0.60 g of urea in 360 g of water. If the vapour pressure of pure water at this temperature is 35 mmHg, lowering of vapour pressure will be (molar mass of urea = 60 g mol^{-1}):-

(1) 0.027 mmHg (2) 0.028 mmHg

(3) 0.017 mmHg (4) 0.031 mmHg

15. A solution is prepared by dissolving 0.6 g of urea (molar mass = 60 g mol^{-1}) and 1.8 g of glucose (molar mass = 180 g mol^{-1}) in 100 mL of water at 27°C. The osmotic pressure of the solution is :

(R = 0.08206 L atm K^{-1} mol^{-1})

(1) 4.92 atm (2) 1.64 atm

(3) 2.46 atm (4) 8.2 atm

16. 1 g of non-volatile non-electrolyte solute is dissolved in 100g of two different solvents A and B whose ebullioscopic constants are in the ratio of 1 : 5. The ratio of the elevation in their boiling points, $\frac{\Delta T_b(A)}{\Delta T_b(B)}$, is :

(1) 5 : 1 (2) 10 : 1

(3) 1 : 5 (4) 1 : 0.2

CHEMICAL EQUILIBRIUM

1. In a chemical reaction, $A + 2B \underset{}{\overset{K}{\rightleftharpoons}} 2C + D$, the initial concentration of B was 1.5 times of the concentration of A, but the equilibrium concentrations of A and B were found to be equal. The equilibrium constant(K) for the aforesaid chemical reaction is :

(1) 16 (2) 4

(3) 1 (4) $\frac{1}{4}$

2. Two solids dissociate as follows

$A(s) \rightleftharpoons B(g) + C(g)$; $K_{p_1} = x\ atm^2$

$D(s) \rightleftharpoons C(g) + E(g)$; $K_{p_2} = y\ atm^2$

The total pressure when both the solids dissociate simultaneously is :-

(1) (x + y) atm (2) $x^2 + y^2$ atm

(3) $2\left(\sqrt{x+y}\right)$atm (4) $\sqrt{x+y}$ atm

3. Consider the reaction,

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

The equilibrium constant of the above reaction is K_P. If pure ammonia is left to dissociate, the partial pressure of ammonia at equilibrium is given by (Assume that $P_{NH_3} << P_{total}$ at equilibrium)

(1) $\frac{3^{\frac{3}{2}} K_P^{\frac{1}{2}} P^2}{4}$ (2) $\frac{3^{\frac{3}{2}} K_P^{\frac{1}{2}} P^2}{16}$

(3) $\frac{K_P^{\frac{1}{2}} P^2}{16}$ (4) $\frac{K_P^{\frac{1}{2}} P^2}{4}$

4. Consider the following reversible chemical reactions :

$A_2(g) + Br_2(g) \overset{K_1}{\rightleftharpoons} 2AB(g)$ .....(1)

$6AB(g) \overset{K_2}{\rightleftharpoons} 3A_2(g) + 3B_2(g)$ .....(2)

The relation between K_1 and K_2 is :

(1) $K_2 = K_1^3$ (2) $K_2 = K_1^{-3}$

(3) $K_1K_2 = 3$ (4) $K_1K_2 = \frac{1}{3}$

5. 5.1g NH_4SH is introduced in 3.0 L evacuated flask at 327°C. 30% of the solid NH_4SH decomposed to NH_3 and H_2S as gases. The K_p of the reaction at 327°C is

(R = 0.082 L atm $mol^{-1}K^{-1}$, Molar mass of S = 32 g $mol^{/01}$, molar mass of N = 14g mol^{-1})

(1) 1×10^{-4} atm^2

(2) 4.9×10^{-3} atm^2

(3) 0.242 atm^2

(4) 0.242×10^{-4} atm^2

6. The value of K_p/K_C for the following reactions at 300K are, respectively :

(At 300K, RT = 24.62 $dm^3atm\ mol^{-1}$)

$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

$N_2O_4(g) \rightleftharpoons 2NO_2(g)$

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

(1) 1, 24.62 $dm^3atm\ mol^{-1}$, 606.0 $dm^6atm^2mol^{-2}$

(2) 1, 4.1×10^{-2} $dm^{-3}atm^{-1}\ mol^{-1}$, 606.0 $dm^6\ atm^2\ mol^{-2}$

(3) 606.0 $dm^6atm^2mol^{-2}$, 1.65×10^{-3} $dm^3atm^{-2}\ mol^{-1}$

(4) 1, 24.62 $dm^3atm\ mol^{-1}$, 1.65×10^{-3} $dm^{-6}atm^{-2}\ mol^2$

7. For the following reactions, equilibrium constants are given :

$S(s) + O_2(g) \rightleftharpoons SO_2(g)$; $K_1 = 10^{52}$

$2S(s) + 3O_2(g) \rightleftharpoons 2SO_3(g)$; $K_2 = 10^{129}$

The equilibrium constant for the reaction,

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ is :

(1) 10^{181} (2) 10^{154}

(3) 10^{25} (4) 10^{77}

8. For the reaction,

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$,

$\Delta H = -57.2 kJ\ mol^{-1}$ and

$K_c = 1.7 \times 10^{16}$.

Which of the following statement is INCORRECT?

(1) The equilibrium constant is large suggestive of reaction going to completion and so no catalyst is required.

(2) The equilibrium will shift in forward direction as the pressure increase.

(3) The equilibrium constant decreases as the temperature increases.

(4) The addition of inert gas at constant volume will not affect the equilibrium constant.

9. In which one of the following equilibria, $K_p \neq K_c$?

(1) $NO_2(g) + SO_2(g) \rightleftharpoons NO(g) + SO_3(g)$

(2) $2\ HI(g) \rightleftharpoons H_2(g) + I_2(g)$

(3) $2NO(g) \rightleftharpoons N_2(g) + O_2(g)$

(4) $2C(s) + O_2(g) \rightleftharpoons 2CO(g)$

SURFACE CHEMISTRY

1. Among the following, the false statement is :

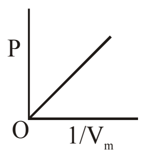
(1) Latex is a colloidal solution of rubber particles which are positively charged

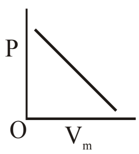
(2) Tyndall effect can be used to distinguish between a colloidal solution and a true solution.

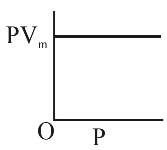
(3) It is possible to cause artificial rain by throwing electrified sand carrying charge opposite to the one on clouds from an aeroplane.

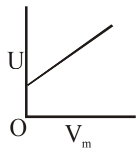
(4) Lyophilic sol can be coagulated by adding an electrolyte.

2. The combination of plots which does not represent isothermal expansion of an ideal gas is:

(A) 

(B) 

(C) 

(D) 

(1) (A) and (C) (2) (A) and (D)

(3) (B) and (D) (4) (B) and (C)

3. An example of solid sol is :

(1) Butter (2) Gem stones

(3) Paint (4) Hair cream

4. Among the colloids cheese (C), milk (M) and smoke (S), the correct combination of the dispersed phase and dispersion medium, respectively is :-

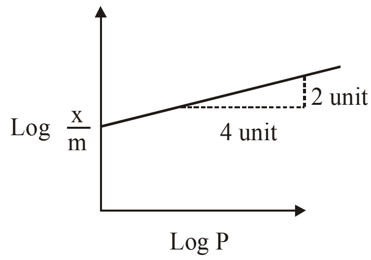
(1) C : solid in liquid; M : solid in liquid ; S : solid in gas

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

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

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

5. Adsorption of a gas follows Freundlich adsorption isotherm. In the given plot, x is the mass of the gas adsorbed on mass m of the adsorbent at pressure p. $\frac{x}{m}$ is proportional to



(1) $P^{1/4}$ (2) P^2 (3) P (4) $P^{1/2}$

6. Haemoglobin and gold sol are examples of :

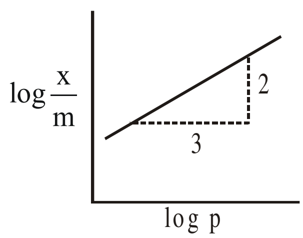
(1) negatively charged sols

(2) positively charged sols]

(3) negatively and positively charged sols, respectively

(4) positively and negatively charged sols, respectively

7. Adsorption of a gas follows Freundlich adsorption isotherm x is the mass of the gas adsorbed on mass m of the adsorbent. The plot of log $\frac{x}{m}$ versus log p is shown in the given graph. $\frac{x}{m}$ is proportional to :



(1) $p^{3/2}$ (2) p^3 (3) $p^{2/3}$ (4) p^2

8. The aerosol is a kind of colloid in which :

(1) gas is dispersed in solid

(2) solid is dispersed in gas

(3) liquid is dispersed in water

(4) gas is dispersed in liquid

9. A gas undergoes physical adsorption on a surface and follows the given Freundlich adsorption isotherm equation

$$\frac{x}{m} = kp^{0.5}$$

Adsorption of the gas increases with :

(1) Decrease in p and decrease in T
(2) Increase in p and increase in T
(3) Increase in p and decrease in T
(4) Decrease in p and increase in T

10. The correct option among the following is :

(1) Colloidal particles in lyophobic sols can be precipiated by electrophoresis.
(2) Brownian motion in colloidal solution is faster the viscosity of the solution is very high.
(3) Colloidal medicines are more effective because they have small surface area.
(4) Addition of alum to water makes it unfit for drinking.

11. Peptization is a :

(1) process of converting a colloidal solution into precipitate
(2) process of converting precipitate into colloidal solution
(3) process of converting soluble particles to form colloidal solution
(4) process of bringing colloidal molecule into solution

12. Among the following, the INCORRECT statement about colloids is :

(1) They can scatter light
(2) They are larger than small molecules and have high molar mass
(3) The range of diameters of colloidal particles is between 1 and 1000 nm
(4) The osmotic pressure of a colloidal solution is of higher order than the true solution at the same concentration

13. 10 mL of 1mM surfactant solution forms a monolayer covering 0.24 cm^2 on a polar substrate. If the polar head is approximated as cube, what is its edge length?

(1) 2.0 pm (2) 2.0 nm
(3) 1.0 pm (4) 0.1 nm

14. For coagulation of arsenious sulphide sol, which one of the following salt solution will be most effective

(1) $AlCl_3$ (2) NaCl
(3) $BaCl_2$ (4) Na_3PO_4

MOLE CONCEPT

1. A 10 mg effervescent tablet containing sodium bicarbonate and oxalic acid releases 0.25 ml of CO_2 at T = 298.15 K and p = 1 bar. If molar volume of CO_2 is 25.0 L under such condition, what is the percentage of sodium bicarbonate in each tablet ? [Molar mass of $NaHCO_3$ = 84 g mol^{-1}]

(1) 16.8 (2) 8.4
(3) 0.84 (4) 33.6

2. For the following reaction, the mass of water produced from 445 g of $C_{57}H_{110}O_6$ is :

$$2C_{57}H_{110}O_6(s) + 163O_2(g) \rightarrow 114CO_2(g) + 110\ H_2O(l)$$

(1) 495 g (2) 490 g (3) 890 g (4) 445 g

3. An organic compound is estimated through Dumas method and was found to evolve 6 moles of CO_2. 4 moles of H_2O and 1 mole of nitrogen gas. The formula of the compound is

(1) $C_{12}H_8N$ (2) $C_{12}H_8N_2$
(3) C_6H_8N (4) $C_6H_8N_2$

4. The percentage composition of carbon by mole in methane is :

(1) 80% (2) 25%
(3) 75% (4) 20%

5. For a reaction,

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$;

identify dihydrogen (H_2) as a limiting reagent in the following reaction mixtures.

(1) 14g of N_2 + 4g of H_2
(2) 28g of N_2 + 6g of H_2
(3) 56g of N_2 + 10g of H_2
(4) 35g of N_2 + 8g of H_2

6. What would be the molality of 20% (mass/mass) aqueous solution of KI?

(molar mass of KI = 166 g mol^{-1})

(1) 1.08 (2) 1.48
(3) 1.51 (4) 1.35

7. At 300 K and 1 atmospheric pressure, 10 mL of a hydrocarbon required 55 mL of O_2 for complete combustion and 40 mL of CO_2 is formed. The formula of the hydrocarbon is :

(1) C_4H_8 (2) C_4H_7Cl
(3) C_4H_{10} (4) C_4H_6

8. The minimum amount of O_2(g) consumed per gram of reactant is for the reaction :

(Given atomic mass : Fe = 56, O = 16, Mg = 24, P = 31, C = 12, H = 1)

(1) $C_3H_8(g) + 5\,O_2(g) \rightarrow 3\,CO_2(g) + 4\,H_2O(l)$

(2) $P_4(s) + 5\,O_2(g) \rightarrow P_4O_{10}(s)$

(3) $4\,Fe(s) + 3\,O_2(g) \rightarrow 2\,FeO_3(s)$

(4) $2\,Mg(s) + O_2(g) \rightarrow 2\,MgO(s)$

9. 5 moles of AB_2 weigh 125×10^{-3} kg and 10 moles of A_2B_2 weigh 300×10^{-3} kg. The molar mass of A(M_A) and molar mass of B(M_B) in kg mol^{-1} are :

(1) $M_A = 50 \times 10^{-3}$ and $M_B = 25 \times 10^{-3}$
(2) $M_A = 25 \times 10^{-3}$ and $M_B = 50 \times 10^{-3}$
(3) $M_A = 5 \times 10^{-3}$ and $M_B = 10 \times 10^{-3}$
(4) $M_A = 10 \times 10^{-3}$ and $M_B = 5 \times 10^{-3}$

10. 25 g of an unknown hydrocarbon upon burning produces 88 g of CO_2 and 9 g of H_2O. This unknown hydrocarbon contains.

(1) 20g of carbon and 5 g of hydrogen
(2) 24g of carbon and 1 g of hydrogen
(3) 18g of carbon and 7 g of hydrogen
(4) 22g of carbon and 3 g of hydrogen

IDEAL GAS

1. 0.5 moles of gas A and x moles of gas B exert a pressure of 200 Pa in a container of volume 10 m^3 at 1000 K. Given R is the gas constant in $JK^{-1}\,mol^{-1}$, x is :

(1) $\frac{2R}{4+12}$ (2) $\frac{2R}{4-R}$

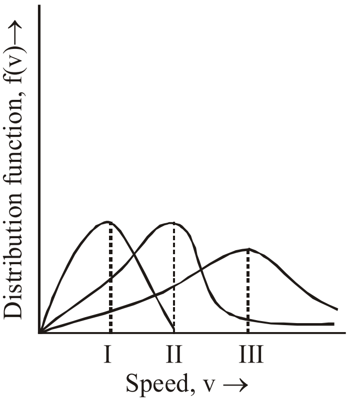
(3) $\frac{4-R}{2R}$ (4) $\frac{4+R}{2R}$

2. An open vessel at 27°C is heated until two fifth of the air (assumed as an ideal gas) in it has escaped from the vessel. Assuming that the volume of the vessel remains constant, the temperature at which the vessel has been heated is :

(1) 750°C (2) 500°C
(3) 750 K (4) 500 K

3. Points I, II and III in the following plot respectively correspond to

(V_{mp} : most probable velocity)



(1) V_{mp} of N_2 (300K); V_{mp} of H_2(300K); V_{mp} of O_2(400K)

(2) V_{mp} of H_2 (300K); V_{mp} of N_2(300K); V_{mp} of O_2(400K)

(3) V_{mp} of O_2 (400K); V_{mp} of N_2(300K); V_{mp} of H_2(300K)

(4) V_{mp} of N_2 (300K); V_{mp} of O_2(400K); V_{mp} of H_2(300K)

CONCENTRATION TERMS

1. The volume strength of 1M H_2O_2 is: (Molar mass of H_2O_2 = 34 g mol^{-1})

(1) 16.8 (2) 11.35 (3) 22.4 (4) 5.6

2. 8g of NaOH is dissolved in 18g of H_2O. Mole fraction of NaOH in solution and molality (in mol kg^{-1}) of the solutions respectively are:

(1) 0.167, 11.11 (2) 0.2, 22.20
(3) 0.2, 11.11 (4) 0.167,22.20

3. A solution of sodium sulfate contains 92 g of Na^+ ions per kilogram of water. The molality of Na^+ ions in that solution in mol kg^{-1} is:

(1) 16 (2) 8 (3) 4 (4) 12

4. The amount of sugar ($C_{12}H_{22}O_{11}$) required to prepare 2 L of its 0.1 M aqueous solution is :
(1) 68.4 g (2) 17.1 g
(3) 34.2 g (4)136.8 g

5. The strength of 11.2 volume solution of H_2O_2 is : [Given that molar mass of H = 1 g mol^{-1} and O = 16 g mol^{-1}]
(1) 13.6% (2) 3.4%
(3) 34% (4) 1.7%

6. The mole fraction of a solvent in aqueous solution of a solute is 0.8. The molality (in mol kg^{-1}) of the aqueous solution is
(1) 13.88×10^{-1}
(2) 13.88×10^{-2}
(3) 13.88
(4) 13.88×10^{-3}

ELECTROCHEMISTRY

1. The standard electrode potential $E^{\ominus}$ and its temeprature coefficient $\left(\frac{dE^{\ominus}}{dT}\right)$ for a cell are 2V and -5×10^{-4} VK^{-1} at 300 K respectively. The cell reaction is
$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$
The standard reaction enthalpy $(\Delta_r H^{\ominus})$ at 300 K in kJ mol^{-1} is,
[Use R = 8JK^{-1} mol^{-1} and F = 96,000 $Cmol^{-1}$]
(1) –412.8 (2) –384.0
(3) 206.4 (4) 192.0

2. $\wedge_m^{\circ}$ for NaCl, HCl and NaA are 126.4, 425.9 and 100.5 S cm^2mol^{-1}, respectively. If the conductivity of 0.001 M HA is 5×10^{-5} S cm^{-1}, degree of dissociation of HA is :
(1) 0.75 (2) 0.125
(3) 0.25 (4) 0.50

3. Consider the following reduction processes :
$Zn^{2+} + 2e^- \rightarrow Zn(s)$; $E° = -0.76$ V
$Ca^{2+} + 2e^- \rightarrow Ca(s)$; $E° = -2.87$ V
$Mg^{2+} + 2e^- \rightarrow Mg(s)$; $E° = -2.36$ V
$Ni^{2+} + 2e^- \rightarrow Ni(s)$; $E° = -0.25$ V
The reducing power of the metals increases in the order :
(1) Ca < Zn < Mg < Ni
(2) Ni < Zn < Mg < Ca
(3) Zn < Mg < Ni < Ca
(4) Ca < Mg < Zn < Ni

4. In the cell :
$Pt(s)|H_2(g, 1bar|HCl(aq)|AgCl(s)|Ag(s)|Pt(s)$
the cell potential is 0.92V when a 10^{-6} molal HCl solution is used. The standard electrode potential of ($AgCl/Ag,Cl^-$) electrode is :
$$\left\{\text{given}, \frac{2.303RT}{F} = 0.06\text{V at } 298\text{K}\right\}$$
(1) 0.20 V (2) 0.76 V
(3) 0.40 V (4) 0.94 V

5. The anodic half-cell of lead-acid battery is recharged unsing electricity of 0.05 Faraday. The amount of $PbSO_4$ electrolyzed in g during the process in :
(Molar mass of $PbSO_4$ = 303 g mol^{-1})
(1) 22.8 (2) 15.2
(3) 7.6 (4) 11.4

6. For the cell $Zn(s) | Zn^{2+}(aq) || M^{x+}(aq) | M(s)$, different half cells and their standard electrode potentials are given below :

$M^{x+}(aq/M(s)$	$Au^{3+}(aq)/Au(s)$	$Ag^{+}(aq)/Ag(s)$	$Fe^{3+}(aq)/Fe^{2+}(aq)$	$Fe^{2+}(aq)/Fe(s)$
$E^o_{M^{x+}/M^{(v)}}$	1.40	0.80	0.77	–0.44

If $E^o_{Zn^{2+}/Zn} = -0.76V$, which cathode will give a mximum value of E^o_{cell} per electron transferred ?
(1) Fe^{3+} / Fe^{2+} (2) Ag^+ / Ag
(3) Au^{3+} / Au (4) Fe^{2+} / Fe

7. If the standard electrode potential for a cell is 2 V at 300 K, the equilibrium constant (K) for the reaction

$Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$

at 300 K is approximately.

($R = 8\ JK^{-1}\ mol^{-1}$, $F = 96000\ C\ mol^{-1}$)

(1) e^{160} (2) e^{320}

(3) e^{-160} (4) e^{-80}

8. Given the equilibrium constant :

K_C of the reaction :

$Cu(s) + 2Ag^{+}(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$ is 10×10^{15}, calculate the E^{0}_{cell} of this reaction at 298 K

$$\left[2.303\frac{RT}{F}\text{ at } 298\,K = 0.059V\right]$$

(1) 0.04736 V

(2) 0.4736 V

(3) 0.4736 mV

(4) 0.04736 mV

9. Given that : $E^{0}_{O_2/H_2O} = +1.23V$,

$E^{0}_{S_2O_8^{2-}/SO_4^{2-}} = +2.05V$

$E^{0}_{Br_2/Br^-} = +1.09V$

$E^{0}_{Au^{3+}/Au} = +1.4V$

The strongest oxidizing agent is -

(1) O_2 (2) Br_2

(3) $S_2O_8^{2-}$ (4) Au^{3+}

10. Calculate the standard cell potential in(V) of the cell in which following reaction takes place :

$Fe^{2+}(aq) + Ag^{+}(aq) \rightarrow Fe^{3+}(aq) + Ag(s)$

Given that

$E^{o}_{Ag^{+}/Ag} = xV$

$E^{o}_{Fe^{2+}/Fe} = yV$

$E^{o}_{Fe^{3+}/Fe} = zV$

(1) x + 2y – 3z (2) x – z

(3) x – y (4) x + y – z

11. The standard Gibbs energy for the given cell reaction in $kJ\ mol^{-1}$ at 298 K is :

$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$,

$E° = 2$ V at 298 K

(Faraday's constant, $F = 96000\ C\ mol^{-1}$)

(1) –384 (2) –192

(3) 192 (4) 384

12. A solution of $Ni(NO_3)_2$ is electrolysed between platinum electrodes using 0.1 Faraday electricity. How many mole of Ni will be deposited at the cathode?

(1) 0.20 (2) 0.05

(3) 0.10 (4) 0.15

13. Consider the statements S1 and S2 :

S1 : Conductivity always increases with decrease in the concentration of electrolyte.

S2 : Molar conductivity always incrteases with decrease in the concentration of electrolyte.

The correct option among the following is :

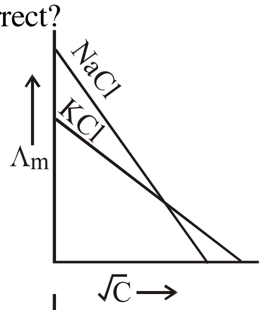
(1) Both S1 and S2 are correct

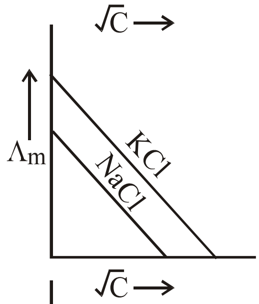
(2) S1 is wrong and S2 is correct

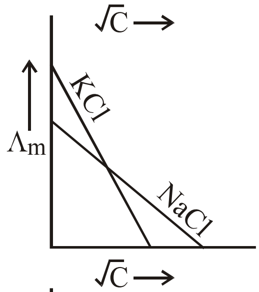
(3) S1 is correct and S2 is wrong

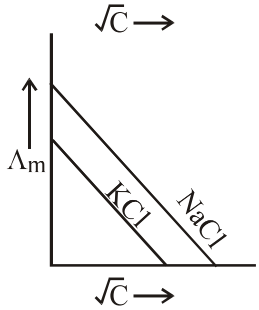
(4) Both S1 and S2 are wrong

14. Which one of the following graphs between molar conductivity (Λ_m) versus $\sqrt{C}$ is correct?

(1)


(2)


(3)


(4)


15. Given :

$Co^{3+} + e^- \rightarrow Co^{2+}$; $E^o = + 1.81$ V

$Pb^{4+} + 2e^- \rightarrow Pb^{2+}$; $E^o = + 1.67$ V

$Ce^{4+} + e^- \rightarrow Ce^{3+}$; $E^o = + 1.61$ V

$Bi^{3+} + 3e^- \rightarrow Bi$; $E^o = + 0.20$ V

Oxidizing power of the species will increase in the order :

(1) $Ce^{4+} < Pb^{4+} < Bi^{3+} < Co^{3+}$

(2) $Co^{3+} < Pb^{4+} < Ce^{4+} < Bi^{3+}$

(3) $Co^{3+} < Ce^{4+} < Bi^{3+} < Pb^{4+}$

(4) $Bi^{3+} < Ce^{4+} < Pb^{4+} < Co^{3+}$

16. The decreasing order of electrical conductivity of the following aqueous solutions is :

0.1 M Formic acid (A),

0.1 M Acetic acid (B)

0.1 M Benzoic acid (C)

(1) C > B > A (2) A > B > C

(3) A > C > B (4) C > A > B

REDOX

1. The hardness of a water sample (in terms of equivalents of $CaCO_3$) containing 10^{-3} M $CaSO_4$ is :

(molar mass of $CaSO_4$ = 136 g mol^{-1})

(1) 100 ppm

(2) 50 ppm

(3) 10 ppm

(4) 90 ppm

2. 50 mL of 0.5 M oxalic acid is needed to neutralize 25 mL of sodium hydroxide solution. The amount of NaOH in 50 mL of the given sodium hydroxide solution is :

(1) 4 g (2) 2 g (3) 8 g (4) 1 g

3. In the reaction of oxalate with permaganate in acidic medium, the number of electrons involved in producing one molecule of CO_2 is :

(1) 10 (2) 2

(3) 1 (4) 5

4. The chemical nature of hydrogen preoxide is :-

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

(2) Oxidising and reducing agent in both acidic and basic medium

(3) Reducing agent in basic medium, but not in acidic medium

(4) Oxidising agent in acidic medium, but not in basic medium.

5. In order to oxidise a mixture one mole of each of FeC_2O_4, $Fe_2(C_2O_4)_3$, $FeSO_4$ and $Fe_2(SO_4)_3$ in acidic medium , the number of moles of $KMnO_4$ required is -

(1) 3 (2) 2
(3) 1 (4) 1.5

6. 100 mL of a water sample contains 0.81 g of calcium bicarbonate and 0.73 of magnesium bicarbonate. The hardness of this water sample expressed in terms of equivalents of $CaCO_3$ is: (molar mass of calcium bicarbonate is 162 g mol^{-1} and magnesium bicarbonate is 146 $gmol^{-1}$)

(1) 1,000 ppm (2) 10,000 ppm
(3) 100 ppm (4) 5,000 ppm

7. An example of a disproportionation reaction is :

(1) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$
(2) $2MnO_4^- + 10I^- + 16H^+ \rightarrow 2Mn^{2+} + 5I_2 + 8H_2O$
(3) $2CuBr \rightarrow CuBr_2 + Cu$
(4) $2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$

SOLID STATE

1. Which premitive unit cell has unequal edge lenghs ($a \neq b \neq c$) and all axial angles different from 90°

(1) Tetragonal (2) Hexagonal
(3) Monoclinic (4) Triclinic

2. A solid having density of 9×10^3 kg m^{-3} forms face centred cubic crystals of edge length $200\sqrt{2}$ pm. What is the molar mass of the solid ?

(Avogadro constant $\cong 6 \times 10^{23}$ mol^{-1}, $\pi \cong 3$)

(1) 0.0216 kg mol^{-1}
(2) 0.0305 kg mol^{-1}
(3) 0.4320 kg mol^{-1}
(4) 0.0432 kg mol^{-1}

3. The radius of the largest sphere which fits properly at the centre of the edge of body centred cubic unit cell is : (Edge length is represented by 'a') :-

(1) 0.134 a (2) 0.027 a
(3) 0.067 a (4) 0.047 a

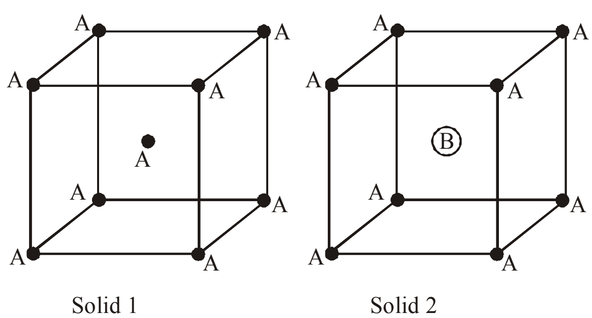
4. At 100°C, copper (Cu) has FCC unit cell structure with cell edge length of x Å. What is the approximate density of Cu (in g cm^{-3}) at this temperature ?
[Atomic Mass of Cu = 63.55u]

(1) $\frac{105}{x^3}$ (2) $\frac{211}{x^3}$
(3) $\frac{205}{x^3}$ (4) $\frac{422}{x^3}$

5. The statement that is **INCORRECT** about the interstitial compounds is :

(1) They have high melting points
(2) They are chemically reactive
(3) They have metallic conductivity
(4) They are very hard

6. Consider the bcc unit cells of the solids 1 and 2 with the position of atoms as shown below. The radius of atom B is twice that of atom A. The unit cell edge length is 50% more in solid 2 than in 1. What is the approximate packing efficiency in solid 2?



(1) 45% (2) 65%
(3) 90% (4) 75%

7. An element has a face-centred cubic (fcc) structure with a cell edge of a. The distance between the centres of two nearest tetrahedral voids in the lattice is :

(1) $\frac{a}{2}$ (2) a

(3) $\frac{3}{2}$a (4) $\sqrt{2}$ a

8. The ratio of number of atoms present in a simple cubic, body centered cubic and face centered cubic structure are, respectively :

(1) 1 : 2 : 4 (2) 8 : 1 : 6

(3) 4 : 2 : 1 (4) 4 : 2 : 3

9. A compound of formula A_2B_3 has the hcp lattice. Which atom forms the hcp lattice and what fraction of tetrahedral voids is occupied by the other atoms :

(1) hcp lattice-A, $\frac{2}{3}$ Tetrachedral voids-B

(2) hcp lattice-B, $\frac{1}{3}$ Tetrachedral voids-A

(3) hcp lattice-B, $\frac{2}{3}$ Tetrachedral voids-A

(4) hcp lattice-A $\frac{1}{3}$ Tetrachedral voids-B

THERMOCHEMISTRY

1. Given :

(i) C(graphite) + O_2(g) → CO_2(g);

$\Delta rH° = x$ kJ mol^{-1}

(ii) C(graphite)+$\frac{1}{2}O_2$(g) → CO_2(g);

$\Delta rH° = y$ kJ mol^{-1}

(iii) CO(g) +$\frac{1}{2}O_2$(g) → CO_2(g);

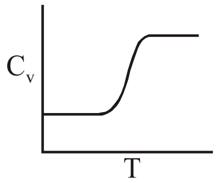
$\Delta rH° = z$ kJ mol^{-1}

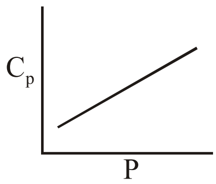
Based on the above thermochemical equations, find out which one of the following algebraic relationships is correct ?

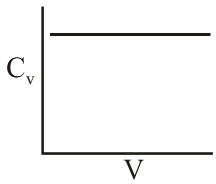
(1) z = x + y (2) x = y – z

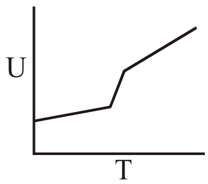
(3) x = y + z (4) y = 2z – x

2. For diatomic ideal gas in a closed system, which of the following plots does not correctly describe the relation between various thermodynamic quantities ?

(1) 

(2) 

(3) 

(4) 

3. The process with negative entropy change is :

(1) Dissolution of iodine in water

(2) Synthesis of ammonia from N_2 and H_2

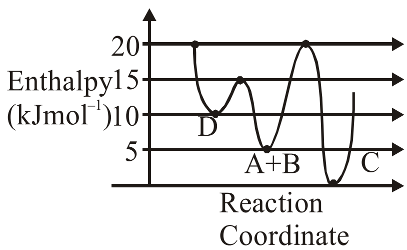
(3) Dissolution of $CaSO_4$(s) to CaO(s) and SO_3(g)

(4) Subimation of dry ice

4. Consider the given plot of enthalpy of the following reaction between A and B.

$A + B \rightarrow C + D$

Identify the incorrect statement.



(1) C is the thermodynamically stable product.

(2) Formation of A and B from C has highest enthalpy of activation.

(3) D is kinetically stable product.

(4) Activation enthalpy to form C is 5kJ mol^{-1} less than that to form D.

5. Enthalpy of sublimation of iodine is 24 cal g^{-1} at 200°C. If specific heat of $I_2(s)$ and $I_2(vap)$ are 0.055 and 0.031 cal $g^{-1}K^{-1}$ respectively, then enthalpy of sublimation of iodine at 250°C in cal g^{-1} is :

(1) 2.85 (2) 11.4

(3) 5.7 (4) 22.8

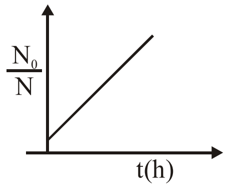
6. The difference between ΔH and ΔU (ΔH–ΔU), when the combustion of one mole of heptane (1) is carried out at a temperature T, is equal to:

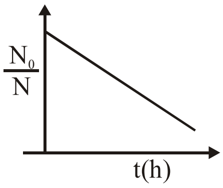
(1) 3RT (2) –3RT

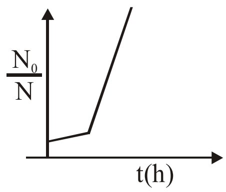
(3) –4RT (4) 4RT

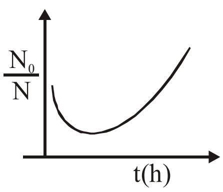
RADIOACTIVITY

1. A bacterial infection in an internal wound grows as $N'(t) = N_0 \exp(t)$, where the time t is in hours. A dose of antibiotic, taken orally, needs 1 hour to reach the wound. Once it reaches there, the bacterial population goes down as $\frac{dN}{dt} = -5N^2$. What will be the plot of $\frac{N_0}{N}$ vs. t after 1 hour ?

(1) 

(2) 

(3) 

(4) 

ANSWER KEY

ATOMIC STRUCTURE

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	2	4	2	2	1	1	3	4	4
Que.	11	12	13	14	15	16				
Ans.	4	4	4	4	2	2				

CHEMICAL KINETICS

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	1	1	1	4	3	1	2	2	3	1
Que.	11	12	13	14						
Ans.	1	2	2	4						

THERMODYNAMICS-01

Que.	1	2	3	4	5	6	7	8		
Ans.	2	2	3	4	1	3	1	3		

THERMODYNAMIS-02

Que.	1	2	3	4	5	6	7	8	9	
Ans.	3	1	1	2	4	4	2	1	4	

IONIC EQUILIBRIUM

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	2	1	3	3	3	4	1	2	2	4
Que.	11									
Ans.	4									

REAL GAS

Que.	1	2	3	4
Ans.	1	1	3	3

LIQUID SOLUTION

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	2	2	3	1	2	4	2	2	4	3
Que.	11	12	13	14	15	16				
Ans.	1	3	2	3	1	3				

CHEMICAL EQUILIBRIUM

Que.	1	2	3	4	5	6	7	8	9	
Ans.	2	3	2	2	3	4	3	1	4	

SURFACE CHEMISTRY										
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.	1	3	2	4	4	4	3	2	3	1
Que.	**11**	**12**	**13**	**14**						
Ans.	2	4	1	1						

MOLE CONCEPT										
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.	2	1	4	4	3	3	4	3	3	2

IDEAL GAS										
Que.	**1**	**2**	**3**							
Ans.	3	4	4							

CONCENTRATION TERMS						
Que.	**1**	**2**	**3**	**4**	**5**	**6**
Ans.	2	1	3	1	2	3

ELECTROCHEMISTRY										
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.	1	2	2	1	3	2	1	2	3	1
Que.	**11**	**12**	**13**	**14**	**15**	**16**				
Ans.	1	2	2	2	4	3				

REDOX										
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**			
Ans.	1	Bonus	3	2	2	2	3			

SOLID STATE										
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
Ans.	4	2	3	4	2	3	1	1	2	

THERMOCHEMISTRY						
Que.	**1**	**2**	**3**	**4**	**5**	**6**
Ans.	3	2	2	4	4	3

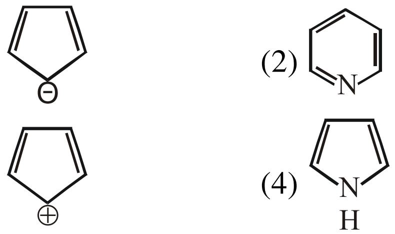
RADIOACTIVITY	
Que.	**1**
Ans.	1

JANUARY & APRIL 2019 ATTEMPT (OC)

GOC

1. Which of the following compounds is not aromatic ?

(1) (2) (3) (4)



2. The increasing basicity order of the following compounds is :

(A) $CH_3CH_2NH_2$ (B) $CH_3CH_2\overset{CH_2CH_3}{\overset{|}{N}}H$

(C) $H_3C–\overset{CH_3}{\overset{|}{N}}–CH_3$ (D) $Ph–\overset{CH_3}{\overset{|}{N}}–H$

(1) (D)<(C)<(A)<(B) (2) (A)<(B)<(D)<(C)

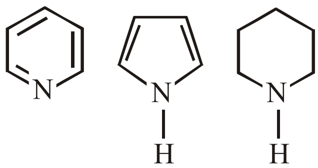
(3) (A)<(B)<(C)< (D) (4) (D)<(C)<(B)<(A)

3. Which amongst the following is the strongest acid ?

(1) CHI_3 (2) $CHCl_3$

(3) $CHBr_3$ (4) $CH(CN)_3$

4. Arrange the following amines in the decreasing order of basicity:



(I) (II) (III)

(1) I > II > III (2) III > II > I

(3) I > III > II (4) III > I > II

5. The correct decreasing order for acid strength is :-

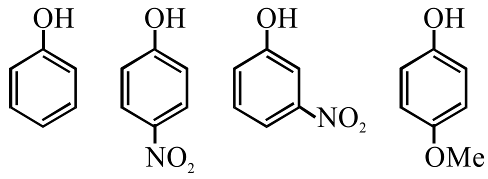
(1) NO_2CH_2COOH > $NCCH_2COOH$ > FCH_2COOH > $ClCH_2COOH$

(2) FCH_2COOH > $NCCH_2COOH$ > $NO_2CHCOOH$ > $ClCH_2COOH$

(3) NO_2CH_2COOH > FCH_2COOH > $CNCH_2COOH$ > $ClCH_2COOH$

(4) $CNCH_2COOH$ > O_2NCH_2COOH > FCH_2COOH > $ClCH_2COOH$

6. The increasing order of the pKa values of the following compounds is :



A B C D

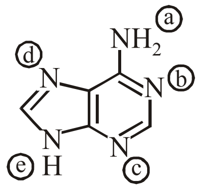
(1) D < A < C < B

(2) B < C < D < A

(3) C < B < A < D

(4) B < C < A < D

7. In the following compound,



the favourable site/s for protonation is/are :-

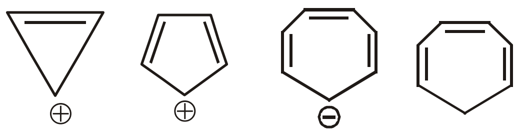
(1) (b), (c) and (d)

(2) (a)

(3) (a) and (e)

(4) (a) and (d)

8. Which compound(s) out of the following is/are not aromatic ?



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

(1) C and D (2) B, C and D

(3) A and C (4) B

9. The correct order for acid strength of compounds

$CH{\equiv}CH$, $CH_3–C{\equiv}CH$ and $CH_2{=}CH_2$

is as follows :

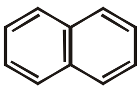
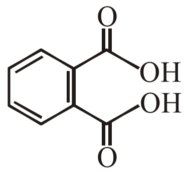
(1) $CH \equiv CH > CH_2 = CH_2 > CH_3–C \equiv CH$

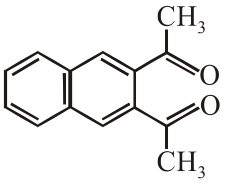
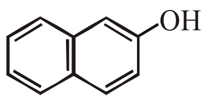
(2) $HC \equiv CH > CH_3 –C \equiv CH > CH_2 = CH_2$

(3) $CH_3–C \equiv CH > CH_2 = CH_2 > HC \equiv CH$

(4) $CH_3–C \equiv CH > CH \equiv CH > CH_2 = CH_2$

10. Among the following four aromatic compounds, which one will have the lowest melting point ?

(1)  (2) 

(3)  (4) 

11. In the following compounds, the decreasing order of basic strength will be -

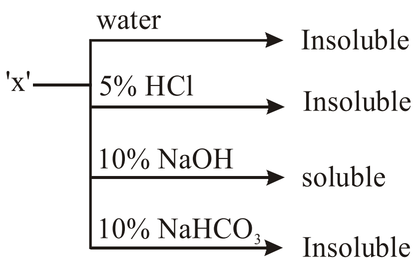
(1) $(C_2H_5)_2NH > C_2H_5NH_2 > NH_3$

(2) $(C_2H_5)_2NH > NH_3 > C_2H_5NH_2$

(3) $NH_3 > C_2H_5NH_2 > (C_2H_5)_2NH$

(4) $C_2H_5NH_2 > NH_3 > (C_2H_5)_2NH$

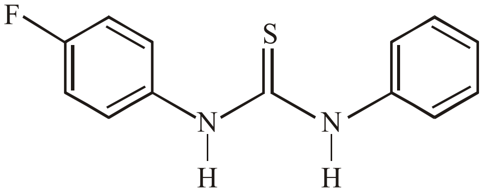
12. An organic compound 'X' showing the following solubility profile is -

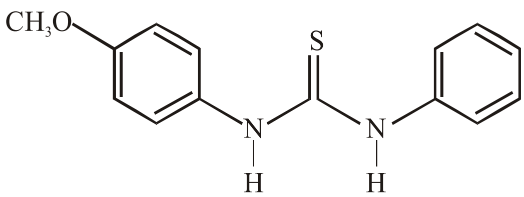


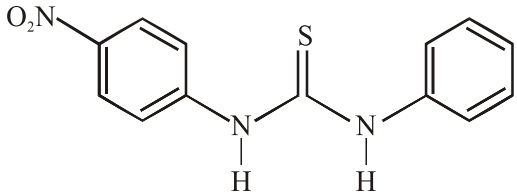
(1) m-Cresol (2) Oleic acid

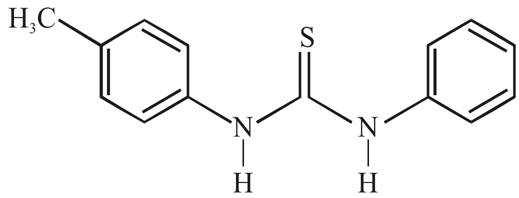
(3) o-Toluidine (4) Benzamide

13. The increasing order of the pK_b of the following compound is :

(A) 

(B) 

(C) 

(D) 

Options :

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

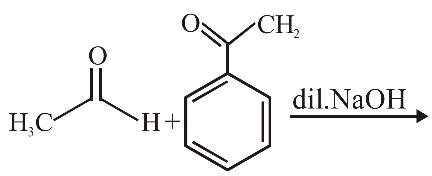
(2) (B) < (D) < (A) < (C)

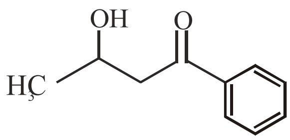
(3) (C) < (A) < (D) < (B)

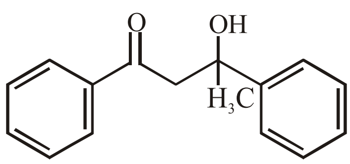
(4) (B) < (D) < (C) < (A)

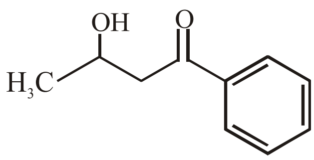
CARBONYL COMPOUND

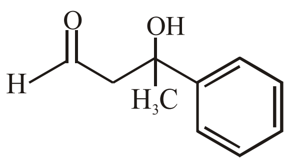
1. The major product formed in the following reaction is:



(1) 

(2) 

(3) 

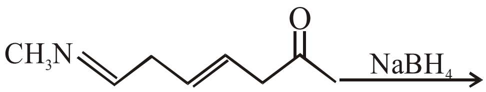
(4) 

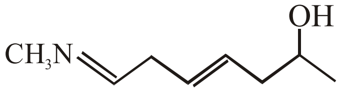
2. The major product of following reaction is :

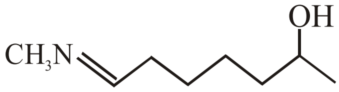
$$R-C\equiv N \xrightarrow[(2)H_2O]{(1)AlH(i-Bu_2)} ?$$

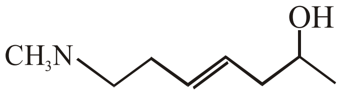
(1) RCHO (2) RCOOH
(3) RCH_2NH_2 (4) $RCONH_2$

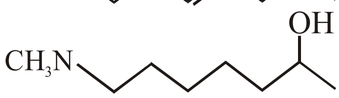
3. The major product of the following recation is:



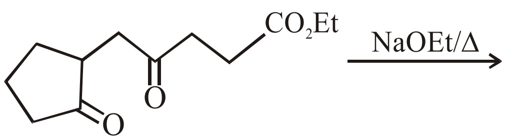
(1) 

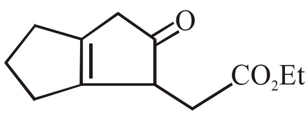
(2) 

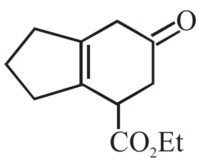
(3) 

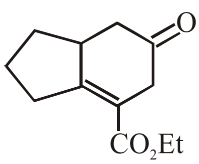
(4) 

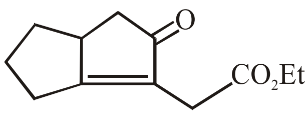
4. The major product obtained in the following reaction is :



(1) 

(2) 

(3) 

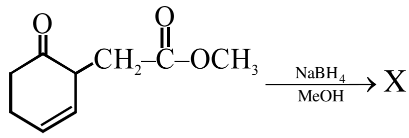
(4) 

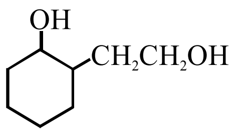
5. Which is the most suitable reagent for the following transformation ?

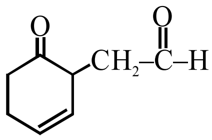
$$CH_3-CH=CH-CH_2-\underset{}{\overset{OH}{CH}}-CH_3 \longrightarrow CH_3-CH=CH-CH_2CO_2H$$

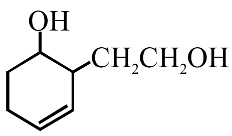
(1) alkaline $KMnO_4$ (2) I_2/NaOH
(3) Tollen's reagent (4) CrO_2/CS_2

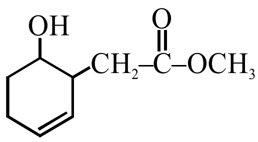
6. The major product 'X' formed in the following reaction is :



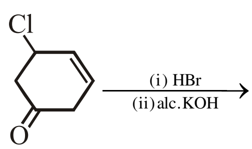
(1) 

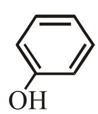
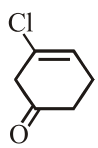
(2) 

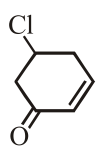
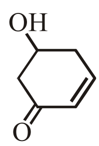
(3) 

(4) 

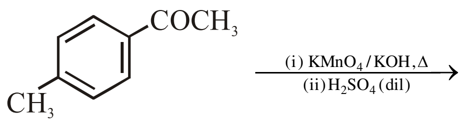
7. The major poduct of the following reaction is:

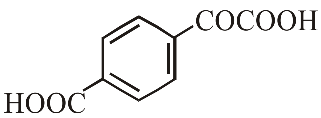


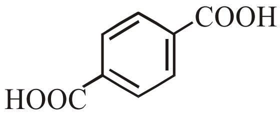
(1)  (2) 

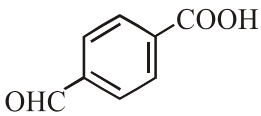
(3)  (4) 

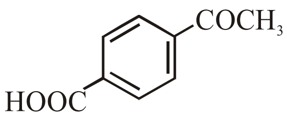
8. The major product of the following reaction is :



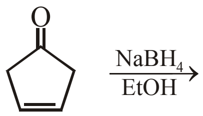
(1) 

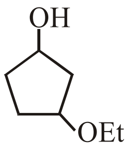
(2) 

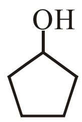
(3) 

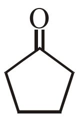
(4) 

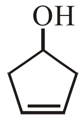
9. The major product of the following reaction is:



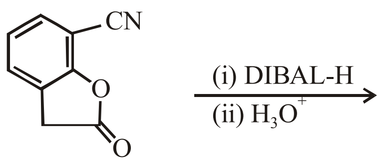
(1) 

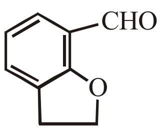
(2) 

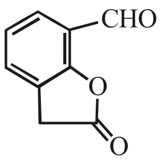
(3) 

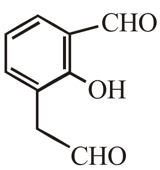
(4) 

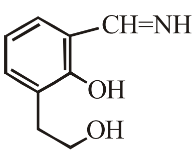
10. The major product of the following reaction is:



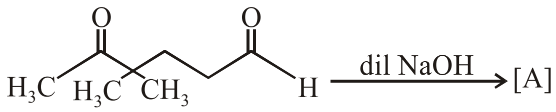
(1) 

(2) 

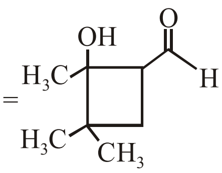
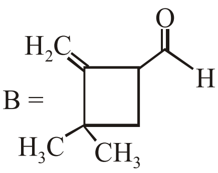
(3) 

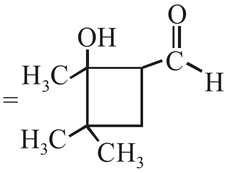
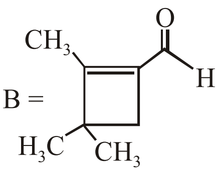
(4) 

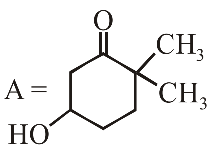
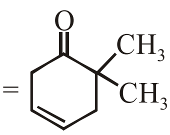
11. In the following reactions, products A and B are :

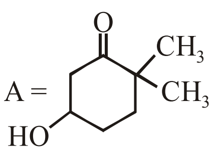
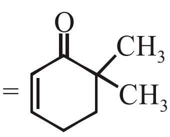


[A] $\xrightarrow[\Delta]{H_3O^+}$ [B]

(1) A =  ; B = 

(2) A =  ; B = 

(3) A =  ; B = 

(4) A =  ; B = 

12. In the following reaction

Aldehyde + Alcohol $\xrightarrow{HCl}$ Acetal

Aldehyde	Alcohol
HCHO	^{t}BuOH
CH_3CHO	MeOH

The best combinations is :

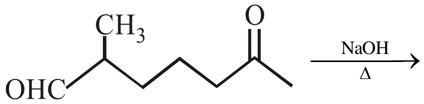
(1) HCHO and MeOH

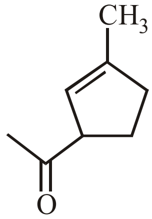
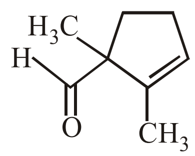
(2) HCHO and ^{t}BuOH

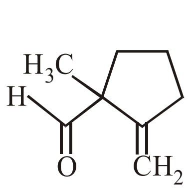
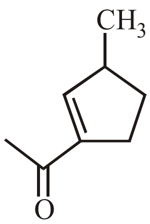
(3) CH_3CHO and MeOH

(4) CH_3CHO and ^{t}BuOH

13. The major product obtained in the following reaction is



(1)  (2) 

(3)  (4) 

14. In the following reaction

carbonyl compound + MeOH $\xrightleftharpoons{HCl}$ acetal

Rate of the reaction is the highest for :

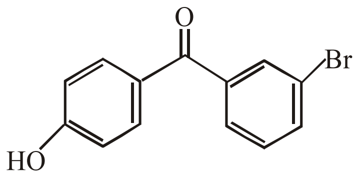
(1) Acetone as substrate and methanol in stoichiometric amount

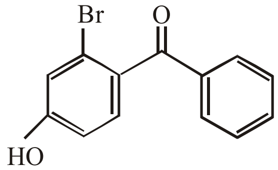
(2) Propanal as substrate and methanol in stoichiometric amount.

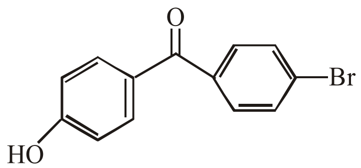
(3) Acetone as substrate and methanol in excess

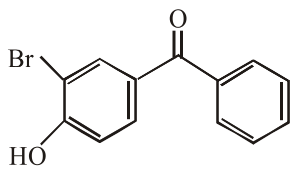
(4) Propanal as substrate and methanol in excess

15. p-Hydroxybenzophenone upon reaction with bromine in carbon tetrachloride gives:

(1) 

(2) 

(3) 

(4) 

16. The major product of the following reaction is :

$CH_3CH(OH)CH_2CH_2NH_2 \xrightarrow[\text{triethylamine}]{\text{ethyl formate (1equiv.)}}$

(1) $CH_3CH(OH)CH_2CH_2NHCHO$

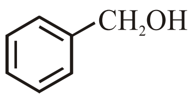
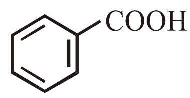
(2) $CH_3CH=CH-CH_2NH_2$

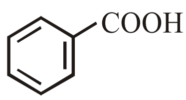
(3) $CH_3CH(OCHO)CH_2CH_2NH_2$

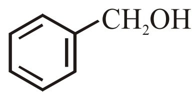
(4) $CH_3-CH(OH)-CH=CH_2$

17. Major products of the following reaction are :

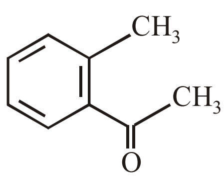
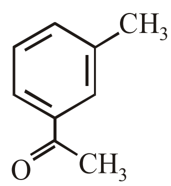
(1) CH_3OH and HCO_2H

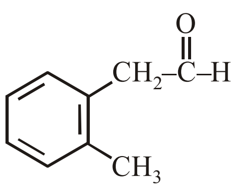
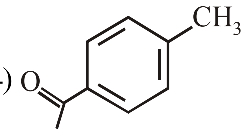
(2)  and 

(3) CH_3OH and 

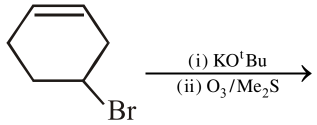
(4) HCOOH and 

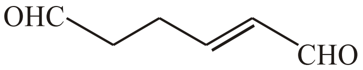
18. Compound A ($C_9H_{10}O$) shows positive iodoform test. Oxidation of A with $KMnO_4$/KOH gives acid B($C_8H_6O_4$). Anhydride of B is used for the preparation of phenolphthalein. Compound A is :-

(1)  (2) 

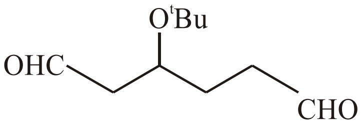
(3)  (4) 

19. The major product(s) obtained in the following reaction is/are :



(1) 

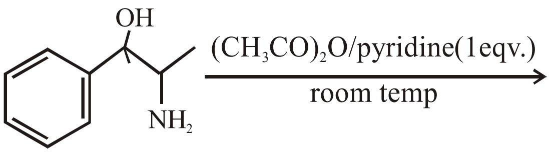
(2) 

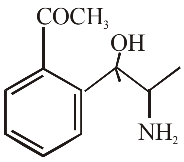
(3) 

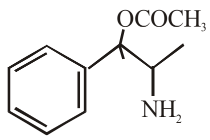
(4) 

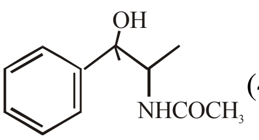
CAD

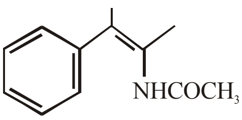
1. The major product obtained in the following reaction is :



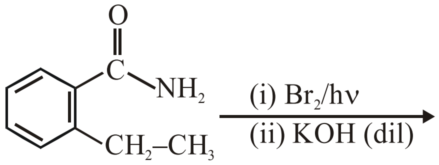
(1) 

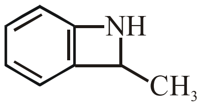
(2) 

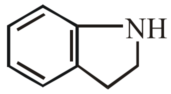
(3) 

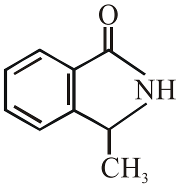
(4) 

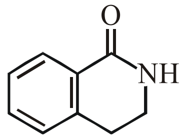
2. The major product of the following reaction is :



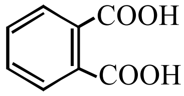
(1) 

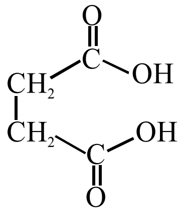
(2) 

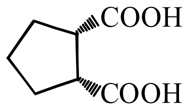
(3) 

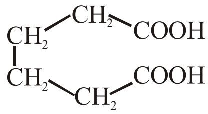
(4) 

3. Which dicarboxylic acid in presence of a dehydrating agent is least reactive to give an anhydride :

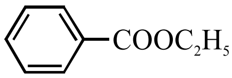
(1) 

(2) 

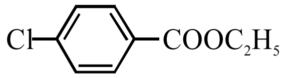
(3) 

(4) 

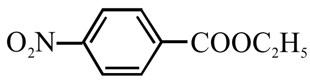
4. The decreasing order of ease of alkaline hydrolysis for the following esters is :



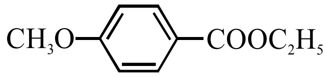
I



II



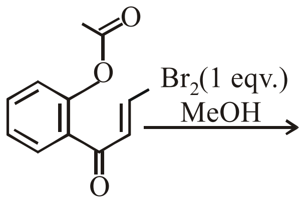
III

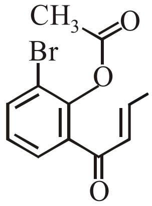


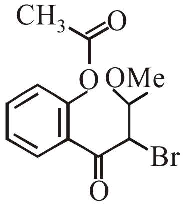
IV

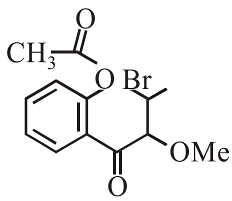
(1) IV > II > III > I
(2) III > II > I > IV
(3) III > II > IV > I
(4) II > III > I > IV

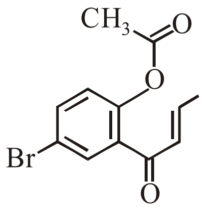
5. The major product obtained in the following conversion is :-



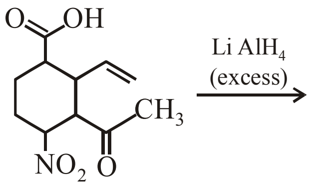
(1) 

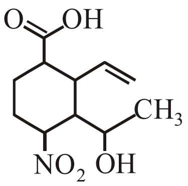
(2) 

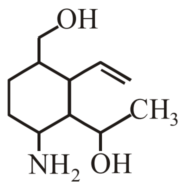
(3) 

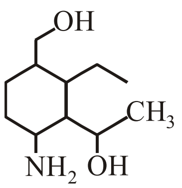
(4) 

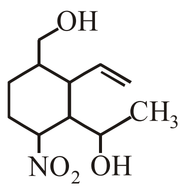
6. The major product obtained in the following reaction is :-



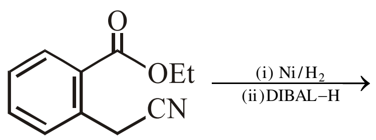
(1) 

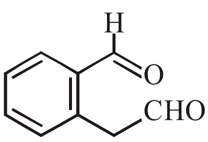
(2) 

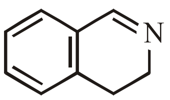
(3) 

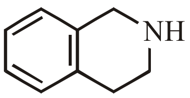
(4) 

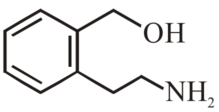
7. The major product of the following reaction is:



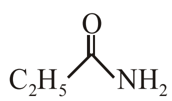
(1) 

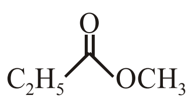
(2) 

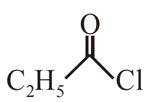
(3) 

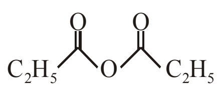
(4) 

8. The increasing order of the reactivity of the following with $LiAlH_4$ is :

(A) 

(B) 

(C) 

(D) 

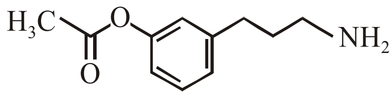
(1) (A) < (B) < (D) < (C)

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

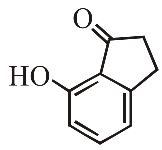
(3) (B) < (A) < (D) < (C)

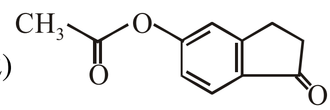
(4) (B) < (A) < (C) < (D)

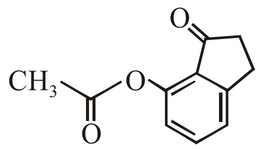
9. The major product of the following reaction is:

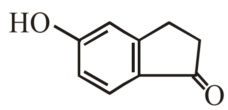


(i) $NaNO_2/H^+$
(ii) $CrCO_3/H^+$
(iii) H_2SO_4 (conc.),Δ

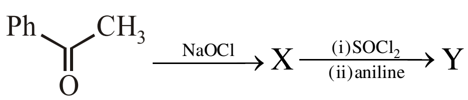
(1) 

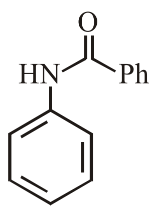
(2) 

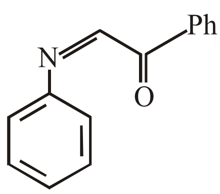
(3) 

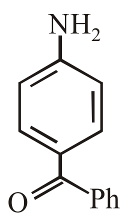
(4) 

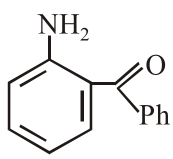
10. The major product 'Y' in the following reaction is:-



(1) 

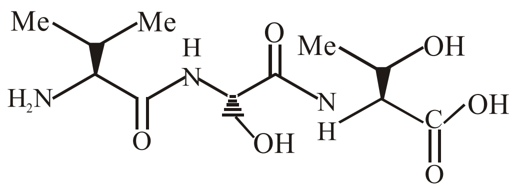
(2) 

(3) 

(4) 

BIOMOLECULE

1. The correct sequence of amino acids present in the tripeptide given below is :

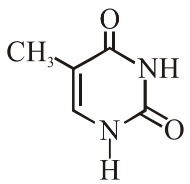
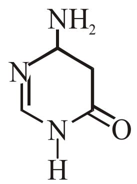
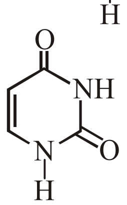
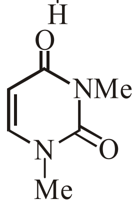


(1) Leu - Ser - Thr
(2) Thr - Ser- Leu
(3) Thr - Ser - Val
(4) Val - Ser - Thr

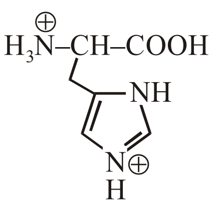
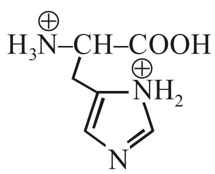
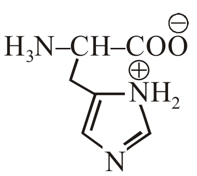
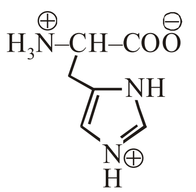
2. Which of the following tests cannot be used for identifying amino acids ?

(1) Biuret test (2) Xanthoproteic test
(3) Barfoed test (4) Ninhydrin test

3. Among the following compound which one is found in RNA ?

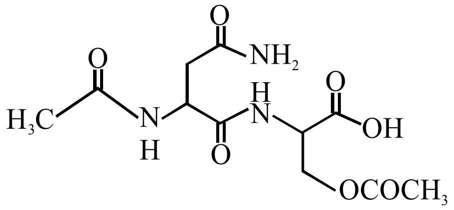
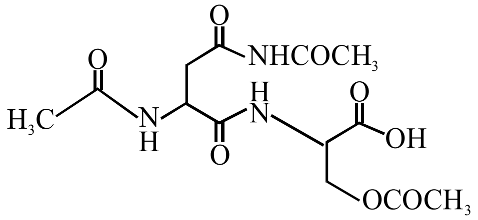
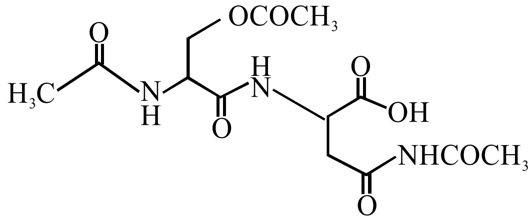
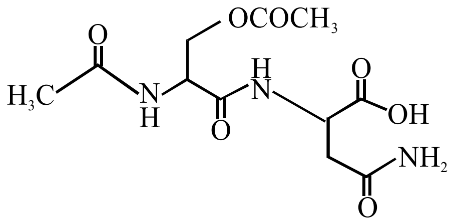
(1) 
(2) 
(3) 
(4) 

4. The correct structure of histidine in a strongly acidic solution (pH=2) is

(1) 
(2) 
(3) 
(4) 

5. The correct structure of product 'P' in the following reaction is :

$$\text{Asn-Ser} + \underset{\text{(excess)}}{(CH_3CO)_2O} \xrightarrow{NEt_3} P$$

(1) 
(2) 
(3) 
(4) 

6. Maltose on treatment with dilute HCI gives :
(1) D-Galactose
(2) D-Glucose
(3) D-Glucose and D-Fructose
(4) D-Fructose

7. Fructose and glucose can be distinguished by :
(1) Fehling's test (2) Barfoed's test
(3) Benedict's test (4) Seliwanoff's test

8. Which of the following statements is not true about sucrose?
(1) On hydrolysis, it produces glucose and fructose
(2) The glycosidic linkage is present between C_1 of α-glucose and C_1 of β-fructose
(3) It is also named as invert sugar
(4) It is a non reducing sugar

9. The peptide that gives positive ceric ammonium nitrate and carbylamine tests is :
(1) Lys-Asp (2) Ser-Lys
(3) Gln-Asp (4) Asp-Gln

10. Amylopectin is composed of :
(1) α-D-glucose, C_1–C_4 and C_1–C_6 linkages
(2) α-D-glucose, C_1–C_4 and C_2–C_6 linkages
(3) β-D-glucose, C_1–C_4 and C_2–C_6 linkages
(4) β-D-Glucose, C_1–C_4 and C_1–C_6 linkages

11. Number of stereo centers present in linear and cyclic structures of glucose are respectively :
(1) 4 & 5 (2) 5 & 5
(3) 4 & 4 (4) 5 & 4

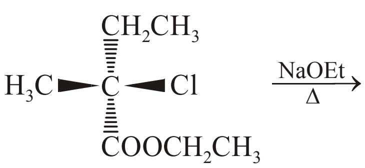
12. Which of the following statements is not true about RNA ?
(1) It has always double stranded α-helix structure
(2) It usually does not replicate
(3) It is present in the nucleus of the cell
(4) It controls the synthesis of protein

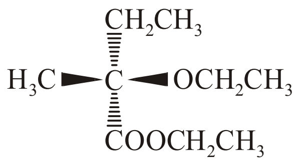
13. Glucose and Galactose are having identical configuration in all the positions except position.
(1) C–3 (2) C–2 (3) C–4 (4) C–5

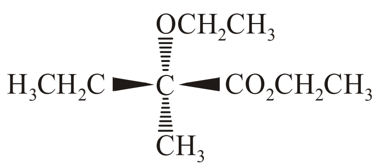
14. Which of the given statements is INCORRECT about glycogen ?
(1) It is a straight chain polymer similar to amylose
(2) Only α-linkages are present in the molecule
(3) It is present in animal cells
(4) It is present in some yeast and fungi

HALOGEN DERIVATIVE

1. The major product of the following reaction is:



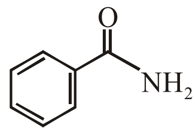
(1) 

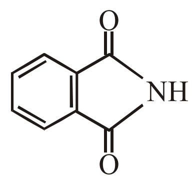
(2) 

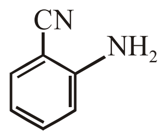
(3) $CH_3C(CO_2CH_2CH_3)=CHCH_3$

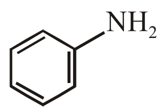
(4) $CH_3CH_2C(CO_2CH_2CH_3)=CH_2$

2. The increasing order of reactivity of the following compounds towards reaction with alkyl halides directly is :


(A)

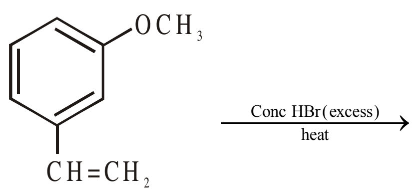

(B)

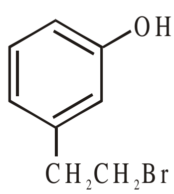

(C)

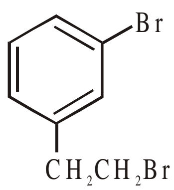

(D)

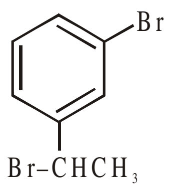
(1) (B) < (A) < (D) < (C)
(2) (B) < (A) < (C) < (D)
(3) (A) < (C) < (D) < (B)
(4) (A) < (B) < (C) < (D)

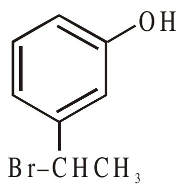
3. The major product of the following reactions:



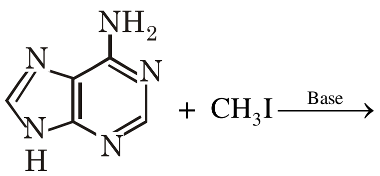
(1) 

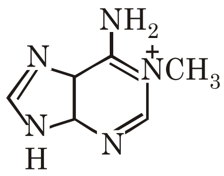
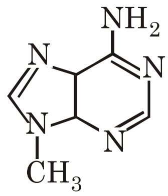
(2) 

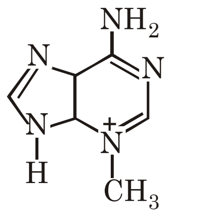
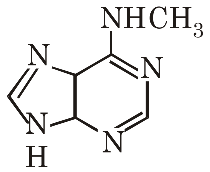
(3) 

(4) 

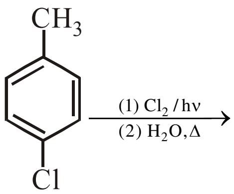
4. The major product in the following reaction is :

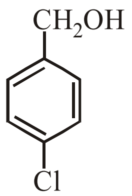
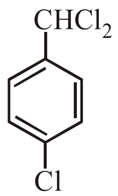


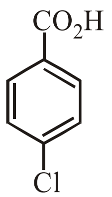
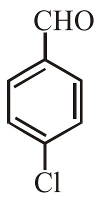
(1)  (2) 

(3)  (4) 

5. The major product of the following reaction is:



(1)  (2) 

(3)  (4) 

6. Which one of the following alkenes when treated with HCl yields majorly an anti Markovnikov product?

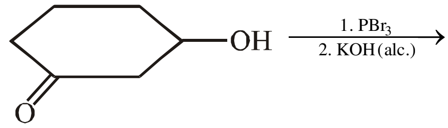
(1) $F_3C - CH = CH_2$

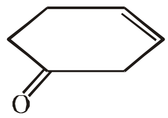
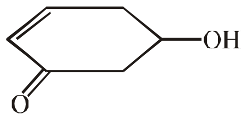
(2) $Cl - CH = CH_2$

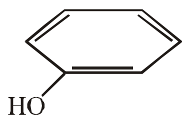
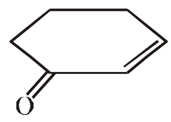
(3) $CH_3O - CH = CH_2$

(4) $H_2N - CH = CH_2$

7. The mojor product of the following reaction is :



(1)  (2) 

(3)  (4) 

8. The mojor product of the following reaction is :

$$CH_3C{\equiv}CH \xrightarrow[\text{(ii) DI}]{\text{(i) DCl (1 equiv.)}}$$

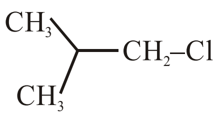
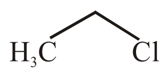
(1) $CH_3CD(Cl)CHD(I)$

(2) $CH_3CD_2CH(Cl)(I)$

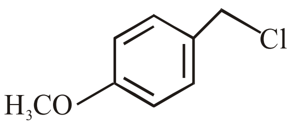
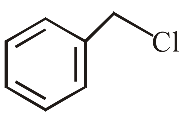
(3) $CH_3CD(I)CHD(Cl)$

(4) $CH_3C(I)(Cl)CHD_2$

9. Increasing order of reactivity of the following compounds for S_N1 substitution is:

(A) (B)

(C) (D)

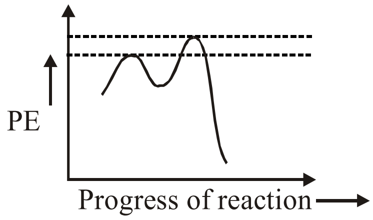
(1) (B) < (C) < (D) < (A)

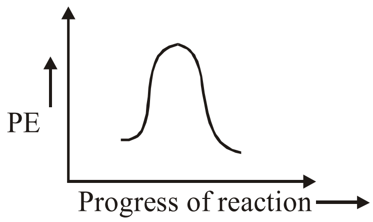
(2) (A) < (B) < (D) < (C)

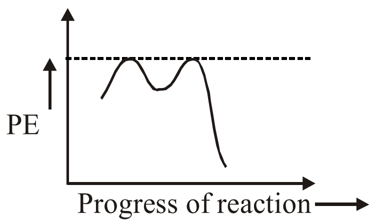
(3) (B) < (A) < (D) < (C)

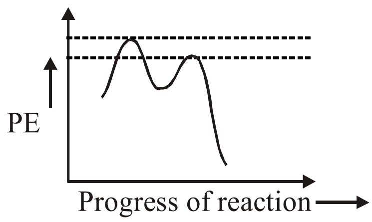
(4) (B) < (C) < (A) < (D)

10. Which of the following potential energy (PE) diagrams represents the S_N1 reaction?

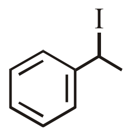
(1) 

(2) 

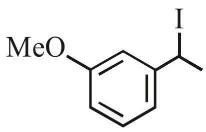
(3) 

(4) 

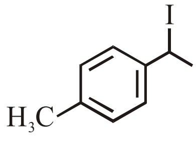
11. Increasing rate of S_N1 reaction in the following compounds is :



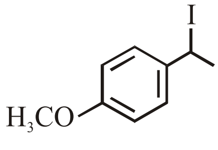
(A)



(B)



(C)



(D)

(1) (A) < (B) < (C) < (D)
(2) (B) < (A) < (D) < (C)
(3) (B) < (A) < (C) < (D)
(4) (A) < (B) < (D) < (C)

12. The major product of the following reaction is :-

$CH_3-C(CH_3)(H)-CH(Br)CH_3 \xrightarrow{CH_3OH}$

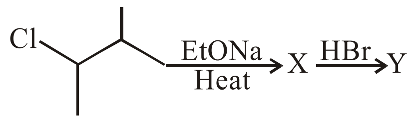
(1) $CH_3-C(CH_3)(H)-CH(OCH_3)CH_3$
(2) $CH_3-C(CH_3)(H)-CH = CH_2$
(3) $CH_3-C(CH_3)(OCH_3)-CH_2CH_3$
(4) $CH_3-C(CH_3) = CH\ CH_3$

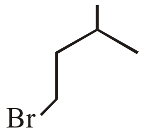
13. The increasing order of nucleophilicity of the following nucleophiles is :

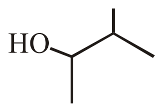
(a) $CH_3CO_2^{\ominus}$ (b) H_2O
(c) $CH_3SO_3^{\ominus}$ (d) $\overset{\ominus}{O}H$

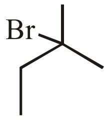
(1) (b) < (c) < (a) < (d) (2) (a) < (d) < (c) < (b)
(3) (d) < (a) < (c) < (b) (4) (b) < (c) < (d) < (a)

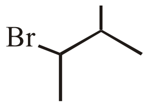
14. The major product 'Y' in the following reaction is:



(1) 

(2) 

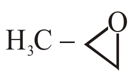
(3) 

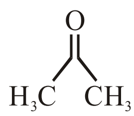
(4) 

15. The major product of the following addition reaction is :

$H_3C - CH = CH_2 \xrightarrow{Cl_2/H_2O}$

(1) $CH_3 - CH(Cl) - CH_2(OH)$
(2) $H_3C - CH(OH) - CH_2(Cl)$

(3) 

(4) 

16. An 'Assertion' and a 'Reason' are given below. Choose the correct answer from the following options.

Assertion (A) : Vinyl halides do not undergo nucleophilic substitution easily.

Reason (R) : Even though the intermediate carbocation is stabilized by loosely held π-electrons, the cleavage is difficult becuase of strong bonding.

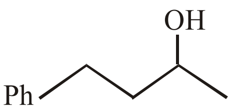
(1) Both (A) and (R) are wrong statements

(2) Both (A) and (R) are correct statements and (R) is the correct explanation of (A)

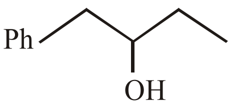
(3) Both (A) and (R) are correct statements but (R) is not the correct explanation of (A)

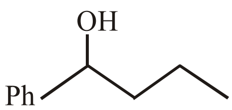
(4) (A) is a correct statement but (R) is a wrong statement.

17. Heating of 2-chloro-1-phenylbutane with EtOK/EtOH gives X as the major product. Reaction of X with $Hg(OAc)_2/H_2O$ followed by $NaBH_4$ gives Y as the major product. Y is :

(1) 

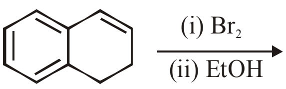
(2) 

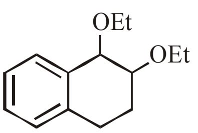
(3) 

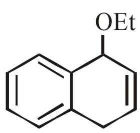
(4) 

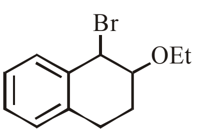
HYDROCARBON

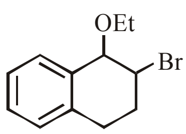
1. The major product the following reaction is :



(1) 

(2) 

(3) 

(4) 

2. Which hydrogen in compound (E) is easily replaceable during bromination reaction in presence of light :

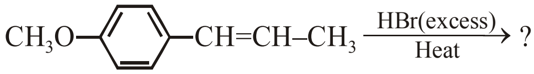
$$\underset{\delta}{CH_3}-\underset{\gamma}{CH_2}-\underset{\beta}{CH}=\underset{\alpha}{CH_2}$$

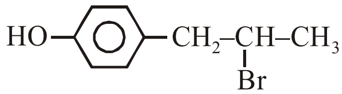
(E)

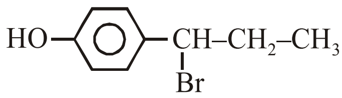
(1) β – hydrogen (2) γ – hydrogen

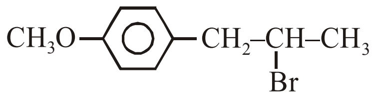
(3) δ – hydrogen (4) α – hydrogen

3. The major product in the following conversion is :



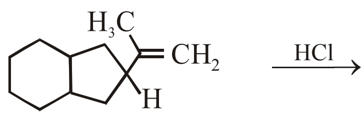
(1) 

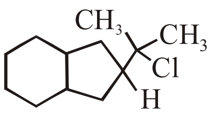
(2) 

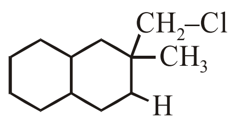
(3) 

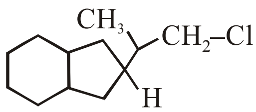
(4) 

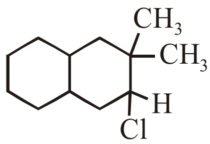
4. The major product of the following reaction is:



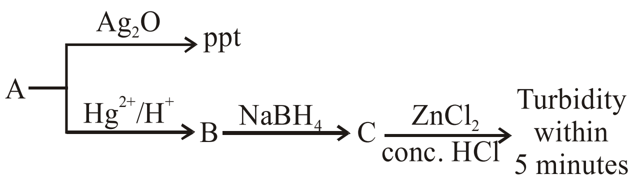
(1) 

(2) 

(3) 

(4) 

5. Consider the following reactions :



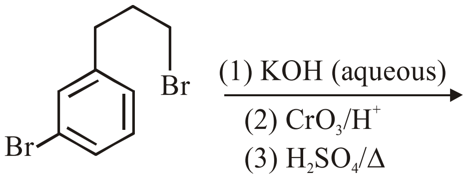
'A' is :

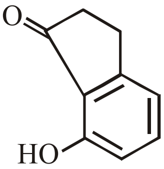
(1) CH≡CH (2) CH_3–C≡CH

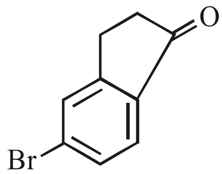
(3) CH_2=CH_2 (4) CH_3–C≡C–CH_3

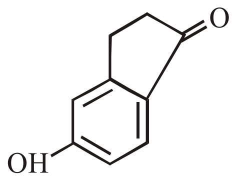
AROMATIC

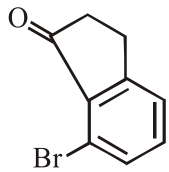
1. The major product of the following reaction is:



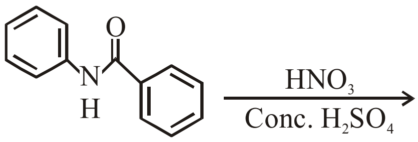
(1) 

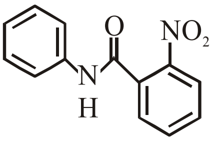
(2) 

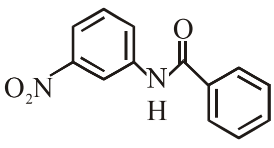
(3) 

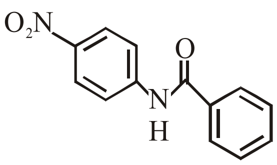
(4) 

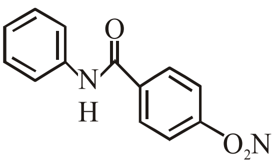
2. What will be the major product in the following mononitation reaction ?



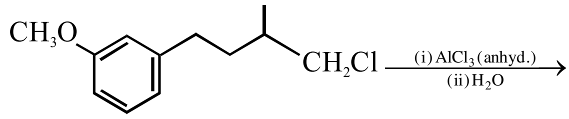
(1) 

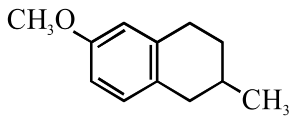
(2) 

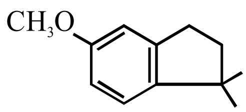
(3) 

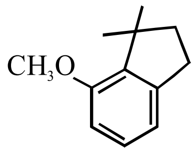
(4) 

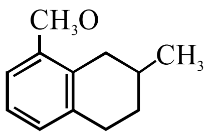
3. The major product of the following reaction is:



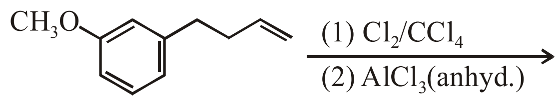
(1) 

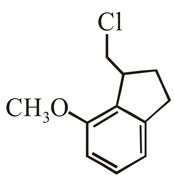
(2) 

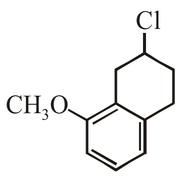
(3) 

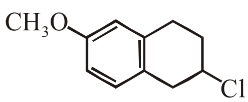
(4) 

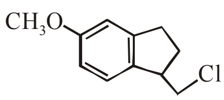
4. The major product of the following reaction is :



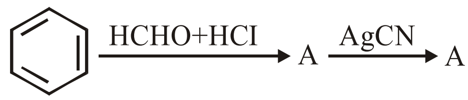
(1) 

(2) 

(3) 

(4) 

5. The compounds A and B in the following reaction are, respectively:



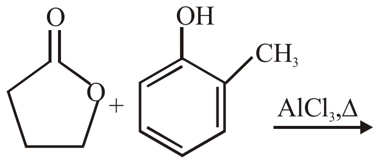
(1) A = Benzyl alcohol, B = Benzyl isocyanide

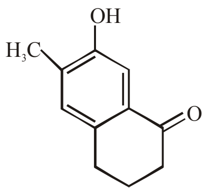
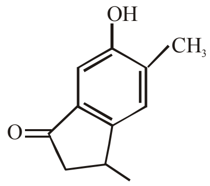
(2) A = Benzyl alcohol, B = Benzyl cyanide

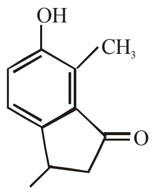
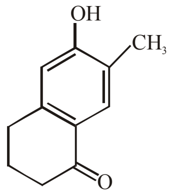
(3) A = Benzyl chloride, B = Benzyl cyanide

(4) A = Benzyl chloride, B = Benzyl isocyanide

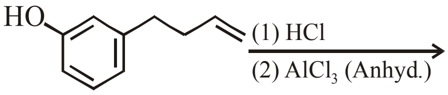
6. The major product of the following reaction is:

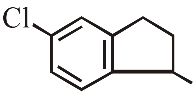
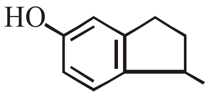


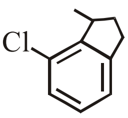
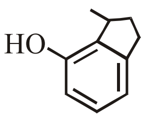
(1)  (2) 

(3)  (4) 

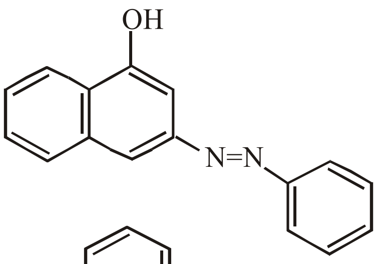
7. The major product of the following reaction is :-

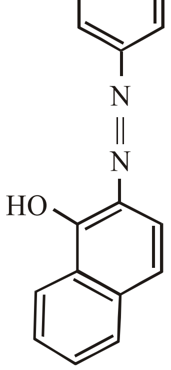


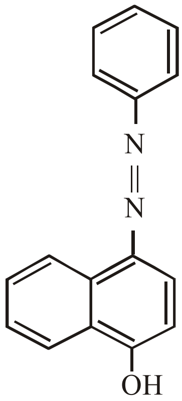
(1)  (2) 

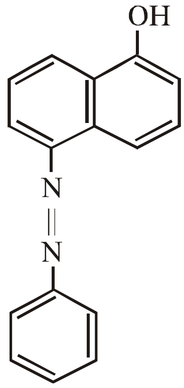
(3)  (4) 

8. Coupling of benzene diazonium chloride with 1-napthol in alkaline medium will give

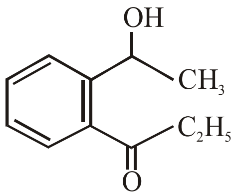
(1) 

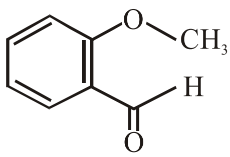
(2) 

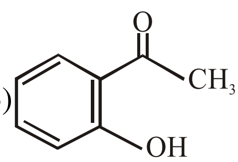
(3) 

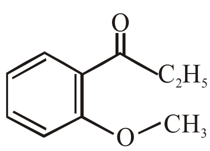
(4) 

9. An organic compound neither reacts with neutral ferric chloride solution nor with Fehling solution, It however, reacts with Grignard reagent and gives positive iodoform test. The compound is -

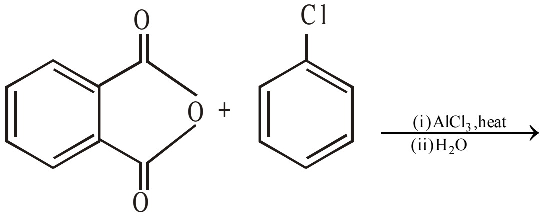
(1) 

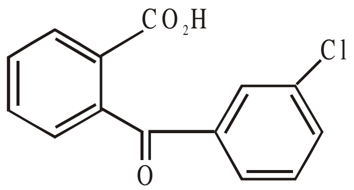
(2) 

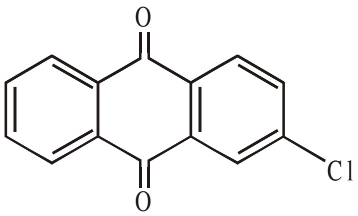
(3) 

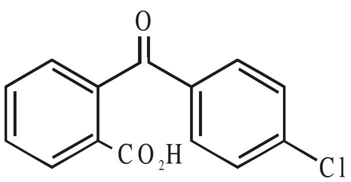
(4) 

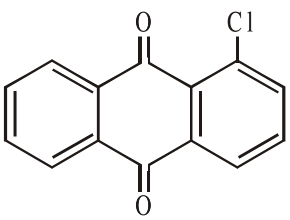
10. The major product of the following reaction is:



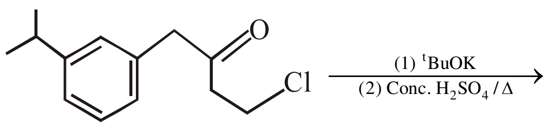
(1) 

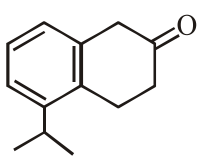
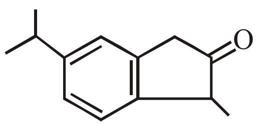
(2) 

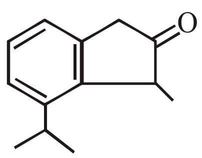
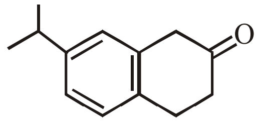
(3) 

(4) 

11. The major product of the following reaction is:



(1)  (2) 

(3)  (4) 

12. Polysubstitution is a major drawback in:

(1) Reimer Tiemann reaction

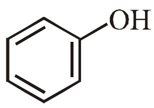
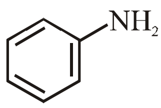
(2) Friedel Craft's acylation

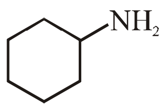
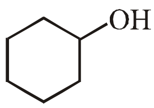
(3) Friedel Craft's alkylation

(4) Acetylation of aniline

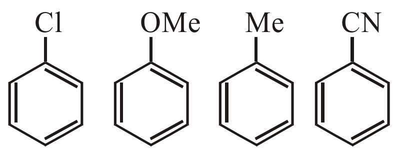
13. The organic compound that gives following qualitative analysis is :

Test	Inference
(a) Dil. HCl	Insoluble
(b) NaOH solution	soluble
(c) Br_2/water	Decolourization

(1)  (2) 

(3)  (4) 

14. The increasing order of reactivity of the following compounds towards aromatic electrophilic substitution reaction is :

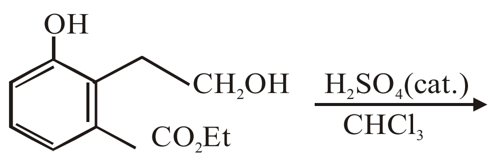


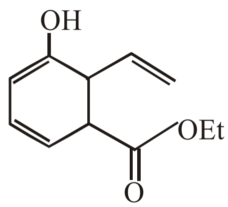
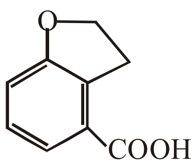
A B C D

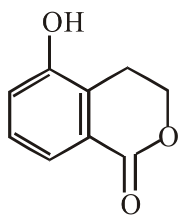
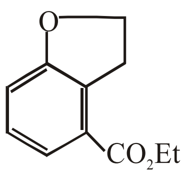
(1) D < B < A < C (2) A < B < C < D

(3) D < A < C < B (4) B < C < A < D

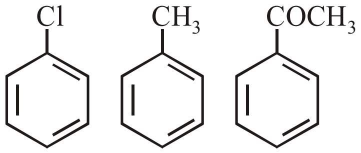
15. The major product of the following reaction is:



(1)  (2) 

(3)  (4) 

16. The increasing order of the reactivity of the following compounds towards electrophilic aromatic substitution reactions is :-

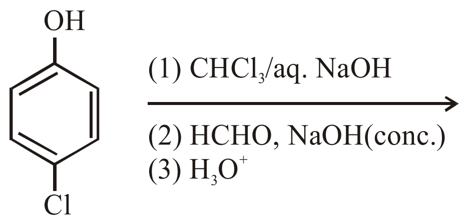


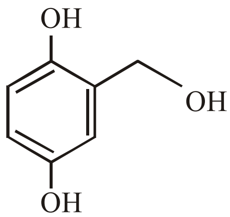
(I) (II) (III)

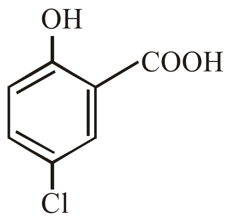
(1) I < III < II (2) II < I < III

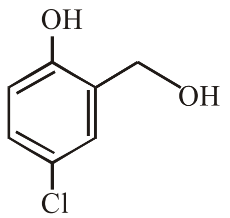
(3) III < I < II (4) III < II < I

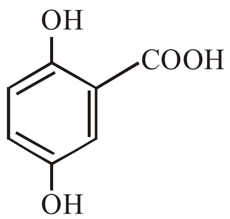
17. The major products of the following reaction are :



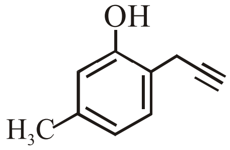
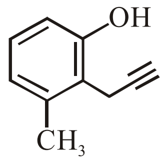
(1)  and Formic acid

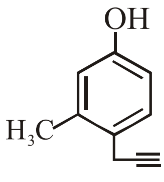
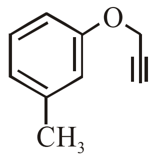
(2)  and Methanol

(3)  and Formic acid

(4)  and Methanol

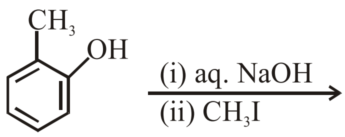
18. What will be the major product when m-cresol is reacted with propargyl bromide ($HC\equiv C-CH_2Br$) in present of K_2CO_3 in acetone

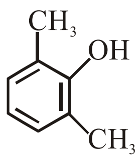
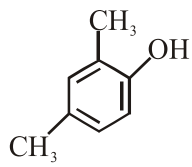
(1)  (2) 

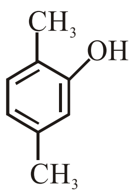
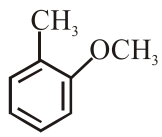
(3)  (4) 

ALKAYLE HALIDE

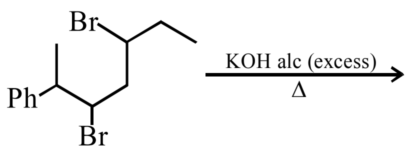
1. The major product of the following reaction is:

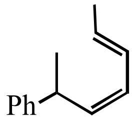
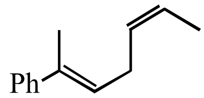


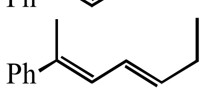
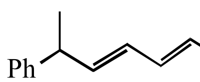
(1)  (2) 

(3)  (4) 

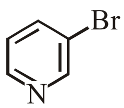
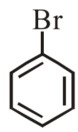
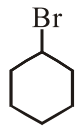
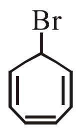
2. The major product of the following reaction is



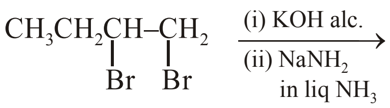
(1)  (2) 

(3)  (4) 

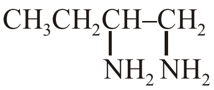
3. Which of the following compounds will produce a precipitate with $AgNO_3$?

(1)  (2)  (3)  (4) 

4. The major product of the following reaction is:



(1) $CH_3CH_2C{\equiv}CH$

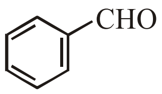
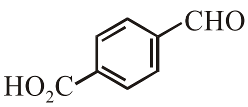
(2) 

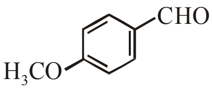
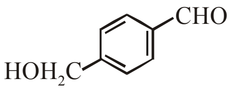
(3) $CH_3CH{=}C{=}CH_2$

(4) $CH_3CH{=}CHCH_2NH_2$

GRIGNARD REAGENT

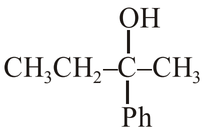
1. The aldehydes which will not form Grignard product with one equivalent Grignard reagents are :

(A)  (B) 

(C)  (D) 

(1) (B), (C), (D) (2) (B), (D)

(3) (B), (C) (4) (C), (D)

2.  cannot be prepared by :

(1) $HCHO + PhCH(CH_3)CH_2MgX$

(2) $PhCOCH_2CH_3 + CH_3MgX$

(3) $PhCOCH_3 + CH_3CH_2MgX$

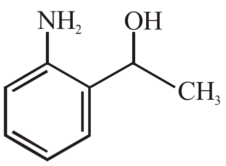
(4) $CH_3CH_2COCH_3 + PhMgX$

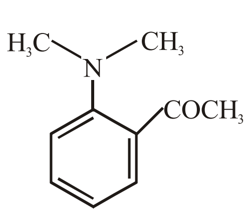
POC

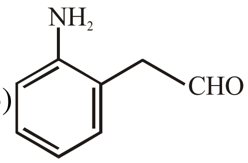
1. The tests performed on compound X and their inferences are:

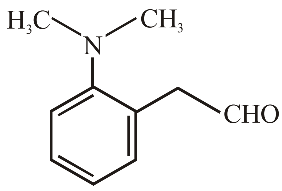
Test	Inference
(a) 2,4 - DNP test	Coloured precipitate
(b) Iodoform test	Yellow precipitate
(c) Azo-dye test	No dye formation

Compound 'X' is:

(1) 

(2) 

(3) 

(4) 

2. The correct match between item 'I' and item 'II' is :

Item 'I' (compound)	Item 'II' (reagent)
(A) Lysine	(P) 1-naphthol
(B) Furfural	(Q) ninhydrin
(C) Benzyl alcohol	(R) $KMnO_4$
(D) Styrene	(S) Ceric ammonium nitrate

(1) (A)→(Q), (B)→(P), (C)→(S), (D)→(R)

(2) (A)→(Q), (B)→(R), (C)→(S), (D)→(P)

(3) (A)→(Q), (B)→(P), (C)→(R), (D)→(S)

(4) (A)→(R), (B)→(P), (C)→(Q), (D)→(S)

3. The correct match between Item I and Item II is :-

Item I		Item II	
(A)	Ester test	(P)	Tyr
(B)	Carbylamine test	(Q)	Asp
(C)	Phthalein dye test	(R)	Ser
		(S)	Lys

(1) (A)→(Q); (B)→(S); (C)→(P)

(2) (A)→(R); (B)→(Q); (C)→(P)

(3) (A)→(Q); (B)→(S); (C)→(R)

(4) (A)→(R); (B)→(S); (C)→(Q)

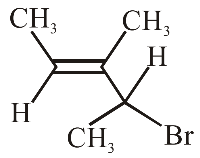
4. Hinsberg's reagent is :

(1) $C_6H_5SO_2Cl$ (2) C_6H_5COCl

(3) $SOCl_2$ (4) $(COCl)_2$

NOMENCLATURE

1. What is the IUPAC name of the following compound ?



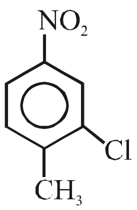
(1) 3-Bromo-1, 2-dimethylbut-1-ene]
(2) 4-Bromo-3-methylpent-2-ene
(3) 2-Bromo-3-methylpent-3-ene
(4) 3-Bromo-3-methyl-1, 2-dimethylprop-1-ene

2. The IUPAC name of the following compound is :

$$H_3C-\overset{CH_3}{\overset{|}{C}H}-\overset{OH}{\overset{|}{C}H}-CH_2-COOH$$

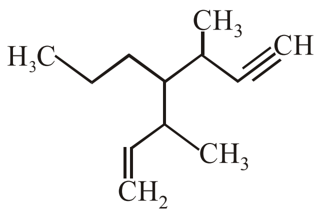
(1) 2-Methyl-3Hydroxypentan-5-oic acid
(2) 4,4-Dimethyl-3-hydroxy butanoic acid
(3) 3-Hydroxy-4 -methylpentanoic acid
(4) 4-Methyl-3-hydroxypentanoic acid

3. The correct IUPAC name of the following compound is :



(1) 5-chloro-4-methyl-1-nitrobenzene
(2) 2-methyl-5-nitro-1-chlorobenzene
(3) 3-chloro-4-methyl-1-nitrobenzene
(4) 2-chloro-1-methyl-4-nitrobenzene

4. The IUPAC name of the following compound is :



(1) 3,5-dimethyl-4-propylhept-6-en-1-yne
(2) 3-methyl-4-(3-methylprop-1-enyl)-1-heptyne
(3) 3-methyl-4-(1-methylprop-2-ynyl)-1-heptene
(4) 3,5-dimethyl-4-propylhept-1-en-6-yne

POLYMER

1. The two monomers for the synthesis of Nylone 6, 6 are :

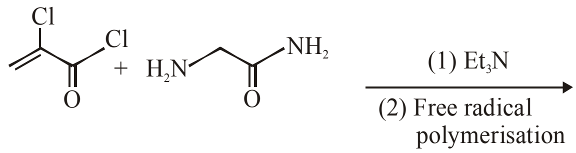
(1) $HOOC(CH_2)_6COOH$, $H_2N(CH_2)_6NH_2$

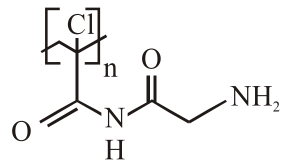
(2) $HOOC(CH_2)_4COOH$, $H_2N(CH_2)_4NH_2$

(3) $HOOC(CH_2)_6COOH$, $H_2N(CH_2)_4NH_2$

(4) $HOOC(CH_2)_4COOH$, $H_2N(CH_2)_6NH_2$

2. Major product of the following reaction is :



(1)


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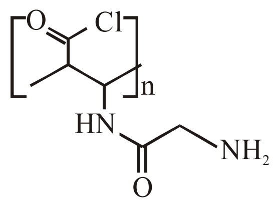
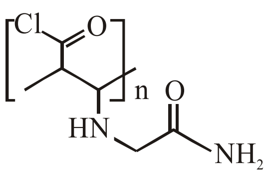
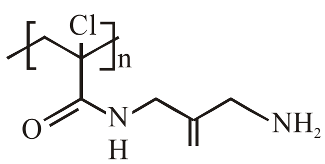
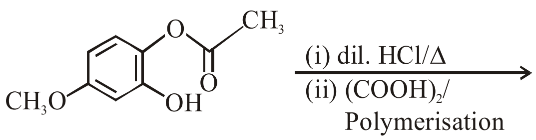
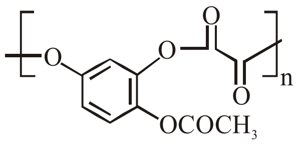


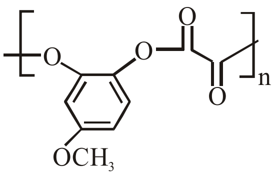
(3)


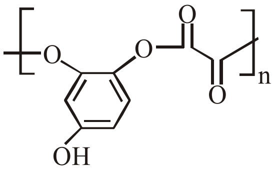
(4)


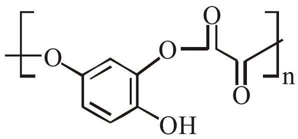
3. The major product of the following reaction is:



(1) 

(2) 

(3) 

(4) 

4. The homopolymer formed from 4-hydroxy-butanoic acid is :-

(1) $\left[\overset{\text{O}}{\overset{\|}{\text{C}}}(\text{CH}_2)_3\text{–O}\right]_n$ (2) $\left[\text{O}\overset{\text{O}}{\overset{\|}{\text{C}}}(\text{CH}_2)_3\text{–O}\right]_n$

(3) $\left[\overset{\text{O}}{\overset{\|}{\text{C}}}(\text{CH}_2)_2\overset{\text{O}}{\overset{\|}{\text{C}}}\text{–O}\right]_n$ (4) $\left[\overset{\text{O}}{\overset{\|}{\text{C}}}(\text{CH}_2)_2\overset{\text{O}}{\overset{\|}{\text{C}}}\right]_n$

5. The polymer obtained from the following reactions is :

(1) $\left[\overset{\text{O}}{\overset{\|}{\text{C}}}\text{–(CH}_2)_4\text{–}\overset{\text{H}}{\text{N}}\right]_n$ (2) $\left[\text{O–(CH}_2)_4\text{–}\overset{\text{O}}{\overset{\|}{\text{C}}}\right]_n$

(3) $\left[\text{HN}\overset{\text{O}}{\overset{\|}{\text{C}}}(\text{CH}_2)_4\text{–}\overset{\text{O}}{\overset{\|}{\text{C}}}\text{–}\overset{\text{H}}{\text{N}}\right]_n$ (4) $\left[\text{O}\overset{\text{O}}{\overset{\|}{\text{C}}}(\text{CH}_2)_4\text{O}\right]_n$

6. Poly-β-hydroxybutyrate-co-β-hydroxyvalerate(PHBV) is a copolymer of___.

(1) 3-hydroxybutanoic acid and 4-hydroxypentanoic acid

(2) 2-hydroxybutanoic acid and 3-hydroxypentanoic acid

(3) 3-hydroxybutanoic acid and 2-hydroxypentanoic acid

(4) 3-hydroxybutanoic acid and 3-hydroxypentanoic acid

7. The structure of Nylon-6 is :

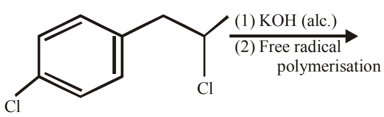
(1) $\left[(\text{CH}_2)_6-\overset{\text{O}}{\overset{\|}{\text{C}}}-\overset{\text{H}}{\overset{|}{\text{N}}}\right]_n$

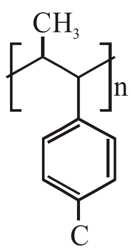
(2) $\left[(\text{CH}_2)_4-\overset{\text{O}}{\overset{\|}{\text{C}}}-\overset{\text{H}}{\overset{|}{\text{N}}}\right]_n$

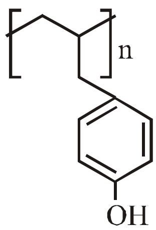
(3) $\left[\overset{\text{O}}{\overset{\|}{\text{C}}}-(\text{CH}_2)_5-\overset{\text{H}}{\overset{|}{\text{N}}}\right]_n$

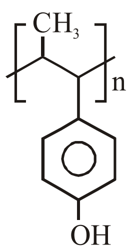
(4) $\left[\overset{\text{O}}{\overset{\|}{\text{C}}}-(\text{CH}_2)_6-\overset{\text{H}}{\overset{|}{\text{N}}}\right]_n$

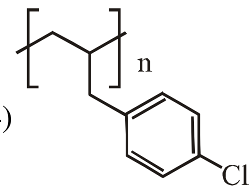
8. The major product of the following reaction is :



(1) 

(2) 

(3) 

(4) 

9. Which of the following compounds is a constituent of the polymer

$$\left[HN - \overset{\overset{\displaystyle O}{\|}}{C} - NH - CH_2 \right]_n ?$$

(1) Formaldehyde (2) Ammonia

(3) Methylamine (4) N-Methyl urea

10. Which of the following is a condensation polymer ?

(1) Buna - S (2) Nylon 6, 6

(3) Teflon (4) Neoprene

11. The correct match between Item-I and Item-II is:

	Item-I		Item-II
(a)	High density polythene	(I)	Peroxide catalyst
(b)	Polyacrylonitrile	(II)	Condensation at high temperature & pressure
(c)	Novolac	(III)	Ziegler-Natta Catalyst
(d)	Nylon 6	(IV)	Acid or base catalyst

(1) (a)→(III), (b)→(I), (c)→(II), (d)→(IV)

(2) (a)→(IV), (b)→(II), (c)→(I), (d)→(III)

(3) (a)→(II), (b)→(IV), (c)→(I), (d)→(III)

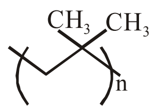
(4) (a)→(III), (b)→(I), (c)→(IV), (d)→(II)

12. Which of the following is a thermosetting polymer?

(1) Buna–N (2) PVC

(3) Bakelite (4) Nylon 6

13. The correct name of the following polymer is:



(1) Polyisoprene

(2) Polytert-butylene

(3) Polyisobutane

(4) Polyisobutylene

CHEMISTRY IN EVERYDAY LIFE

1. The correct match between Item(I) and Item(II) is :

Item-I	Item-II
(A) Nortehindrone	(P) Anti-biotic
(B) Ofloxacin	(Q) Anti-fertility
(C) Equanil	(R) Hypertension
	(S) Analgesics

(1) A-R, B-P, C-S

(2) A-Q, B-P, C-R

(3) A-R, B-P, C-R

(4) A-Q, B-R, C-S

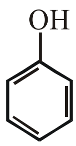
2. Noradrenaline is a /an

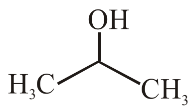
(1) Neurotransmitter (2) Antidepressant

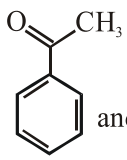
(3) Antihistamine (4) Antacid

PHENOL

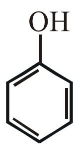
1. The product formed in the reaction of cumene with O_2 followed by treatment with dil. HCl are :

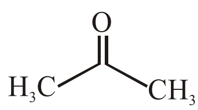
(1) 

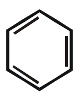
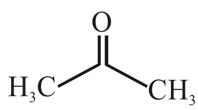
and 

(2) 

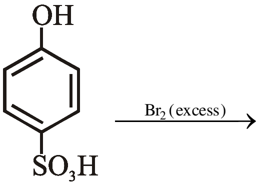
and $CH_3 - OH$

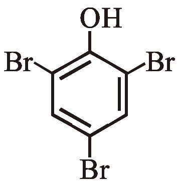
(3) 

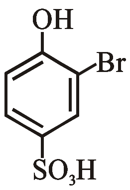
and 

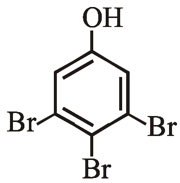
(4) 
and 

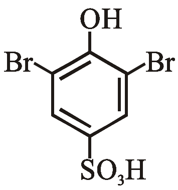
2. The major product of the following reaction is :



(1) 

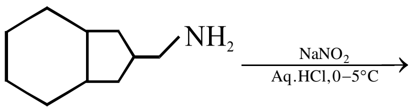
(2) 

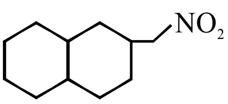
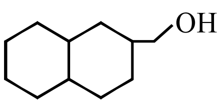
(3) 

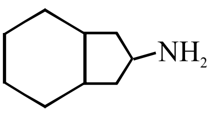
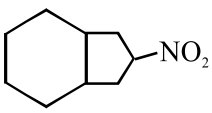
(4) 

AMINE

1. The major product formed in the reaction given below will be :



(1) 
(2) 

(3) 
(4) 

2. A compound 'X' on treatment with Br_2/NaOH, provided C_3H_9N, which gives positive carbylamine test. Compound 'X' is :-

(1) $CH_3COCH_2NHCH_3$

(2) $CH_3CH_2COCH_2NH_2$

(3) $CH_3CH_2CH_2CONH_2$

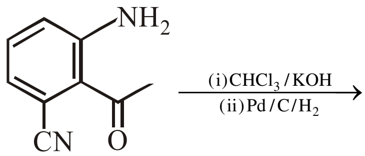
(4) $CH_3CON(CH_3)_2$

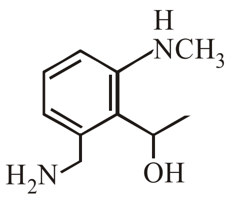
3. Which of the following amines can be prepared by Gabriel phthalimide reaction ?

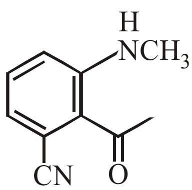
(1) Neo-pentylamine (2) n-butylamine

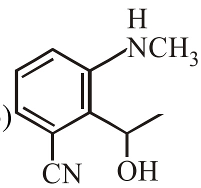
(3) triethylamine (4) t-butylamine

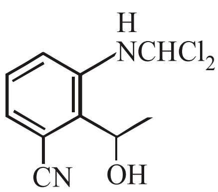
4. The major product obtained in the following reaction is :



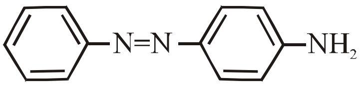
(1) 

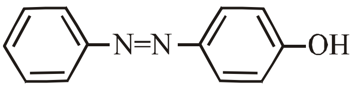
(2) 

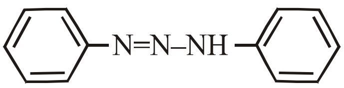
(3) 

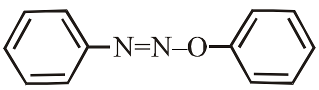
(4) 

5. Aniline dissolved in dilute HCl is reacted with sodium nitrite at 0°C. This solution was added dropwise to a solution containing equimolar mixture of aniline and phenol in dil. HCl. The structure of the major product is :

(1) 

(2) 

(3) 

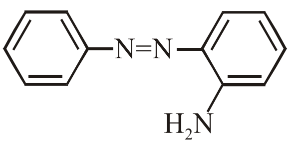
(4) 

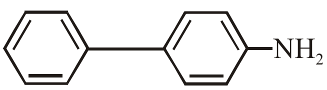
6. Ethylamine ($C_2H_5NH_2$) can be obtained from N-ethylphthalimide on treatment with :

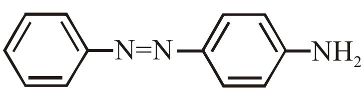
(1) $NaBH_4$ (2) CaH_2

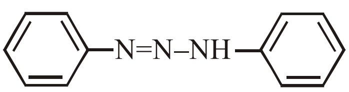
(3) H_2O (4) NH_2NH_2

7. Benzene diazonium chloride on reaction with aniline in the presence of dilute hydrochloric acid gives :

(1) 

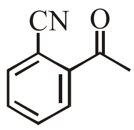
(2) 

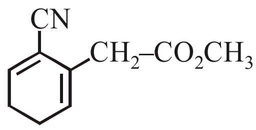
(3) 

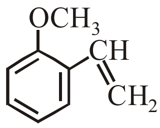
(4) 

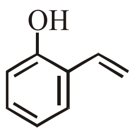
ORGANO METALIC

1. Which of the following compounds reacts with ethylmagnesium bromide and also decolourizes bromine water solution :-

(1) 

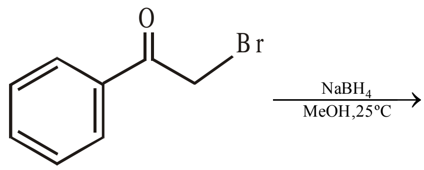
(2) 

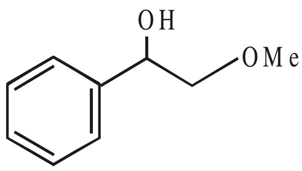
(3) 

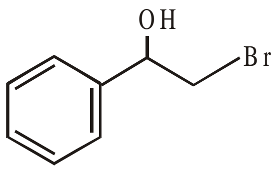
(4) 

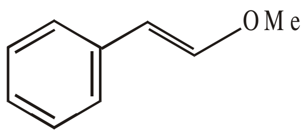
REDUCTION

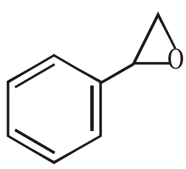
1. The major product of the following reaction is:



(1) 

(2) 

(3) 

(4) 

2. The major product of the following reaction is :

$CH_3CH = CHCO_2CH_3 \xrightarrow{LiAlH_4}$

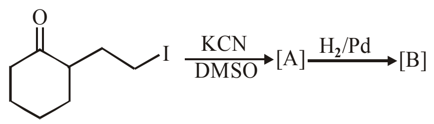
(1) $CH_3CH_2CH_2CHO$

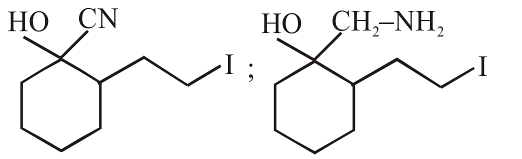
(2) $CH_3CH = CHCH_2OH$

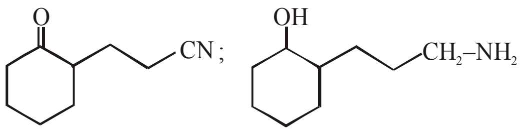
(3) $CH_3CH_2CH_2CO_2CH_3$

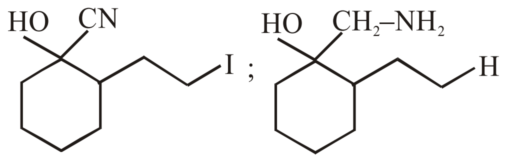
(4) $CH_3CH_2CH_2CH_2OH$

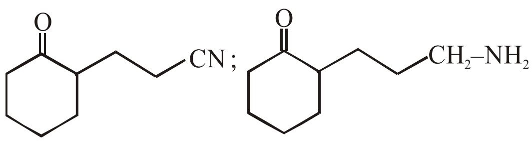
3. The major products A and B for the following reactions are, respectively:



(1) 

(2) 

(3) 

(4) 

4. Which of the following is NOT a correct method of the preparation of benzylamine from cyanobenzene ?

(1) (i) HCl/H_2O (ii) $NaBH_4$

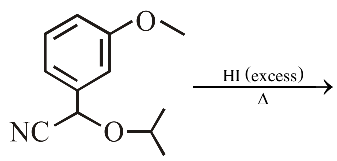
(2) (i) $LiAlH_4$ (ii) H_3O^+

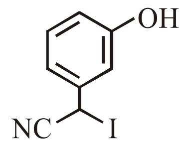
(3) (i) $SnCl_2$+HCl(gas) (ii) $NaBH_4$

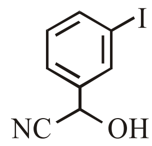
(4) H_2/Ni

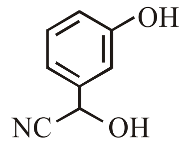
ALCOHOL & ETHER

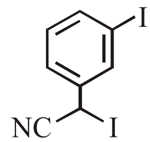
1. The major product of the following reaction is :



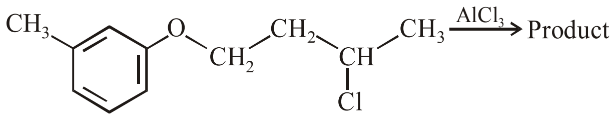
(1) 

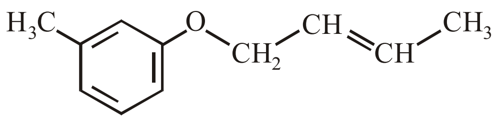
(2) 

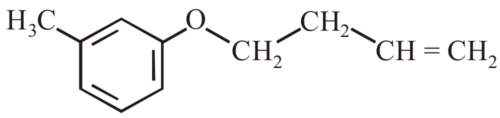
(3) 

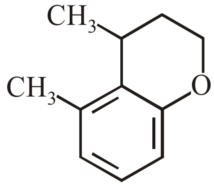
(4) 

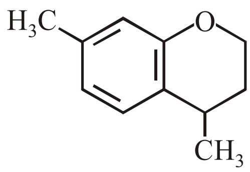
2. The major product obtained in the given reaction is :-



(1) 

(2) 

(3) 

(4) 

ANSWER KEY

GOC

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	1	4	4	1	4	1	2	2	1
Que.	11	12	13							
Ans.	1	1	2							

CARBONYL COMPOUND

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	1	1	3	4	2	4	1	2	4	3
Que.	11	12	13	14	15	16	17	18	19	
Ans.	4	1	4	4	4	1	4	1	2	

CAD

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	3	4	2	2	2	2	1	4	1

BIOMOLECULE

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	4	3	3	1	1	2	4	2	2	1
Que.	11	12	13	14						
Ans.	1	1	3	1						

HALOGEN DERIVATIVE

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	2	4	Bonus	4	1	4	4	3	4
Que.	11	12	13	14	15	16	17			
Ans.	3	3	1	3	2	4	4			

HYDROCARBON

Que.	1	2	3	4	5
Ans.	4	2	2	1	2

AROMATIC

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	2	3	2	4	4	1	2	3	1	3
Que.	11	12	13	14	15	16	17	18		
Ans.	4	3	1	3	3	3	3	4		

ALKAYLE HALIDE

Que.	1	2	3	4
Ans.	4	3	4	1

GRIGNARD REAGENT

Que.	1	2
Ans.	2	1

POC

Que.	1	2	3	4
Ans.	2	1	1	1

NOMENCLATURE				
Que.	1	2	3	4
Ans.	2	3	4	4

POLYMER										
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	4	4	2	1	2	4	3	1	1	2
Que.	11	12	13							
Ans.	4	3	4							

CHEMISTRY IN EVERYDAY LIFE		
Que.	1	2
Ans.	2	1

PHENOL		
Que.	1	2
Ans.	3	1

AMINE							
Que.	1	2	3	4	5	6	7
Ans.	Bonus	3	2	1	1	4	3

ORGANO METALIC	
Que.	1
Ans.	4

REDUCTION				
Que.	1	2	3	4
Ans.	4	2	2	1

ALCOHOL & ETHER		
Que.	1	2
Ans.	1	4

JANUARY & APRIL 2019 ATTEMPT (IOC)

COORDINATION COMPOUND

1. The metal d-orbitals that are directly facing the ligands in $K_3[Co(CN)_6]$ are :

(1) d_{xz}, d_{yz} and d_{z^2}

(2) d_{xy}, d_{xz} and d_{yz}

(3) d_{xy} and $d_{x^2-y^2}$

(4) $d_{x^2-y^2}$ and d_{z^2}

2. $Mn_2(CO)_{10}$ is an organometallic compound due to the presence of :

(1) Mn – Mn bond

(2) Mn – C bond

(3) Mn – O bond

(4) C – O bond

3. The pair of metal ions that can give a spin only magnetic moment of 3.9 BM for the complex $[M(H_2O)_6]Cl_2$, is :

(1) Cr^{2+} and Mn^{2+}

(2) V^{2+} and Co^{2+}

(3) V^{2+} and Fe^{2+}

(4) Co^{2+} and Fe^{2+}

4. The magnetic moment of an octahedral homoleptic Mn(II) complex is 5.9 BM. The suitable ligand for this complex is :

(1) CN^- (2) NCS^-

(3) CO (4) ethylenediamine

5. The coordination number of Th in $K_4[Th(C_2O_4)_4(OH_2)_2]$ is :-

$\left(C_2O_4^{2-} = \text{Oxalato}\right)$

(1) 6 (2) 10 (3) 14 (4) 8

6. The number of bridging CO ligand (s) and Co-Co bond (s) in $Co_2(CO)_8$, respectively are :-

(1) 0 and 2 (2) 2 and 0

(3) 4 and 0 (4) 2 and 1

7. The total number of isomers for a square planar complex $[M(F)(Cl)(SCN)(NO_2)]$ is :

(1) 12 (2) 8 (3) 16 (4) 4

8. Wilkinson catalyst is :

(1) $[(Ph_3P)_3RhCl]$ ($Et = C_2H_5$)

(2) $[Et_3P)_3IrCl]$

(3) $[Et_3P)_3RhCl]$

(4) $[Ph_3P)_3IrCl]$

9. Two complexes $[Cr(H_2O_6)Cl_3]$ (A) and $[Cr(NH_3)_6]Cl_3$ (B) are violet and yellow coloured, respectively. The incorrect statement regarding them is :

(1) Δ_0 value of (A) is less than that of (B).

(2) Δ_0 value of (A) and (B) are calculated from the energies of violet and yellow light, respectively

(3) Bothe absorb energies corresponding to their complementary colors.

(4) Bothe are paramagnetic with three unpaired electrons.

10. The highest value of the calculated spin only magnetic moment (in BM) among all the transition metal complexs is :

(1) 5.92 (2) 3.87

(3) 6.93 (4) 4.90

11. The complex thai has highest crystal field splitting energy (Δ), is :

(1) $K_3[Co(CN)_6]$

(2) $[Co(NH_3)_5(H_2O)]Cl_3$

(3) $K_2[CoCl_4]$

(4) $[Co(NH_3)_5Cl]Cl_2$

12. The difference in the number of unpaired electrons of a metal ion in its high-spin and low-spin octahedral complexes is two. The metal ion is :

(1) Fe^{2+} (2) Co^{2+}

(3) Mn^{2+} (4) Ni^{2+}

13. A reaction of cobalt(III) chloride and ethylenediamine in a 1 : 2 mole ratio generates two isomeric products A (violet coloured) B (green coloured). A can show optial actively, B is optically inactive. What type of isomers does A and B represent ?

(1) Geometrical isomers

(2) Ionisation isomers

(3) Coordination isomers

(4) Linkage isomers

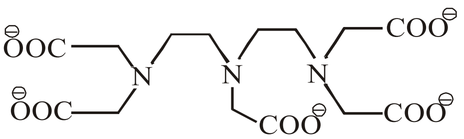
14. The compound used in the treatment of lead poisoning is :
(1) EDTA (2) Cis-platin
(3) D-penicillamine (4) desferrioxime B

15. The coordination numbers of Co and Al in $[Co(Cl)(en)_2]Cl$ and $K_3[Al(C_2O_4)_3]$, respectively, are :
(en=ethane-1,2-diamine)
(1) 3 and 3 (2) 6 and 6
(3) 5 and 6 (4) 5 and 3

16. The crystal fied stabilization energy (CFSE) of $[Fe(H_2O)_6]Cl_2$ and $K_2[NiCl_4]$, respectively, are :-
(1) $-0.4\Delta_O$ and $-0.8\Delta_t$
(2) $-0.4\Delta_O$ and $-1.2\Delta_t$
(3) $-2.4\Delta_O$ and $-1.2\Delta_t$
(4) $-0.6\Delta_O$ and $-0.8\Delta_t$

17. The INCORRECT statement is :
(1) the spin-only magnetic moments of $[Fe(H_2O)_6]^{2+}$ and and $[Cr(H_2O)_6]^{2+}$ are nearly similar.
(2) the spin-only magnetic moment of $[Ni(NH_3)_4(H_2O)_2]^{2+}$ is 2.83BM.
(3) the gemstone, ruby, has Cr^{3+} ions occupying the octahedral sites of beryl.
(4) the color of $[CoCl(NH_3)_5]^{2+}$ is violet as it absorbs the yellow light.

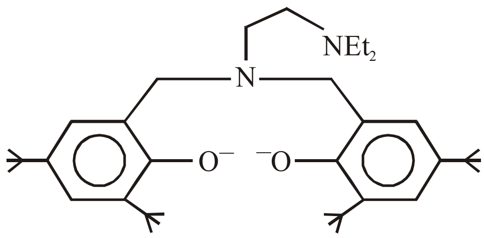
18. The maximum possible denticities of a ligand given below towards a common transition and inner-transition metal ion, respectively, are :



(1) 6 and 8 (2) 8 and 6
(3) 8 and 8 (4) 6 and 6

19. The compound that inhibits the growth of tumors is :
(1) cis-$[Pd(Cl)_2(NH_3)_2]$
(2) cis-$[Pt(Cl)_2(NH_3)_2]$
(3) trans-$[Pt(Cl)_2(NH_3)_2]$
(4) trans-$[Pd(Cl)_2(NH_3)_2]$

20. The following ligand is



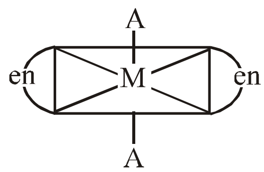
(1) Bidentate (2) Hexadentate
(3) Tetradentate (4) Tridentate

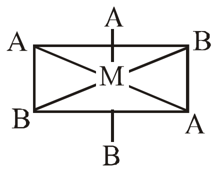
21. The correct order of the spin-only magnetic moment of metal ions in the following low spin complexes, $[V(CN)_6]^{4-}$, $[Fe(CN)_6]^{4-}$, $[Ru(NH_3)_6]^{3+}$, and $[Cr(NH_3)_6]^{2+}$, is :
(1) $V^{2+} > Cr^{2+} > Ru^{3+} > Fe^{2+}$
(2) $V^{2+} > Ru^{3+} > Cr^{2+} > Fe^{2+}$
(3) $Cr^{2+} > V^{2+} > Ru^{3+} > Fe^{2+}$
(4) $Cr^{2+} > Ru^{3+} > Fe^{2+} > V^{2+}$

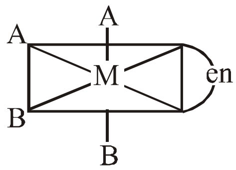
22. The calculated spin-only magnetic moments (BM) of the anionic and cationic species of $[Fe(H_2O)_6]_2$ and $[Fe(CN)_6]$, respectively, are :
(1) 4.9 and 0 (2) 2.84 and 5.92
(3) 0 and 4.9 (4) 0 and 5.92

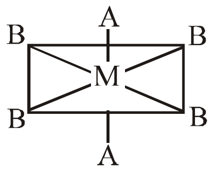
23. The degenerate orbitals of $[Cr(H_2O)_6]^{3+}$ are :
(1) d_{yz} and d_{z^2} (2) d_{z^2} and d_{xz}
(3) d_{xz} and d_{yz} (4) $d_{x^2-y^2}$ and d_{xy}

24. The one that will show optical activity is :
(en = ethane-1,2-diamine)

(1)


(2)


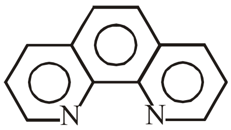
(3)


(4)


25. The species that can have a trans-isomer is :
(en = ethane-1, 2-diamine, ox = oxalate)
(1) $[Pt(en)Cl_2]$ (2) $[Cr(en)_2(ox)]^+$
(3) $[Zn(en)Cl_2]$ (4) $[Pt(en)_2Cl_2]^{2+}$

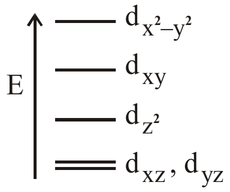
26. Three complexes,
$[CoCl(NH_3)_5]^{2+}$ (I),
$[Co(NH_3)_5H_2O]^{3+}$ (II) and
$[Co(NH_3)_6]^{3+}$ (III)
absorb light in the visible region. The correct order of the wavelength of light absorbed by them is :
(1) (III) > (I) > (II) (2) (I) > (II) > (III)
(3) (II) > (I) > (III) (4) (III) > (II) > (I)

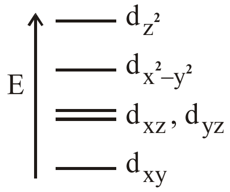
27. The complex ion that will lose its crystal field stabilization energy upon oxidation of its metal to +3 state is

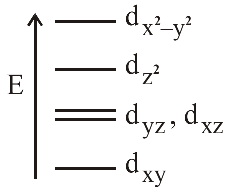
(Phen = 

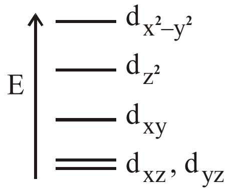
and ignore pairing energy)
(1) $[Fe(phen)_3]^{2+}$ (2) $[Zn(phen)_3]^{2+}$
(3) $[Ni(phen)_3]^{2+}$ (4) $[Co(phen)_3]^{2+}$

28. Complete removal of both the axial ligands (along the z-axis) from an octahedral complex leads to which of the following splitting patterns? (relative orbital energies not on scale).

(1) 

(2) 

(3) 

(4) 

CHEMICAL BONDING

1. The element that shows greater ability to form pπ-pπ multiple bonds, is :
(1) Si (2) Ge (3) Sn (4) C

2. The element that does NOT show catenation is:
(1) Sn (2) Ge (3) Si (4) Pb

3. The chloride that CANNOT get hydrolysed is :
(1) $SiCl_4$ (2) $SnCl_4$ (3) $PbCl_4$ (4) CCl_4

4. The relative stability of +1 oxidation state of group 13 elements follows the order :-
(1) Al < Ga < Tl < In
(2) Tl < In < Ga < Al
(3) Al < Ga < In < Tl
(4) Ga < Al < In < Tl

5. The hydride that is NOT electron deficient is :-
(1) B_2H_6 (2) AlH_3 (3) SiH_4 (4) GaH_3

6. The type of hybridisation and number of lone pair(s) of electrons of Xe in $XeOF_4$, respectively, are :
(1) sp^3d and 1 (2) sp^3d and 2
(3) sp^3d^2 and 1 (4) sp^3d^2 and 2

7. Two pi and half sigma bonds are present in:
(1) N_2^+ (2) N_2 (3) O_2^+ (4) O_2

8. The pair that contains two P–H bonds in each of the oxoacids is :
(1) H_3PO_2 nad $H_4P_2O_5$
(2) $H_4P_2O_5$ and $H_4P_2O_6$
(3) H_3PO_3 and H_3PO_2
(4) $H_4P_2O_5$ nad H_3PO_3

9. According to molecular orbital theory, which of the following is true with respect to Li_2^+ and Li_2^-?
(1) Both are unstable
(2) Li_2^+ is unstable and Li_2^- is stable
(3) Li_2^+ is stable and Li_2^- is unstable
(4) Both are stable

10. C_{60}, an allotrope of carbon contains :
(1) 20 hexagons and 12 pentagons.
(2) 12 hexagons and 20 pentagons.
(3) 18 hexagons and 14 pentagons.
(4) 16 hexagons and 16 pentagons.

11. Aluminium is usually found in +3 oxidation stagte. In contarast, thallium exists in +1 and +3 oxidation states. This is due to :
(1) lanthanoid contraction
(2) lattice effect
(3) diagonal relationship
(4) inert pair effect

12. Good reducing nature of H_3PO_2 attributed to the presence of:
(1) One P-OH bond (2) One P-H bond
(3) Two P-H bonds (4) Two P-OH bonds

13. In which of the following processes, the bond order has increased and paramagnetic character has changed to diamagnetic ?
(1) $N_2 \rightarrow N_2^+$ (2) $NO \rightarrow NO^+$
(3) $O_2 \rightarrow O_2^{2-}$ (4) $O_2 \rightarrow O_2^+$

14. The number of 2-centre-2-electron and 3-centre-2-electron bonds in B_2H_6, respectively, are :
(1) 2 and 4 (2) 2 and 1
(3) 2 and 2 (4) 4 and 2

15. The C–C bond length is maximum in
(1) graphite (2) C_{70}
(3) diamond (4) C_{60}

16. The correct sequence of thermal stability of the following carbonates is
(1) $BaCO_3 < CaCO_3 < SrCO_3 < MgCO_3$
(2) $MgCO_3 < CaCO_3 < SrCO_3 < BaCO_3$
(3) $BaCO_3 < SrCO_3 < CaCO_3 < MgCO_3$
(4) $MgCO_3 < SrCO_3 < CaCO_3 < BaCO_3$

17. The correct statement among the following is
(1) $(SiH_3)_3N$ is pyramidal and more basic than $(CH_3)_3N$
(2) $(SiH_3)_3N$ is planar and more basic than $(CH_3)_3N$
(3) $(SiH_3)_3N$ is pyramidal and less basic than $(CH_3)_3N$
(4) $(SiH_3)_3N$ is planar and less basic than $(CH_3)_3N$

18. The basic structural unit of feldspar, zeolites, mica, and asbestos is :
(1) $(SiO_3)^{2-}$ (2) SiO_2
(3) $(SiO_4)^{4-}$ (4) $-\!\!\left(\underset{R}{\overset{R}{|}}\!\!Si\!-\!O\right)\!\!-_n$ (R=Me)

19. The number of pentagons in C_{60} and trigons (triangles) in white phosphorus, respectively, are:
(1) 12 and 3 (2) 20 and 4
(3) 12 and 4 (4) 20 and 3

20. The ion that has sp^3d^2 hybridization for the central atom, is :
(1) $[ICl_2]^-$ (2) $[IF_6]^-$
(3) $[ICl_4]^-$ (4) $[BrF_2]^-$

21. The covalent alkaline earth metal halide (X = Cl, Br, I) is :
(1) CaX_2 (2) SrX_2
(3) BeX_2 (4) MgX_2

22. Among the following molecules / ions,
$C_2^{2-}, N_2^{2-}, O_2^{2-}, O_2$
which one is diamagnetic and has the shortest bond length?
(1) C_2^{2-} (2) N_2^{2-} (3) O_2 (4) O_2^{2-}

23. The correct statement about ICl_5 and ICl_4^- is
(1) ICl_5 is trigonal bipyramidal and ICl_4^- is tetrahedral.
(2) ICl_5 is square pyramidal and ICl_4^- is tetrahedral.
(3) ICl_5 is square pyramidal and ICl_4^- is square planar.
(4) Both are isostructural.

24. The correct order of the oxidation states of nitrogen in NO, N_2O, NO_2 and N_2O_3 is :
(1) $NO_2 < N_2O_3 < NO < N_2O$
(2) $NO_2 < NO < N_2O_3 < N_2O$
(3) $N_2O < N_2O_3 < NO < NO_2$
(4) $N_2O < NO < N_2O_3 < NO_2$

25. Among the following, the molecule expected to be stabilized by anion formation is :
C_2, O_2, NO, F_2
(1) NO (2) C_2 (3) F_2 (4) O_2

26. The number of water molecule(s) not coordinated to copper ion directly in $CuSO_4.5H_2O$, is :
(1) 4 (2) 3 (3) 1 (4) 2

27. Among the following species, the diamagnetic molecule is

(1) O_2 (2) NO

(3) B_2 (4) CO

28. The structures of beryllium chloride in the solid state and vapour, phase, respectively,are :

(1) chain and dimeric (2) chain and chain

(3) dimeric and dimeric (4) dimeric and chain

29. HF has highest boiling point among hydrogen halides, because it has :

(1) lowest dissociation enthalpy

(2) strongest van der Waals' interactions

(3) strongest hydrogen bonding

(4) lowest ionic character

30. The correct statements among I to III are :

(I) Valence bond theory cannot explain the color exhibited by transition metal complexes.

(II) Valence bond theory can predict quantitatively the magnetic properties of transtition metal complexes.

(III) Valence bond theory cannot distinguish ligands as weak and strong field ones.

(1) (I) and (II) only

(2) (I), (II) and (III)

(3) (I) and (III) only

(4) (II) and (III) only

31. The oxoacid of sulphur that does not contain bond between sulphur atoms is :

(1) $H_2S_4O_6$ (2) $H_2S_2O_7$

(3) $H_2S_2O_3$ (4) $H_2S_2O_4$

32. During the change of O_2 to O_2^-, the incoming electron goes to the orbital :

(1) $\sigma^*\ ^2P_z$ (2) $\pi\ ^2P_y$

(3) $\pi^*\ ^2P_x$ (4) $\pi\ ^2P_x$

S-BLOCK

1. A metal on combustion in excess air forms X, X upon hydrolysis with water yields H_2O_2 and O_2 along with another product. The metal is :

(1) Rb (2) Na (3) Mg (4) Li

2. Match the following items in column I with the corresponding items in column II.

	Column I		Column II
(i)	$Na_2CO_3 \cdot 10\ H_2O$	(P)	Portland cement ingredient
(ii)	$Mg(HCO_3)_2$	(Q)	Castner-Keller process
(iii)	NaOH	(R)	Solvay process
(iv)	$Ca_3Al_2O_6$	(S)	Temporary hardness

(1) (i)→(C); (ii)→(B); (iii)→(D); (iv)→(A)

(2) (i)→(C); (ii)→(D); (iii)→(B); (iv)→(A)

(3) (i)→(D); (ii)→(A); (iii)→(B); (iv)→(C)

(4) (i)→(B); (ii)→(C); (iii)→(A); (iv)→(D)

3. The metal used for making X-ray tube window is :

(1) Mg (2) Na (3) Ca (4) Be

4. The alkaline earth metal nitrate that does not crystallise with water molecules, is :

(1) $Sr(NO_3)_2$ (2) $Mg(NO_3)_2$

(3) $Ca(NO_3)_2$ (4) $Ba(NO_3)_2$

5. The metal that forms nitride by reacting directly with N_2 of air, is :

(1) K (2) Cs (3) Li (4) Rb

6. Sodium metal on dissolution in liquid ammonia gives a deep blue solution due to the formation of:

(1) sodium ion-ammonia complex

(2) sodamide

(3) sodium-ammonia complex

(4) ammoniated electrons

7. Magnisium powder burns in air to give:

(1) MgO only

(2) MgO and $Mg(NO_3)_2$

(3) MgO and Mg_3N_2

(4) $Mg(NO_3)_2$ and Mg_3N_2

8. A hydrated solid X on heating initially gives a monohydrated compound Y. Y upon heating above 373K leads to an anhydrous white powder Z. X and Z, respectively, are:

(1) Washing soda and soda ash.

(2) Washing soda and dead burnt plaster.

(3) Baking soda and dead burnt plaster.

(4) Baking soda and soda ash.

9. The temporary hardness of a water sample is due to compound X. Boiling this sample converts X to compound Y. X and Y, respectively, are :

(1) $Ca(HCO_3)_2$ and CaO

(2) $Mg(HCO_3)_2$ and $MgCO_3$

(3) $Mg(HCO_3)_2$ and $Mg(OH)_2$

(4) $Ca(HCO_3)_2$ and $Ca(OH)_2$

10. The INCORRECT statement is :

(1) Lithium is least reactive with water among the alkali metals.

(2) LiCl crystallises from aqueous solution as $LiCl.2H_2O$.

(3) Lithium is the strongest reducing agent among the alkali metals.

(4) $LiNO_3$ decomposes on heating to give $LiNO_2$ and O_2.

PERIODIC TABLE

1. The element with Z = 120 (not yet discovered) will be an/a :

(1) transition metal

(2) inner-transition metal

(3) alkaline earth metal

(4) alkali metal

2. The correct order of atomic radii is :

(1) Ce > Eu > Ho > N

(2) N > Ce > Eu > Ho

(3) Eu > Ce > Ho > N

(4) Ho > N > Eu > Ce

3. The amphoteric hydroxide is :

(1) $Ca(OH)_2$ (2) $Be(OH)_2$

(3) $Sr(OH)_2$ (4) $Mg(OH)_2$

4. The correct order of the atomic radii of C, Cs, Al and S is :

(1) S < C < Al < Cs

(2) S < C < Cs < Al

(3) C < S < Cs < Al

(4) C < S < Al < Cs

5. The correct option with respect to the Pauling electronegativity values of the elements is :-

(1) Ga < Ge (2) Si < Al

(3) P > S (4) Te > Se

6. The effect of lanthanoid contraction in the lanthanoid series of elements by and large means :

(1) decrease in both atomic and ionic radii

(2) increase in atomic radii and decrease in ionic radii

(3) increase in both atomic and ionic radii

(4) decrease in atomic radii and increase in ionic radii

7. The electronegativity of aluminium is similar to :

(1) Boron (2) Carbon

(3) Lithium (4) Beryllium

8. In general, the properties that decrease and increase down a group in the periodic table, respectively, are :

(1) electronegativity and electron gain enthalpy.

(2) electronegativity and atomic radius.

(3) atomic radius and electronegativity.

(4) electron gain enthalpy and electronegativity.

9. When the first electron gain enthalpy ($\Delta_{eg}H$) of oxygen is –141 kJ/mol, its second electron gain enthalpy is :

(1) almost the same as that of the first

(2) negative , but less negative than the first

(3) a positive value

(4) a more negative value than the first

10. The pair that has similar atomic radii is :

(1) Sc and Ni (2) Ti and HF

(3) Mo and W (4) Mn and Re

11. In comparison to boron, berylium has :

(1) lesser nuclear charge and greater first ionisation enthalpy

(2) lesser nuclear charge and lesser first ionisation enthalpy

(3) greater nuclear charge and greater first ionisation enthalpy

(4) greater nuclear charge and lesser first ionisation enthalpy

12. The group number, number of valence electrons, and valency of an element with atomic number 15, respectively, are
(1) 16, 5 and 2 (2) 16, 6 and 3
(3) 15, 5 and 3 (4) 15, 6 and 2

13. The highest possible oxidation states of uranium and plutonium, respectively, are :-
(1) 6 and 4 (2) 7 and 6
(3) 4 and 6 (4) 6 and 7

14. The noble gas that does NOT occur in the atmosphere is:
(1) He (2) Ra (3) Ne (4) Kr

15. The correct order of the first ionization enthalpies is:
(1) Mn < Ti < Zn < Ni
(2) Ti < Mn < Ni < Zn
(3) Zn < Ni < Mn < Ti
(4) Ti < Mn < Zn < Ni

16. The correct order of hydration enthalpies of alkali metal ions is -
(1) $Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$
(2) $Li^+ > Na^+ > K^+ > Cs^+ > Rb^+$
(3) $Na^+ > Li^+ > K^+ > Rb^+ > Cs^+$
(4) $Na^+ > Li^+ > K^+ > Cs^+ > Rb^+$

17. The IUPAC symbol for the element with atomic number 119 would be :
(1) unh (2) uun (3) une (4) uue

18. The size of the iso-electronic species Cl^-, Ar and Ca^{2+} is affected by -
(1) Principal quantum number of valence shell
(2) Nuclear charge
(3) Azimuthal qunatum number of valence shell
(4) Electron-electron interaction in the outer orbitals

19. The element having greatest difference between its first and second ionization energies, is :
(1) Ca (2) K (3) Ba (4) Sc

METALLURGY

1. In the Hall-Heroult process, aluminium is formed at the cathode. The cathode is made out of :
(1) Platinum (2) Carbon
(3) Pure aluminium (4) Copper

2. The pair that does NOT require calcination is:
(1) ZnO and MgO
(2) Fe_2O_3 and $CaCO_3.MgCO_3$
(3) ZnO and $Fe_2O_3.xH_2O$
(4) $ZnCO_3$ and CaO

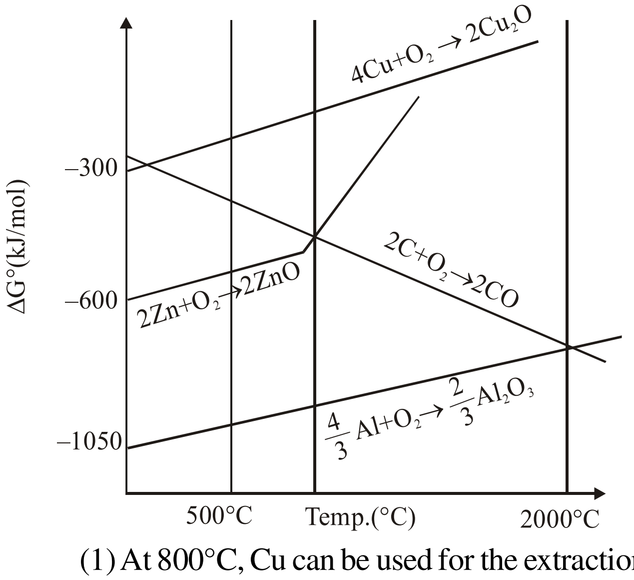
3. Match the ores(Column A) with the metals (column B) :

Column-A	***Column-B***
Ores	***Metals***
(I) Siderite	(a) Zinc
(II) Kaolinite	(b) Copper
(III) Malachite	(c) Iron
(IV) Calamine	(d) Aluminium

(1) I-b ; II-c ; III-d ; IV-a
(2) I-c ; II-d ; III-a ; IV-b
(3) I-c ; II-d ; III-b ; IV-a
(4) I-a ; II-b ; III-c ; IV-d

4. The ore that contains both iron and copper is:
(1) malachite (2) dolomite
(3) azurite (4) copper pyrites

5. The correct statement regarding the given Ellingham diagram is:



(1) At 800°C, Cu can be used for the extraction of Zn from ZnO
(2) At 500 C, coke can be used for the extraction of Zn from ZnO
(3) Coke cannot be used for the extraction of Cu from Ca_2O.
(4) At 1400°C, Al can be used for the extraction of Zn from ZnO

6. The reaction that does NOT define calcination is :-

(1) $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2$

(2) $Fe_2O_3 \cdot XH_2O \xrightarrow{\Delta} Fe_2O_3 + XH_2O$

(3) $CaCO_3 \cdot MgCO_3 \xrightarrow{\Delta} CaO + MgO + 2\,CO_2$

(4) $2\,Cu_2S + 3\,O_2 \xrightarrow{\Delta} 2\,Cu_2O + 2\,SO_2$

7. Hall-Heroult's process is given by "

(1) $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr$

(2) Cu^{2+} (aq.) + H_2(g) $\rightarrow$ Cu(s) + $2H^+$ (aq)

(3) $ZnO + C \xrightarrow{\text{Coke, 1673K}} Zn + CO$

(4) $2Al_2O_3 + 3C \rightarrow 4Al + 3CO_2$

8. The idea of froth floatation method came from a person X and this method is related to the process Y of ores. X and Y, respectively, are:

(1) fisher woman and concentration
(2) washer man and reduction
(3) washer woman and concentration
(4) fisher man and reduction

9. The correct statement is :

(1) leaching of bauxite using concentrated NaOH solution gives sodium aluminate and sodium silicate
(2) the blistered appearance of copper during the metallurgical process is due to the evolution of CO_2
(3) pig iron is obtained from cast iron
(4) the Hall-Heroult process is used for the production of aluminium and iron

10. The correct statement is :

(1) zincite is a carbonate ore
(2) aniline is a froth stabilizer
(3) zone refining process is used for the refining of titanium
(4) sodium cyanide cannot be used in the metallurgy of silver

11. With respect to an ore, Ellingham diagram helps to predict the feasibility of its -

(1) Vapour phase refining
(2) Zone refining
(3) Electrolysis
(4) Thermal reduction

12. The Mond process is used for the

(1) extraction of Mo
(2) Purification of Ni
(3) Purification of Zr and Ti
(4) Extraction of Zn

13. The ore that contains the metal in the form of fluoride is :

(1) magnetite (2) sphalerite
(3) malachite (4) cryolite

14. The one that is not a carbonate is :

(1) bauxite (2) siderite
(3) calamine (4) malachite

15. **Assertion:** For the extraction of iron, haematite ore is used.

Reason: Haematite is a carbonate ore of iron.

(1) Only the reason is correct.
(2) Both the assertion and reason are correct and the reason is the correct explanation for the assertion.
(3) Only the assertion is correct.
(4) Both the assertion and reason are correct, but the reason is not the correct explanation for the assertion.

16. Match the refining methods (Column I) with metals (Column II).

Column I (Refining methods)	Column II (Metals)
(I) Liquation	(a) Zr
(II) Zone Refining	(b) Ni
(III) Mond Process	(c) Sn
(IV) Van Arkel Method	(d) Ga

(1) (I) – (b); (II) – (c); (III) – (d); (IV) – (a)
(2) (I) – (b); (II) – (d); (III) – (a); (IV) – (c)
(3) (I) – (c); (II) – (a); (III) – (b); (IV) – (d)
(4) (I) – (c); (II) – (d); (III) – (b); (IV) – (a)

17. The alloy used in the construction of aircrafts is :-

(1) Mg – Sn (2) Mg – Mn
(3) Mg – Al (4) Mg – Zn

QUANTUM NUMBER

1. The total number of isotopes of hydrogen and number of radioactive isotopes among them, respectively, are :
(1) 2 and 0 (2) 3 and 2
(3) 3 and 1 (4) 2 and 1

2. The isotopes of hydrogen are :
(1) Tritium and protium only
(2) Deuterium and tritium only
(3) Protium and deuterum only
(4) Protium, deuterium and tritium

3. The 71st electron of an element X with an atomic number of 71 enters into the orbital :
(1) 4f (2) 6p (3) 6s (4) 5d

4. The quantum number of four electrons are given below -
I. $n = 4, l = 2, m_l = -2, m_s = -½$
II. $n = 3, l = 2, m_l = 1, m_s = +½$
III. $n = 4, l = 1, m_l = 0, m_s = +½$
IV. $n = 3, l = 1, m_l = 1, m_s = -½$
The correct order of their increasing energies will be -
(1) IV < III < II < I (2) IV < II < III < I
(3) I < II < III < IV (4) I < III < II < IV

5. The isoelectronic set of ions is :
(1) N^{3-}, Li^+, Mg^{2+} and O^{2-}
(2) Li^+, Na^+, O^{2-} and F^-
(3) F^-, Li^+, Na^+ and Mg^{2+}
(4) N^{3-}, O^{2-}, F^- and Na^+

P-BLOCK

1. Among the following reactions of hydrogen with halogens, the one that requires a catalyst is :
(1) $H_2 + I_2 \rightarrow 2HI$ (2) $H_2 + F_2 \rightarrow 2HF$
(3) $H_2 + Cl_2 \rightarrow 2HCl$ (4) $H_2 + Br_2 \rightarrow 2HBr$

2. Which of the following is not and example of heterogeneous catalytic reaction ?
(1) Ostwald's process
(2) Haber's process
(3) Combustion of coal
(4) Hydrogenation of vegetable oils

3. Diborane (B_2H_6) reacts independently with O_2 and H_2O to produce, respectively
(1) HBO_2 and H_3BO_3 (2) H_3BO_3 and B_2O_3
(3) B_2O_3 and H_3BO_3 (4) B_2O_3 and $[BH_4]^-$

4. The one that is extensively used as a piezoelectric material is :
(1) Quartz (2) Amorphous silica
(3) Mica (4) Tridymite

5. The amorphous form of silica is :
(1) quartz (2) kieselguhr
(3) cristobalite (4) tridymite

6. The correct statements among I to III regarding group 13 element oxides are,
(I) Boron trioxide is acidic.
(II) Oxides of aluminium and gallium are amphoteric.
(III) Oxides of indium and thalliumare basic.
(1) (I), (II) and (III) (2) (II) and (III) only
(3) (I) and (III) only (4) (I) and (II) only

7. The correct order of catenation is :
(1) C > Si > Ge ≈ Sn (2) C > Sn > Si ≈ Ge
(3) Ge > Sn > Si > C (4) Si > Sn > C > Ge

8. The synonym for water gas when used in the production of methanol is :-
(1) natural gas (2) laughing gas
(3) syn gas (4) fuel gas

D-BLOCK

1. The element that usually does not show variable oxidation states is :
(1) V (2) Ti (3) Sc (4) Cu

2. $\underline{A} \xrightarrow{4\ KOH,\ O_2} 2\underline{B} + 2\ H_2O$ (Green)
$3\ \underline{B} \xrightarrow{4\ HCl} 2\ \underline{C} + MnO_2 + 2\ H_2O$ (Purple)
$2\ \underline{B} \xrightarrow{H_2O,\ KI} 2\ \underline{A} + 2KOH + \underline{D}$
In the above sequence of reactions, A and D respectively, are :-
(1) KIO_3 and MnO_2 (2) KI and K_2MnO_4
(3) MnO_2 and KIO_3 (4) KI and $KMnO_4$

3. The transition element that has lowest enthalpy of atomisation, is :

(1) Zn (2) Cu (3) V (4) Fc

4. Match the catalysts **(Column I)** with products **(Column II)**.

Column I	Column II
(A) V_2O_5	(i) Polyethylene
(B) $TiCl_4/Al(Me)_3$	(ii) ethanal
(C) $PdCl_2$	(iii) H_2SO_4
(D) Iron Oxide	(iv) NH_3

(1) (A)-(ii); (B)-(iii); (C)-(i); (D)-(iv)

(2) (A)-(iii); (B)-(i); (C)-(ii); (D)-(iv)

(3) (A)-(iii); (B)-(iv); (C)-(i); (D)-(ii)

(4) (A)-(iv); (B)-(iii); (C)-(ii); (D)-(i)

5. Consider the hydrates ions of Ti^{2+}, V^{2+}, Ti^{3+} and Sc^{3+}. The correct order of their spin-only magnetic moments is :

(1) $Sc^{3+} < Ti^{3+} < Ti^{2+} < V^{2+}$

(2) $Ti^{3+} < Ti^{2+} < Sc^{3+} < V^{2+}$

(3) $Sc^{3+} < Ti^{3+} < V^{2+} < Ti^{2+}$

(4) $V^{2+} < Ti^{2+} < Ti^{3+} < Sc^{3+}$

HYDROGEN & IT'S COMPOUND

1. NaH is an example of :

(1) Electron-rich hydride

(2) Molecular hydride

(3) Saline hydride

(4) Metallic hydride

2. The correct statements among (a) to (d) regarding H_2 as a fuel are :

(a) It produces less pollutant than petrol

(b) A cylinder of compressed dihydrogen weighs ~ 30 times more than a petrol tank producing the same amount of energy

(c) Dihydrogen is stored in tanks of metal alloys like $NaNi_5$

(d) On combustion, values of energy released per gram of liquid dihydrogen and LPG are 50 and 142 kJ, respectively

(1) b and d only (2) a, b and c only

(3) b, c and d only (4) a and c only

3. The temporary hardness of water is due to :-

(1) $Ca(HCO_3)_2$ (2) NaCl

(3) Na_2SO_4 (4) $CaCl_2$

4. The chemical nature of hydrogen preoxide is :-

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

(2) Oxidising and reducing agent in both acidic and basic medium

(3) Reducing agent in basic medium, but not in acidic medium

(4) Oxidising agent in acidic medium, but not in basic medium.

5. The metal that gives hydrogen gas upon treatment with both acid as well as base is :

(1) zinc (2) iron

(3) magnesium (4) mercury

ENVIRONMENTAL CHEMISTRY

1. Water samples with BOD values of 4 ppm and 18 ppm, respectively, are :

(1) Highly polluted and Clean

(2) Highly polluted and Highly polluted

(3) Clean and Highly polluted

(4) Clean and Clean

2. The upper stratosphere consisting of the ozone layer protects us from the sun's radiation that falls in the wavelength region of :

(1) 600-750 nm (2) 0.8-1.5 nm

(3) 400-550 nm (4) 200-315 nm

3. The compound that is NOT a common component of photochemical smog is :

(1) O_3 (2) $CH_2=CHCHO$

(3) CF_2Cl_2 (4) $H_3C-\underset{\underset{O}{\|}}{C}-OONO_2$

4. Taj Mahal is being slowly disfigured and discoloured. This is primarily due to :-

(1) Water pollution (2) Global warming

(3) Soil pollution (4) Acid rain

5. The higher concentration of which gas in air can cause stiffness of flower buds ?

(1) SO_2 (2) NO_2

(3) CO_2 (4) CO

6. Peoxyacetyl nitrate (PAN), an eye irritant is produced by :
(1) Acid rain
(2) Photochemical smog
(3) Classical smog
(4) Organic waste

7. The correct set of species responsible for the photochemical smog is :
(1) NO, NO_2, O_3 and hydrocarbons
(2) N_2,O_2, O_3 and hydrocarbons
(3) N_2, NO_2 and hydrocarbons
(4) CO_2, NO_2, SO_2 and hydrocarbons

8. Air pollution that occurs in sunlight is :
(1) oxidising smog (2) acid rain
(3) reducing smog (4) fog

9. **Assertion :** Ozone is destroyed by CFCs in the upper stratosphere
Reason : Ozone holes increase the amount of UV radiation reaching the earth.
(1) Assertion and reason are correct, but the reason is not the explanation for the assertion
(2) Assertion is false, but the reason is correct
(3) Assertion and reason are incorrect, Assertion and reason are both correct
(4) And the reason is the correct explanation for the assertion

10. Which is wrong with respect to our responsibility as a human being to protect our environment ?
(1) Avoiding the use of floodlighted facilities
(2) Restricting the use of vehicles
(3) Using plastic bags
(4) Setting up compost tin in gardens

11. Excessive release of CO_2 into the atomosphere results in :
(1) polar vortex
(2) depletion of ozone
(3) formation of smog
(4) global warming

12. The layer of atmosphere between 10 km to 50 km above the sea level is called as :
(1) troposphere (2) mesosphere
(3) stratosphere (4) thermosphere

13. The regions of the atmosphere, where clouds form and where we live respectively, are :-
(1) Stratosphere and Troposphere
(2) Troposphere and Stratosphere
(3) Troposphere and Troposphere
(4) Stratosphere and Stratosphere

14. The primary pollutant that leads to photochemical smog is :
(1) sulphur dioxide (2) acrolein
(3) ozone (4) nitrogen oxides

SALT ANALYSIS

1. Chlorine on reaction with hot and concentrated sodium hydroxide gives :
(1) Cl^- and ClO_2^-
(2) Cl^- and ClO_3^-
(3) Cl^- and ClO^-
(4) ClO_3^- and ClO_2^-

2. Iodine reacts with concentrated HNO_3 to yield Y along with other products. The oxidation state of iodine in Y, is :-
(1) 5 (2) 3 (3) 1 (4) 7

3. An organic compound 'A' is oxidized with Na_2O_2 followed by boiling with HNO_3.The resultant solution is then treated with ammonium molybdate to yield a yellow precipitate.
Based on above observation, the element present in the given compound is :
(1) Sulphur (2) Nitrogen
(3) Fluorine (4) Phosphorus

4. Which one of the following is likely to give a precipitate with $AgNO_3$ solution ?
(1) $(CH_3)_3CCl$ (2) $CHCl_3$
(3) $CH_2=CH-Cl$ (4) CCl_4

F-BLOCK

1. The lanthanide ion that would show colour is-
(1) Sm^{3+} (2) La^{3+}
(3) Lu^{3+} (4) Gd^{3+}

2. The maximum number of possible oxidation states of actinoides are shown by
(1) berkelium (Bk) and californium (Cf)
(2) nobelium (No) and lawrencium (Lr)
(3) actinium (Ac) and thorium (Th)
(4) neptunium (Np) and plutonium (Pu)

ANSWER KEY

COORDINATION COMPOUND

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	4	2	2	2	2	4	1	1	2	1
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	1	2	1	1	3	1	3	1	2	3
Que.	21	22	23	24	25	26	27	28		
Ans.	1	Bonus	3	3	4	2	1	1		

CHEMICAL BONDING

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	4	4	4	3	3	3	1	1	4	1
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	4	3	2	4	3	2	4	3	3	3
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	3	1	3	4	2	3	4	1	3	3
Que.	31	32								
Ans.	2	3								

S-BLOCK

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	1	2	4	4	3	4	3	1	3	4

PERIODIC TABLE

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	3	2	4	1	1	4	2	3	3
Que.	11	12	13	14	15	16	17	18	19	
Ans.	1	3	4	Bonus	2	1	4	2	2	

METALLURGY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	2	1	3	4	4	4	4	3	1	2
Que.	11	12	13	14	15	16	17			
Ans.	4	2	4	1	3	4	3			

QUANTUM NUMBER

Que.	1	2	3	4	5
Ans.	3	4	1	2	4

P-BLOCK

Que.	1	2	3	4	5	6	7	8
Ans.	1	3	3	1	2	1	1	3

D-BLOCK					
Que.	**1**	**2**	**3**	**4**	**5**
Ans.	3	3	2	2	1

HYDROGEN & ITS COMPOUND					
Que.	**1**	**2**	**3**	**4**	**5**
Ans.	3	2	1	2	1

ENVIRONMENTAL CHEMISTRY										
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.	3	4	3	4	1	2	1	1	1	3
Que.	**11**	**12**	**13**	**14**						
Ans.	4	3	3	4						

SALT ANALYSIS				
Que.	**1**	**2**	**3**	**4**
Ans.	2	1	4	1

F-BLOCK		
Que.	**1**	**2**
Ans.	1	4