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JEE Main – Chemistry

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Chapter: Some Basic Concepts of Chemistry

Q1. Some Basic Concepts of Chemistry, 2024 (09 Apr Shift 1)

Molarity (M) of an aqueous solution containing x g of anhyd. $CuSO_4$ in 500 mL solution at $32^{\circ}C$ is 2×10^{-1}M. Its molality will be _____ $\times 10^{-3}$ m. (nearest integer). [Given density of the solution $= 1.25$ g/mL]

Q2. Some Basic Concepts of Chemistry, 2024 (06 Apr Shift 1)

The density of ' x ' M solution (' X ' molar) of NaOH is 1.12 g mL^{-1}, while in molality, the concentration of the solution is 3 m(3molal). Then x is (Given : Molar mass of NaOH is 40 g/mol)

(1) 3.5 (2) 3.8

(3) 2.8 (4) 3.0

Q3. Some Basic Concepts of Chemistry, 2024 (01 Feb Shift 2)

10 mL of gaseous hydrocarbon on combustion gives 40 mL of $CO_2(g)$ and 50 mL of water vapour. Total number of carbon and hydrogen atoms in the hydrocarbon is _____.

Q4. Some Basic Concepts of Chemistry, 2024 (31 Jan Shift 2)

The molarity of 1L orthophosphoric acid (H_3PO_4) having 70% purity by weight (specific gravity 1 .54 g cm^{-3}) is _____ M. (Molar mass of $H_3PO_4 = 98$ g mol^{-1})

Q5. Some Basic Concepts of Chemistry, 2022 (29 Jul Shift 2)

Consider the reaction

$4HNO_3(l) + 3KCl(s) \rightarrow Cl_2(g) + NOCl(g) + 2H_2O(g) + 3KNO_3(s)$

The amount of HNO_3 required to produce110. 0 g of KNO_3 is

(Given : Atomic masses of H, O, N and K are 1, 16, 14 and 39, respectively.)

(1) 32. 2 g (2) 69. 4 g

(3) 91. 5 g (4) 162. 5 g

Q6. Some Basic Concepts of Chemistry, 2022 (29 Jul Shift 2)

$C(s) + O_2(g) \rightarrow CO_2(g) + 400$ kJ

$C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g) + 100$ kJ

When coal of purity 60% is allowed to burn in presence of insufficient oxygen, 60% of carbon is converted into ' CO' and the remaining is converted into 'CO_2'.

The heat generated when 0. 6 kg of coal is burnt is

(1) 1600 kJ (2) 3200 kJ

(3) 4400 kJ (4) 6600 kJ

Q7. Some Basic Concepts of Chemistry, 2022 (28 Jul Shift 1)

In the given reaction,

$X + Y + 3Z \rightleftarrows XYZ_3$

if one mole of each of X and Y with 0. 05 mol of Z gives compound XYZ_3. (Given : Atomic masses of X, Y and Z are 10,20 and 30 amu, respectively). The yield of XYZ_3 is____g.

Q8. Some Basic Concepts of Chemistry, 2022 (27 Jul Shift 1)

250 g solution of D-glucose in water contains 10. 8% of carbon by weight. The molality of the solution is nearest to (Given: Atomic Weights are H = 1u; C = 12 u; O = 16 u)

(1) 1. 03 (2) 2. 06

(3) 3. 09 (4) 5. 40

Q9. Some Basic Concepts of Chemistry, 2022 (26 Jul Shift 2)

Hemoglobin contains 0. 34% of iron by mass. The number of Fe atoms in 3. 3 g of hemoglobin is (Given : Atomic mass of Fe is 56u, N_A in 6.022×10^{23} mol^{-1})

(1) 1.21×10^5 (2) 12.0×10^{16}

(3) 1.21×10^{20} (4) 3.4×10^{22}

Q10. Some Basic Concepts of Chemistry, 2022 (25 Jul Shift 2)

56.0 L of nitrogen gas is mixed with excess of hydrogen gas and it is found that 20 L of ammonia gas is produced, The volume of unused nitrogen gas is found to be_____ L.

Q11. Some Basic Concepts of Chemistry, 2022 (29 Jun Shift 1)

Production of iron in blast furnace follows the following equation

$Fe_3O_4(s) + 4CO(g) \rightarrow 3Fe(l) + 4CO_2(g)$

when 4.640 kg of Fe_3O_4 and 2.520 kg of CO are allowed to react then the amount of iror (in g) produced is :

[Given: Molar Atomic mass $\left(gmol^{-1}\right)$: Fe = 56

Molar Atomic mass $\left(gmolm^{-1}\right)$: O = 16

Molar Atomic mass $\left(gmolm^{-1}\right)$: C = 12]

(1) 1400 (2) 2200

(3) 3360 (4) 4200

Q12. Some Basic Concepts of Chemistry, 2022 (26 Jun Shift 1)

A commercially sold conc. HCl is 35% HCl by mass. If the density of this commercial acid is 1.46 g/ mL, the molarity of this solution is :

(Atomic mass : Cl = 35.5 amu, H = 1 amu)

(1) 10.2 M (2) 14.0 M

(3) 12.5 M (4) 18.2 M

Q13. Some Basic Concepts of Chemistry, 2022 (24 Jun Shift 1)

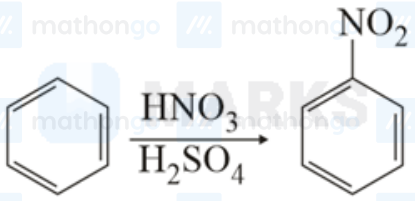
If a rocket runs on a fuel $(C_{15}H_{30})$ and liquid oxygen, the weight of oxygen required and CO_2 released for every litre of fuel respectively are :

(Given : density of the fuel is 0.756 g/ mL)

(1) 1188 g and 1296 g (2) 2376 g and 2592 g

(3) 2592 g and 2376 g (4) 3429 g and 3142 g

Q14. Some Basic Concepts of Chemistry, 2021 (17 Mar Shift 1)



In the above reaction, 3.9 g of benzene on nitration gives 4.92 g of nitrobenzene. The percentage yield of nitrobenzene in the above reaction is _____ %. (Round off to the Nearest Integer).

(Given atomic mass : C : 12.0 u, H : 1.0 u O : 16.0 u, N : 14.0 u)

Q15. Some Basic Concepts of Chemistry, 2021 (16 Mar Shift 1)

Complete combustion of 750 g of an organic compound provides 420 g of CO_2 and 210 g of H_2O. The percentage composition of carbon and hydrogen in organic compound is 15.3 and _____ respectively. (Round off to the Nearest Integer)

Q16. Some Basic Concepts of Chemistry, 2021 (26 Feb Shift 2)

The $NaNO_3$ weighed out to make 50 mL of an aqueous solution containing 70.0 mg Na^+ per mL is_ g. (Rounded off to the nearest integer)

[Given : Atomic weight in $gmol^{-1}$ – Na : 23; N : 14; O : 16]

Q17. Some Basic Concepts of Chemistry, 2021 (24 Feb Shift 1)

4.5 g of compound A(M. W. = 90) was used to make 250 mL of its aqueous solution. The molarity of the solution in M is $x \times 10^{-1}$. The value of x is_____ (Rounded off to the nearest integer)

Q18. Some Basic Concepts of Chemistry, 2020 (06 Sep Shift 1)

A solution of two components containing n_1 moles of the 1st component and n_2 moles of the 2nd component is prepared. M_1 and M_2 are the molecular weights of component 1 and 2 respectively. If d is the density of the solution in gmI^{-1}, C_2 is the molarity and x_2 is the mole fraction of the 2nd component, then C_2 can be expressed as :

(1) $C_2 = \frac{1000x_2}{M_1+x_2(M_2-M_1)}$ (2) $C_2 = \frac{dx_2}{M_1+x_2(M_2-M_1)}$

(3) $C_2 = \frac{1000\,dx_2}{M_1+x_2(M_2-M_1)}$ (4) $C_2 = \frac{dx_1}{M_2+x_2(M_2-M_1)}$

Q19. Some Basic Concepts of Chemistry, 2020 (03 Sep Shift 2)

The strengths of 5.6 volume hydrogen peroxide (of density $1\ g/mL$) in terms of mass percentage and molarity(M) respectively, are: (Take molar mass of hydrogen peroxide as $34\ g/mol$)

(1) 1.7 and 0.5 (2) 0.85 and 0.25

(3) 1.7 and 0.25 (4) 0.85 and 0.5

Q20. Some Basic Concepts of Chemistry, 2020 (03 Sep Shift 2)

0.023×10^{22} molecules are present in 10gof a substance 'x'. The molarity of a solution containing 5g of substance 'x' in 2 L solution is _____ $\times 10^{-3}$

Chapter: Structure of Atom

Q21. Structure of Atom, 2024 (09 Apr Shift 2)

The electronic configuration of Einsteinium is : (Given atomic number of Einsteinium $= 99$)

(1) $[Rn]5f^{10}6\,d^{\circ}7\,s^2$ (2) $[Rn]5f^{13}6\,d^{\circ}7\,s^2$

(3) $[Rn]5f^{11}6\,d^{\circ}7\,s^2$ (4) $[Rn]5f^{12}6\,d^{\circ}7\,s^2$

Q22. Structure of Atom, 2024 (09 Apr Shift 2)

Match List I with List II

	List - I (Element)		List - II (Electronic configuration)
A.	N	I.	$[Ar]3\,d^{10}4\,s^2 4p^5 AR$
B.	S	II.	$[Ne]3\,s^2 3p^4$
C.	Br	III.	$[He]2\,s^2 2p^3$
D.	Kr	IV.	$[Ar]3\,d^{10}4\,s^2 4p^6$

Choose the correct answer from the options given below:

(1) A-III, B-II, C-I, D-IV (2) A-II, B-I, C-IV, D-III

(3) A-I, B-IV, C-III, D-II (4) A-IV, B-III, C-II, D-I

Q23. Structure of Atom, 2024 (06 Apr Shift 1)

Frequency of the de-Broglie wave of electron in Bohr's first orbit of hydrogen atom is _____ $\times 10^{13}$ Hz (nearest integer).

[Given : R_H(Rydberg constant) $= 2.18 \times 10^{-18}$ J, h (Plank's constant) $= 6.6 \times 10^{-34}$ J.s.]

Q24. Structure of Atom, 2024 (06 Apr Shift 2)

For hydrogen atom, energy of an electron in first excited state is -3.4eV, K. E. of the same electron of hydrogen atom is xeV. Value of x is _____ $\times 10^{-1}$eV. (Nearest integer)

Q25. Structure of Atom, 2024 (04 Apr Shift 2)

Choose the Incorrect Statement about Dalton's Atomic Theory

(1) chemical reactions involve reorganization of atoms (2) Matter consists of indivisible atoms.

(3) Compounds are formed when atoms of different elements combine in any ratio. (4) Compounds are formed when atoms of different elements combine in any ratio. All the atoms of a given element have identical properties including identical mass.

Q26. Structure of Atom, 2024 (01 Feb Shift 2)

The number of radial node/s for 3p orbital is:

(1) 1 (2) 4

(3) 2 (4) 3

Q27. Structure of Atom, 2024 (31 Jan Shift 2)

The four quantum numbers for the electron in the outer most orbital of potassium (atomic no. 19) are

(1) $n = 4, l = 2, m = -1, s = +\frac{1}{2}$ (2) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$
(3) $n = 3, l = 0, m = -1, s = +\frac{1}{2}$ (4) $n = 2, l = 0, m = 0, s = +\frac{1}{2}$-

Q28. Structure of Atom, 2024 (29 Jan Shift 1)

The correct set of four quantum numbers for the valence electron of rubidium atom $(Z = 37)$ is:
(1) $5, 0, 0, +\frac{1}{2}$ (2) $5, 0, 1, +\frac{1}{2}$
(3) $5, 1, 0, +\frac{1}{2}$ (4) $5, 1, 1, +\frac{1}{2}$

Q29. Structure of Atom, 2023 (15 Apr Shift 1)

Given below are two statements

Statement I : According to Bohr's model of hydrogen atom, the angular momentum of an electron in a given stationary state is quantised.

Statement II : The concept of electron in Bohr's orbit, violates the Heisenberg uncertainty principle. In the light of the above statements, choose the most appropriate answer from the options given below

(1) Statement I is incorrect but Statement II is correct (2) Both Statement I and Statement II are correct
(3) Both Statement I and Statement II are incorrect (4) Statement I is correct but Statement II is incorrect

Q30. Structure of Atom, 2023 (25 Jan Shift 1)

The radius of the 2nd orbit of Li^{2+} is x. The expected radius of the 3rd orbit of Be^{3+} is
(1) $\frac{9}{4}$x (2) $\frac{4}{9}$x
(3) $\frac{27}{16}$x (4) $\frac{16}{27}$x

Q31. Structure of Atom, 2022 (29 Jul Shift 1)

The minimum uncertainty in the speed of an electron in one dimensional region of length $2a_o$ (Where a_o = Bohr radius 52.9 pm) is____kms^{-1} (Nearest integer) (Given : Mass of electron $= 9.1 \times 10^{-31}$ kg, Planck's constant $h = 6.63 \times 10^{-34}$ Js)

Q32. Structure of Atom, 2022 (25 Jun Shift 1)

The longest wavelength of light that can be used for the ionisation of lithium ion (Li^{2+}) is $x \times 10^{-8}$ m. The value of x is (Nearest Integer)
(Given : Energy of the electron in the first shell of the hydrogen atom is -2.2×10^{-18} J; $h = 6.63 \times 10^{-34}$ Js and $c = 3 \times 10^8$ ms^{-1})

Q33. Structure of Atom, 2021 (01 Sep Shift 2)

A 50 watt bulb emits monochromatic red light of wavelength of 795 nm. The number of photons emitted per second by the bulb is $x \times 10^{20}$. The value of x is _____ .
(Nearest integer)
[Given : $h = 6.63 \times 10^{-34}$ Js and $c = 3.0 \times 10^8$ ms^{-1}]

Q34. Structure of Atom, 2021 (27 Aug Shift 2)

The number of photons emitted by a monochromatic (single frequency) infrared range finder of power 1 mW and wavelength of 1000 nm, in 0.1 second is $x \times 10^{13}$. The value of x is (Nearest integer) $(h = 6.63 \times 10^{-34}$ Js, $c = 3.00 \times 10^8$ $ms^{-1})$:

Q35. Structure of Atom, 2021 (25 Jul Shift 1)

A source of monochromatic radiation wavelength 400 nm provides 1000 J of energy in 10 seconds. When this radiation falls on the surface of sodium, $x \times 10^{20}$ electrons are ejected per second. Assume that wavelength 400 nm is sufficient for ejection of electron from the surface of sodium metal. The value of x is _____. (Nearest integer)
$(h = 6.626 \times 10^{-34}$ Js)

Q36. Structure of Atom, 2021 (20 Jul Shift 2)

Outermost electronic configuration of a group 13 element, E, is $4s^2, 4p^1$. The electronic configuration of an element of p-block period-five placed diagonally to element, E is:
(1) $[Kr]3d^{10}4s^24p^2$ (2) $[Ar]3d^{10}4s^24p^2$
(3) $[Xe]5d^{10}6s^26p^2$ (4) $[Kr]4d^{10}5s^25p^2$

Q37. Structure of Atom, 2021 (20 Jul Shift 2)

The wavelength of electrons accelerated from rest through a potential difference of 40 kV is $X \times 10^{-12}$ m. The value of x is. (Nearest integer)
Given: Mass of electron $= 9.1 \times 10^{-31}$ kg

Charge on an electron $= 1.6 \times 10^{-19}$C
Planck's constant $= 6.63 \times 10^{-34}$ Js

Q38. Structure of Atom, 2021 (16 Mar Shift 1)

When light of wavelength 248 nm falls on a metal of threshold energy 3.0 eV, the de-Broglie wavelength of emitted electrons is _____ $\mathring{A}$. (Round off to the Nearest Integer).
[Use : $\sqrt{3} = 1.73$, $h = 6.63 \times 10^{-34}$ Js; $m_e = 9.1 \times 10^{-31}$ kg; $c = 3.0 \times 10^8$ ms^{-1}; 1 eV $= 1.6 \times 10^{-19}$ J]

Q39. Structure of Atom, 2021 (16 Mar Shift 2)

The number of orbitals with $n = 5$, $m_1 = +2$ is _____. (Round off to the Nearest Integer).

Q40. Structure of Atom, 2021 (24 Feb Shift 2)

According to Bohr's atomic theory:
(A) Kinetic energy of electron is $\propto \frac{Z^2}{n^2}$.
(B) The product of velocity (v) of electron and principal quantum number (n), $/vn/ \propto Z^2$.
(C) Frequency of revolution of electron in an orbit is $\propto \frac{Z^3}{n^3}$.
(D) Coulombic force of attraction on the electron is $\propto \frac{Z^3}{n^4}$.
Choose the most appropriate answer from the options given below:
(1) (A), (C) and (D) only
(2) (A) and (D) only
(3) (C) only
(4) (A) only

Chapter: Thermodynamics (C)

Q41. Thermodynamics (C), 2024 (06 Apr Shift 1)

An ideal gas, $\overline{C}_v = \frac{5}{2}R$, is expanded adiabatically against a constant pressure of 1 atm untill it doubles in volume. If the initial temperature and pressure is 298 K and 5 atm, respectively then the final temperature is _____ K (nearest integer). [$\overline{C}_v$ is the molar heat capacity at constant volume]

Q42. Thermodynamics (C), 2024 (05 Apr Shift 2)

Combustion of 1 mole of benzene is expressed at $C_6H_6(l) + \frac{15}{2}O_2(g) \rightarrow 6CO_2(g) + 3H_2O(l)$. The standard enthalpy of combustion of 2 mol of benzene is $-'x'$kJ. $x =$ _____ Given: 1. standard Enthalpy of formation of 1 mol of $C_6H_6(l)$, for the reaction 6C (graphite) $+3H_2(g) \rightarrow C_6H_6(l)$ is 48.5 kJ mol^{-1}. 2. Standard Enthalpy of formation of 1 mol of $CO_2(g)$, for the reaction C (graphite) $+O_2(g) \rightarrow CO_2(g)$ is -393.5 kJ mol^{-1}. 3. Standard and Enthalpy of formation of 1 mol of $H_2O(l)$, for the reaction $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$ is -286 kJ mol^{-1}.

Q43. Thermodynamics (C), 2024 (04 Apr Shift 1)

The enthalpy of formation of ethane (C_2H_6) from ethylene by addition of hydrogen where the bond-energies of $C-H, C-C, C=C, H-H$ are 414 kJ, 347 kJ, 615 kJ and 435 kJ respectively is kJ

Q44. Thermodynamics (C), 2024 (31 Jan Shift 2)

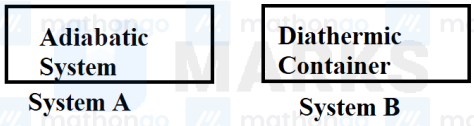
If 5 moles of an ideal gas expands from 10L to a volume of 100L at 300K under isothermal and reversible condition then work, w, is $-x$ J. The value of x is $-$_____.
(Given R = 8 .314 J K^{-1} mol^{-1})

Q45. Thermodynamics (C), 2024 (27 Jan Shift 1)

If three moles of an ideal gas at 300 K expand isothermally from 30 dm^3 to 45 dm^3 against a constant opposing pressure of 80 kPa, then the amount of heat transferred is _____J.

Q46. Thermodynamics (C), 2023 (13 Apr Shift 2)

What happens when methane undergoes combustion in systems A and B respectively?



(1) System A	System B	(2) System A	System B
Temperature rises	Temperature remains same	Temperature remains same	Temperature rises
(3) System A	System B	(4) System A	System B
Temperature falls	Temperature remains same	Temperature falls	Temperature rises

Q47. Thermodynamics (C), 2023 (25 Jan Shift 2)

28.0 L of CO_2 is produced on complete combustion of 16.8 L gaseous mixture of ethene and methane at $25^{\circ}C$ and 1 atm. Heat evolved during the combustion process is kJ

Given: $\Delta H_C(CH_4) = -900$ kJ mol^{-1}

$\Delta H_C(C_2H_4) = -1400$ kJ mol^{-1}.

Q48. Thermodynamics (C), 2022 (29 Jul Shift 1)

When 600 mL of $0.2M$ HNO_3 is mixed with 400 mL of $0.1M$ NaOH solution in a flask, the rise in temperature of the flask is_____ $\times 10^{-2}$ $^{\circ}C$

(Enthalpy of neutralisation $= 57$ kJ mol^{-1} and Specific heat of water $= 4.2$ JK^{-1} g^{-1}) (Neglect heat capacity of flask)

Q49. Thermodynamics (C), 2022 (27 Jul Shift 2)

A gas (Molar mass $= 280$ g mol^{-1}) was burnt in excess O_2 in a constant volume calorimeter and during combustion the temperature of calorimeter increased from 298.0 K to 298.45 K. If the heat capacity of calorimeter is 2.5 kJ K^{-1} and enthalpy of combustion of gas is 9 kJ mol^{-1} then amount of gas burnt is____g.

Q50. Thermodynamics (C), 2022 (26 Jul Shift 1)

2.4 g coal is burnt in a bomb calorimeter in excess of oxygen at 298 K and 1 atm pressure.

The temperature of the calorimeter rises from 298 K to 300 K. The enthalpy change during the combustion of coal is $-x$ kJ mol^{-1}. The value of x is_____(Given : Heat capacity of bomb calorimeter 20.0 kJK^{-1}. Assume coal to be pure carbon)

Q51. Thermodynamics (C), 2022 (25 Jul Shift 1)

The enthalpy of combustion of propane, graphite and dihydrogen at 298 K are: -2220.0 kJ mol^{-1}, -393.5 kJ mol^{-1} and -285.8 kJ mol^{-1} respectively. The magnitude enthalpy of formation of propane (C_3H_8) is _____ kJmol^{-1}. (Nearest integer)

Q52. Thermodynamics (C), 2022 (29 Jun Shift 1)

17.0 g of NH_3 completely vapourises at -33.42 $^{\circ}C$ and 1 bar pressure and the enthalpy change in the process is 23.4 kJ mol^{-1}. The enthalpy change for the vapourisation of 85 g of NH_3 under the same conditions is kJ.

Q53. Thermodynamics (C), 2022 (27 Jun Shift 1)

Match List - I with List - II.

List-I	**List-II**
(A) Spontaneous process	(I) $\Delta H < 0$
(B) Process with $\Delta P = 0, \Delta T = 0$	(II) $\Delta G_{T,P} < 0$
(C) $\Delta H_{reaction}$	(III) Isothermal and isobaric process
	[Bond energies of molecules in reactants]
(D) Exothermic Process	(IV) -
	[Bond energies of product molecules]

Choose the correct answer from the options given below

(1) (A) – (III), (B) – (II), (C) – (IV), (D) – (I)

(2) (A) – (II), (B) – (III), (C) – (IV), (D) – (I)

(3) (A) – (II), (B) – (III), (C) – (I), (D) – (IV)

(4) (A) – (II), (B) – (I), (C) – (III), (D) – (IV)

Q54. Thermodynamics (C), 2022 (27 Jun Shift 2)

When 5 moles of He gas expand isothermally and reversibly at 300 K from 10 litre to 20 litre, the magnitude of the maximum work obtained is J. [nearest integer] (Given : R $= 8.3$ J K^{-1} mol^{-1} and $\log 2 = 0.3010$)

Q55. Thermodynamics (C), 2022 (24 Jun Shift 2)

At 25 $^{\circ}C$ and 1 atm pressure, the enthalpies of combustion are as given below:

Substance	H_2	C (graphite)	$C_2H_6(g)$
$\frac{\Delta_c H^\ominus}{kJmol^{-1}}$	-286.0	-394.0	-1560.0

The enthalpy of formation of ethane is

(1) $+54.0$ kJ mol^{-1} (2) -68.0 kJ mol^{-1}

(3) -86.0 kJ mol^{-1} (4) $+97.0$ kJ mol^{-1}

Q56. Thermodynamics (C), 2021 (26 Aug Shift 2)

The equilibrium constant K_c at 298 K for the reaction

$A + B \rightleftharpoons C + D$ is 100 . Starting with an equimolar solution with concentrations of A, B, C and D all equal to 1M, the equilibrium concentration of D is _____$\times 10^{-2}$M. (Nearest integer)

Q57. Thermodynamics (C), 2021 (27 Jul Shift 2)

When 400 mL of 0.2 M H_2SO_4 solution is mixed with 600 mL of 0.1 MNaOH solution, the increase in temperature of the final solution is — $\times 10^{-2}$ K. (Round off to the nearest integer).

[Use :$H^+(aq) + OH^-(aq) \rightarrow H_2O : \Delta_\gamma H = -57.1$ kJ mol^{-1}]

Specific heat of $H_2O = 4.18$ J K^{-1} g^{-1} , density of $H_2O = 1.0$ g cm^{-3}

Assume no change in volume of solution on mixing.

Q58. Thermodynamics (C), 2021 (18 Mar Shift 1)

For the reaction

$C_2H_6 \rightarrow C_2H_4 + H_2$

the reaction enthalpy $\Delta_r H$ in kJmol^{-1} is

(Round off to the Nearest Integer).

[Given : Bond enthalpies in kJmol^{-1} : C – C : 347, C = C : 611; C – H : 414, H – H : 436]

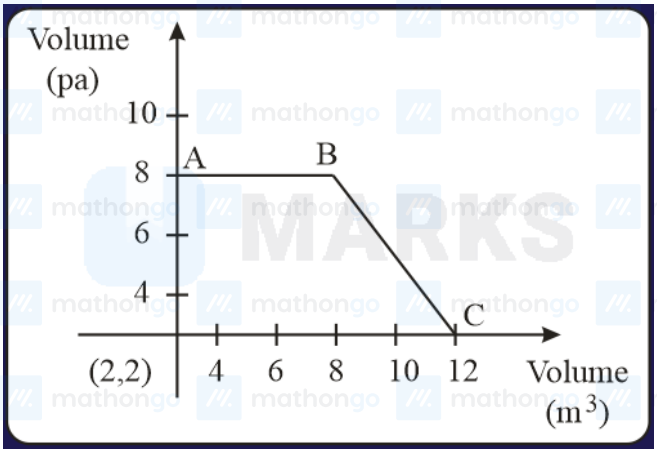
Q59. Thermodynamics (C), 2021 (25 Feb Shift 2)

Five moles of an ideal gas at 293 K is expanded isothermally from an initial pressure of 2.1 MPa to 1.3 MPa against at constant external pressure 4.3 MPa. The heat transferred in this process is ___ kJmol^{-1}. (Rounded-off to the nearest integer)

[Use $R = 8.314$ J mol^{-1} K^{-1}]

Q60. Thermodynamics (C), 2020 (08 Jan Shift 1)

The magnitude of work done by a gas that undergoes a reversible expansion along the path ABC shown in the figure is _____.



Chapter: Chemical Equilibrium

Q61. Chemical Equilibrium, 2024 (06 Apr Shift 1)

At -20°C and 1 atm pressure, a cylinder is filled with equal number of H_2, I_2 and HI molecules for the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$, the K_p for the process is $x \times 10^{-1}$. x = _____ [Given : R = 0.082 L atm K^{-1} mol^{-1}]

(1) 0.01 (2) 10

(3) 2 (4) 1

Q62. Chemical Equilibrium, 2024 (04 Apr Shift 2)

The equilibrium constant for the reaction $SO_3(g) \rightleftharpoons SO_2(g) + \frac{1}{2}O_2(g)$ is $K_c = 4.9 \times 10^{-2}$. The value of K_c for the reaction given below is $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ is :

(1) 4.9
(2) 49
(3) 41.6
(4) 416

Q63. Chemical Equilibrium, 2024 (31 Jan Shift 1)

For the given reaction, choose the correct expression of K_C from the following:

$Fe^{3+}_{(aq)} + SCN^-_{(aq)} \rightleftharpoons (FeSCN)^{2+}_{(aq)}$

(1) $K_C = \frac{[FeSCN^{2+}]}{[Fe^{3+}][SCN^-]}$
(2) $K_C = \frac{[Fe^{3+}][SCN^-]}{[FeSCN^{2+}]}$
(3) $K_C = \frac{[FeSCN^{2+}]}{[Fe^{3+}]^2[SCN^-]^2}$
(4) $K_C = \frac{[FeSCN^{2+}]^2}{[Fe^{3+}][SCN^-]}$

Q64. Chemical Equilibrium, 2024 (31 Jan Shift 2)

$A_{(g)} \rightleftharpoons B_{(g)} + \frac{C}{2_{(g)}}$. The correct relationship between K_P, α and equilibrium pressure P is

(1) $K_P = \frac{\alpha^{\frac{1}{2}} P^{\frac{1}{2}}}{(2+\alpha)^{\frac{1}{2}}}$
(2) $K_P = \frac{\alpha^{\frac{3}{2}} P^{\frac{1}{2}}}{(2+\alpha)^{\frac{1}{2}}(1-\alpha)}$
(3) $K_P = \frac{\alpha^{\frac{1}{2}} P^{\frac{3}{2}}}{(2+\alpha)^{\frac{3}{2}}}$
(4) $K_P = \frac{\alpha^{\frac{1}{2}} P^{\frac{1}{2}}}{(2+\alpha)^{\frac{3}{2}}}$

Q65. Chemical Equilibrium, 2024 (29 Jan Shift 1)

For the reaction $N_2O_4(g) \rightleftharpoons 2NO_2(g)$, $K_p = 0.492$ atm at 300 K. K_c for the reaction at same temperature is _____ $\times 10^{-2}$. (Given : $R = 0.082$ L atm mol^{-1} K^{-1})

Q66. Chemical Equilibrium, 2023 (06 Apr Shift 2)

The equilibrium composition for the reaction
$PCl_3 + Cl_2 \rightleftharpoons PCl_5$ at 298 K is given below:

$[PCl_3]_{eq} = 0.2$ mol L^{-1}, $[Cl_2]_{eq} = 0.1$ mol L^{-1}, $[PCl_5]_{eq} = 0.40$ mol L^{-1}

If 0.2 mol of Cl_2 is added at the same temperature, the equilibrium concentrations of PCl_5 is _____ $\times 10^{-2}$ mol L^{-1}

Given: K_c for the reaction at 298 K is 20

Q67. Chemical Equilibrium, 2023 (01 Feb Shift 2)

The effect of addition of helium gas to the following reaction in equilibrium state at constant volume, is :

$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

(1) the equilibrium will shift in the forward direction and more of Cl_2 and PCl_3 gases will be produced.
(2) the equilibrium will go backward due to suppression of dissociation of PCl_5.
(3) helium will deactivate PCl_5 and reaction will stop.
(4) addition of helium will not affect the equilibrium.

Q68. Chemical Equilibrium, 2022 (29 Jun Shift 2)

4.0 moles of argon and 5.0 moles of PCl_5 are introduced into an evacuated flask of 100 litre capacity at 610 K. The system is allowed to equilibrate. At equilibrium, the total pressure of mixture was found to be 6.0 atm. The K_p for the reaction is [Given : $R = 0.082$ L atm K^{-1} mol^{-1}]

(1) 2.25
(2) 6.24
(3) 12.13
(4) 15.24

Q69. Chemical Equilibrium, 2022 (25 Jun Shift 1)

The standard free energy change (ΔG°) for 50% dissociation of N_2O_4 into NO_2 at 27 °C and 1 atm pressure is $-x$ J mol^{-1}. The value of x is $-$..... J. (Nearest Integer)

[Given : $R = 8.31$ J K^{-1} mol^{-1}, $\log 1.33 = 0.1239$ $\ln 10 = 2.3$]

Q70. Chemical Equilibrium, 2022 (24 Jun Shift 1)

For a reaction at equilibrium

$A(g) \rightleftharpoons B(g) + \frac{1}{2}C(g)$

the relation between dissociation constant (K), degree of dissociation (α) and equilibrium pressure (p) is given by :

(1) $K=\frac{\alpha^{\frac{3}{2}} p^{\frac{1}{2}}}{(2+\alpha)^{\frac{1}{2}}(1-\alpha)}$

(2) $K=\frac{\alpha^{\frac{1}{2}} p^{\frac{3}{2}}}{(1+\frac{3}{2}\alpha)^{\frac{1}{2}}(1-\alpha)}$

(3) $K=\frac{(\alpha p)^{\frac{3}{2}}}{(1+\frac{3}{2}\alpha)^{\frac{1}{2}}(1-\alpha)}$

(4) $K=\frac{(\alpha p)^{\frac{3}{2}}}{(1+\alpha)(1-\alpha)^{\frac{1}{2}}}$

Q71. Chemical Equilibrium, 2021 (26 Aug Shift 2)

The reaction rate for the reaction

$[PtCl_4]^{2-} + H_2O \rightleftharpoons [Pt(H_2O)\,Cl_3]^- + Cl^-$

was measured as a function of concentrations of different species. It was observed that

$\frac{-d\left[[PtCl_4]^{2-}\right]}{dt} = 4.8\times10^{-5}\left[[PtCl_4]^{2-}\right] - 2.4\times10^{-3}\left[[Pt(H_2O)\,Cl_3]^-\right]\left[Cl^-\right]$

where square brackets are used to denote molar concentrations. The equilibrium constant

$K_c = X$(Nearest integer)

Value of $\frac{1}{X}$ *is* (question is modified.)

Q72. Chemical Equilibrium, 2021 (17 Mar Shift 2)

Consider the reaction $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ The temperature at which $K_C = 20.4$ and $K_P = 600.1$, is _____ K. (Round off to the Nearest Integer). [Assume all gases are ideal and $R = 0.0831$ L bar K^{-1} mol^{-1}]

Q73. Chemical Equilibrium, 2021 (24 Feb Shift 1)

The stepwise formation of $[Cu(NH_3)_4]^{2+}$ is given below:

$Cu^{2+} + NH_3 \overset{K_1}{\rightleftharpoons} [Cu(NH_3)]^{2+}$

$[Cu(NH_3)]^{2+} + NH_3 \overset{K_2}{\rightleftharpoons} [Cu(NH_3)_2]^{2+}$

$[Cu(NH_3)_2]^{2+} + NH_3 \overset{K_3}{\rightleftharpoons} [Cu(NH_3)_3]^{2+}$

$[Cu(NH_3)_3]^{2+} + NH_3 \overset{K_4}{\rightleftharpoons} [Cu(NH_3)_4]^{2+}$

The value of stability constants K_1, K_2, K_3 and K_4 are 10^4, 1.58×10^3, 5×10^2 and 10^2 respectively. The overall equilibrium constants for dissociation of $[Cu(NH_3)_4]^{2+}$ is $x\times10^{-12}$. The value of x is _____ (Rounded off to the nearest integer)

Q74. Chemical Equilibrium, 2021 (24 Feb Shift 1)

At 1990 K and 1 atm pressure, there are equal number of Cl_2 molecules and Cl atoms in the reaction mixture. The value of K_p for the reaction $Cl_{2(g)} = 2\,Cl_{(g)}$ under the above conditions is $x\times10^{-1}$. The value of x is_____(Rounded off to the nearest integer)

Q75. Chemical Equilibrium, 2020 (05 Sep Shift 1)

Consider the following reaction:

$N_2O_4(g) = 2NO_2(g)$: $\Delta H^0 = +58$k

For each of the following cases (a, b), the direction in which the equilibrium shifts is:

(a) Temperature is decreased.

(b) Pressure is increased by adding N_2 at constant T.

(1) (a) towards product, (b) towards reactant

(2) (a) towards reactant, (b) towards product

(3) (a) towards reactant, (b) no change

(4) (a) towards product, (b) no change

Chapter: Ionic Equilibrium

Q76. Ionic Equilibrium, 2023 (13 Apr Shift 2)

20 mL of 0.1 MNaOH is added to 50 mL of 0.1M acetic acid solution. The pH of the resulting solution is $\times10^{-2}$. (Nearest integer) Given :

$pK_a(CH_3COOH) = 4.76$

$\log 2 = 0.30$

$\log 3 = 0.48$

Q77. Ionic Equilibrium, 2023 (24 Jan Shift 1)

The dissociation constant of acetic is $x \times 10^{-5}$. When 25 mL of 0.2 M CH_3COONa solution is mixed with 25 mL of 0.02 M CH_3COOH solution, the pH of the resultant solution is found to be equal to 5. The value of x is _____.

Q78. Ionic Equilibrium, 2022 (29 Jul Shift 2)

200 mL of 0.01 M HCl is mixed with 400 mL of 0.01 M H_2SO_4. The pH of the mixture is

(1) 1.14 (2) 1.78

(3) 2.34 (4) 3.02

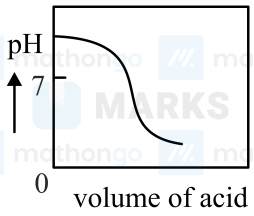
Q79. Ionic Equilibrium, 2022 (27 Jul Shift 1)

At 310 K, the solubility of CaF_2 in water is 2.34×10^{-3} g/100 mL. The solubility product of CaF_2 is ---- $\times 10^{-8}(mol/L)^3$(nearest integer).
(Given molar mass : $CaF_2 = 78$ g mol^{-1})

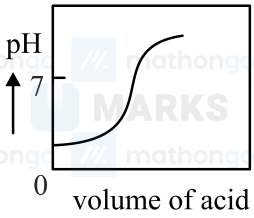
Q80. Ionic Equilibrium, 2022 (27 Jul Shift 2)

The Plot of pH-metric titration of weak base NH_4OH vs strong acid HCl looks like

(1)



(2)



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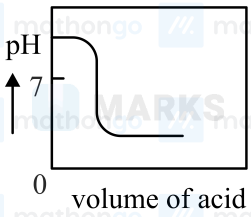
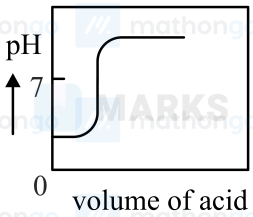


(4)



Q81. Ionic Equilibrium, 2022 (25 Jul Shift 1)

20 mL of 0.1M NH_4OH is mixed with 40 mL of 0.05 M HCl. The pH of the mixture is nearest to:
(Given: $K_b(NH_4OH) = 1 \times 10^{-5}$, $\log 2 = 0.30, \log 3 = 0.48$, $\log 5 = 0.69$, $\log 7 = 0.84, \log 11 = 1.04$)

(1) 3.2 (2) 4.2

(3) 5.2 (4) 6.2

Q82. Ionic Equilibrium, 2022 (25 Jul Shift 2)

Ka_1, Ka_2 and Ka_3 are the respective ionization constants for the following reactions (a), (b) and (c).

(a) $H_2C_2O_4 \rightleftharpoons H^+ + HC_2O_4^-$

(b) $HC_2O_4^- \rightleftharpoons H^+ + HC_2O_4^{2-}$

(c) $H_2C_2O_4 \rightleftharpoons 2H^+ + C_2O_4^{2-}$

The relationship between K_{a_1}, K_{a_2} and K_{a_3} is given as

(1) $K_{a3} = K_{a1} + K_{a2}$ (2) $K_{a3} = \frac{K_{a1}}{K_{a2}}$

(3) $K_{a3} = K_{a1} - K_{a2}$ (4) $K_{a3} = K_{a1} \times K_{a2}$

Q83. Ionic Equilibrium, 2022 (29 Jun Shift 1)

The solubility of AgCl will be maximum in which of the following?

(1) 0.01 M HCl (2) 0.01 M KCl

(3) Deionised water (4) 0.01M $AgNO_3$

Q84. Ionic Equilibrium, 2022 (26 Jun Shift 1)

50 mL of 0.1 M CH_3COOH is being titrated against 0.1 M NaOH. When 25 mL of NaOH has been added, the pH of the solution will be____$\times 10^{-2}$. (Nearest integer)
(Given : $pK_a(CH_3COOH) = 4.76$)
$\log 2 = 0.30$
$\log 3 = 0.48$
$\log 5 = 0.69$
$\log 7 = 0.84$
$\log 11 = 1.04$

Q85. Ionic Equilibrium, 2021 (01 Sep Shift 2)

The molar solubility of $Zn(OH)_2$ in $0.1\,M$ NaOH solution is $x \times 10^{-18}$M. The value of x is _____ . (Nearest integer)

(Given : The solubility product of $Zn(OH)_2$ is 2×10^{-20})

Q86. Ionic Equilibrium, 2021 (31 Aug Shift 1)

A_3B_2 is a sparingly soluble salt of molar mass $M\left(g\ mol^{-1}\right)$ and solubility x g L^{-1}. The solubility product satisfies $K_{sp} = a\left(\frac{x}{M}\right)^5$. The value of a is _____ . (Integer answer)

Q87. Ionic Equilibrium, 2021 (25 Jul Shift 2)

Assuming that $Ba(OH)_2$ is completely ionised in aqueous solution under the given conditions the concentration of H_3O^+ ions in $0.005M$ aqueous solution of $Ba(OH)_2$ at 298 K is _____ $\times 10^{-12}$ mol L^{-1}. (Nearest integer)

Q88. Ionic Equilibrium, 2021 (20 Jul Shift 2)

A solution is $0.1M$ in Cl^- and $0.001M$ in CrO_4^{2-}.

Solid $AgNO_3$ is gradually added to it Assuming that the addition does not change in volume and $K_{sp}(AgCl) = 1.7 \times 10^{-10}M^2$ and $K_{sp}(Ag_2CrO_4) = 1.9 \times 10^{-12}M^3$.

Select correct statement from the following:

(1) AgCl precipitates first because its K_{sp} is high.

(2) Ag_2CrO_4 precipitates first as its K_{sp} is low.

(3) Ag_2CrO_4 precipitates first because the amount of Ag^+ needed is low.

(4) AgCl will precipitate first as the amount of Ag^+ needed to precipitate is low.

Q89. Ionic Equilibrium, 2021 (18 Mar Shift 2)

10.0 ml of Na_2CO_3 solution is titrated against $0.2\,M$ HCl solution. The following values were obtained in 5 readings. 4.8 ml, 4.9 ml, 5.0 ml, 5.0 ml and 5.0 ml

Based on these readings, and convention of titrimetric estimation of concentration of Na_2CO_3 solution is ___ mM.

(Round off to the Nearest integer)

Q90. Ionic Equilibrium, 2021 (17 Mar Shift 1)

0.01 moles of a weak acid HA $\left(K_a = 2.0 \times 10^{-6}\right)$ is dissolved in 1.0 L of $0.1M$ HCl solution. The degree of dissociation of HA is _____ $\times 10^{-5}$ (Round off to the Nearest Integer). [Neglect volume change on adding HA and assume degree of dissociation $<< 1$]

Q91. Ionic Equilibrium, 2020 (05 Sep Shift 1)

A soft drink was bottled with a partial pressure of CO_2 of 3 bar over the liquid at room temperature. The partial pressure of CO_2 over the solution approaches a value of 30 bar when 44 g of CO_2 is dissolved in 1 kg of water at room temperature. The approximate pH of the soft drink is _____ $\times 10^{-1}$.

(First dissociation constant of $H_2CO_3 = 4.0 \times 10^{-7}$; $\log 2 = 0.3$; density of the soft drink $= 1$ g mL^{-1})

Q92. Ionic Equilibrium, 2020 (09 Jan Shift 1)

The K_{sp} for the following dissociation is 1.6×10^{-5}

$PbCl_{2(s)} \rightleftharpoons Pb^{2+}_{(aq)} + 2Cl^-_{(aq)}$

Which of the following choices is correct for a mixture of 300 mL 0.134 M $Pb(NO_3)_2$ and 100 mL 0.4 M NaCl?

(1) Not enough data provided

(2) $Q < K_{sp}$

(3) $Q > K_{sp}$

(4) $Q = K_{sp}$

Chapter: Redox Reactions

Q93. Redox Reactions, 2024 (01 Feb Shift 1)

Given below are two statements :

Statement (I) : Potassium hydrogen phthalate is a primary standard for standardisation of sodium hydroxide solution.

Statement (II) : In this titration phenolphthalein can be used as indicator.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are correct

(2) Statement I is correct but Statement II is incorrect

(3) Statement I is incorrect but Statement II is correct

(4) Both Statement I and Statement II are incorrect

Q94. Redox Reactions, 2023 (08 Apr Shift 2)

Given below are two statements:

Statement I: In redox titration, the indicators used are sensitive to change in pH of the solution.

Statement II: In acid-base titration, the indicators used are sensitive to change in oxidation potential.

In the light of the above statements, choose the **most appropriate** answer from the options given below

(1) **Statement I** is correct but **Statement II** is incorrect

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is incorrect but **Statement II** is correct

(4) Both **Statement I** and **Statement II** are correct

Q95. Redox Reactions, 2023 (06 Apr Shift 1)

Strong reducing and oxidizing agents among the following , respectively, are

(1) Ce^{3+} and Ce^{4+}

(2) Ce^{4+} and Tb^{4+}

(3) $Ce^{4+}$and Eu^{2+}

(4) Eu^{2+} and Ce^{4+}

Q96. Redox Reactions, 2023 (06 Apr Shift 2)

During the reaction of permanganate with thiosulphate, the change in oxidation of manganese occurs by value of 3. Identify which of the below medium will favour the reaction.

(1) Both aqueous acidic and neutral

(2) Aqueous neutral

(3) Both aqueous acidic and faintly alkaline

(4) Aqueous acidic

Q97. Redox Reactions, 2022 (27 Jul Shift 2)

The normality of H_2SO_4 in the solution obtained on mixing $100\ mL$ of $0.1M\ H_2SO_4$ with $50\ mL$ of $0.1M\ NaOH$ is____$\times 10^{-1}$ N.

Q98. Redox Reactions, 2022 (26 Jul Shift 1)

Which of the given reactions is not an example of disproportionation reaction?

(1) $2H_2O_2 \rightarrow 2H_2O + O_2$

(2) $2\,NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

(3) $MnO_4^- + 4H^+ + 3e^- \rightarrow MnO_2 + 2H_2O$

(4) $3\,MnO_4{}^{2-} + 4H^+ \rightarrow 2\,MnO_4{}^- + MnO_2 + 2H_2O$

Q99. Redox Reactions, 2022 (26 Jul Shift 2)

$20\ mL$ of 0.02 M hypo solution is used for the titration of $10\ mL$ of copper sulphate solution, in the presence of excess of KI using starch as an indicator. The molarity of Cu^{2+} is found to be _____ $\times 10^{-2}$M (nearest integer)

Given : $2\,Cu^{2+} + 4I^- \rightarrow Cu_2I_2 + I_2I_2 + 2S_2O_3^{-2} \rightarrow 2I^- + S_4O_6^{-2}$

Q100. Redox Reactions, 2022 (28 Jun Shift 1)

A 2.0 g sample containing MnO_2 is treated with HCl liberating Cl_2. The Cl_2 gas is passed into a solution of KI and $60.0\,mL$ of $0.1\,MNaS_2O_3$ is required to titrate the liberated iodine. The percentage of MnO_2 in the sample is____. Nearest integer)

[Atomic masses (in u) $Mn = 55; Cl = 35.5 : O = 16, I = 127, Na = 23, K = 39, S = 32$]

Q101. Redox Reactions, 2021 (27 Aug Shift 1)

In polythionic acid, $H_2S_xO_6 (x = 3$ to $5)$ the oxidation state(s) of sulphur is/are:

(1) $+6$ only

(2) $+5$ only

(3) 0 and $+5$ only

(4) $+3$ and $+5$ only

Q102. Redox Reactions, 2021 (25 Jul Shift 1)

When $10\ mL$ of an aqueous solution of Fe^{2+} ions was titrated in the presence of dil H_2SO_4 using diphenylamine indicator, $15\ mL$ of 0.02 M solution of $K_2Cr_2O_7$ was required to get the end point. The molarity of the solution containing Fe^{2+} ions is $x \times 10^{-2}$ M. The value of x is _____. (Nearest integer)

Q103. Redox Reactions, 2021 (17 Mar Shift 1)

$15\ mL$ of aqueous solution of Fe^{2+} in acidic medium completely reacted with $20\ mL$ of 0.03 M aqueous $Cr_2O_7{}^{2-}$. The molarity of the Fe^{2+} solution is _____ $\times 10^{-2}$M (Round off to the Nearest Integer).

Q104. Redox Reactions, 2021 (25 Feb Shift 1)

In basic medium CrO_4^{2-} oxidises $S_2O_3^{2-}$ to form $SO_4{}^{2-}$ and itself changes into $Cr(OH)_4^-$.The volume of $0.154\,MCrO_4^{2-}$ required to react with $40\ mL$ of $0.25\,MS_2O_3{}^{2-}$ is _____ mL. (Rounded-off to the nearest integer)

Q105. Redox Reactions, 2020 (04 Sep Shift 1)

A 20.0 mL solution containing 0.2 g impure H_2O_2 reacts completely with 0.316 g of $KMnO_4$ in acid solution. The purity of H_2O_2 (in %) is_____ (mol. wt. of $H_2O_2 = 34$; mol. wt. of $KMnO_4 = 158$)

Chapter: Solutions

Q106. Solutions, 2024 (09 Apr Shift 2)

The vapour pressure of pure benzene and methyl benzene at $27^\circ C$ is given as 80 Torr and 24 Torr, respectively. The mole fraction of methyl benzene in vapour phase, in equilibrium with an equimolar mixture of those two liquids (ideal solution) at the same temperature is _____ $\times 10^{-2}$ (nearest integer)

Q107. Solutions, 2024 (06 Apr Shift 1)

Given below are two statements: Statement I : Gallium is used in the manufacturing of thermometers. Statement II : A thermometer containing gallium is useful for measuring the freezing point $(256\ K)$ of brine solution. In the light of the above statements, choose the correct answer from the options given below :

(1) Both Statement I and Statement II are true
(2) Statement I is false but Statement II is true
(3) Both Statement I and Statement II are false
(4) Statement I is true but Statement II is false

Q108. Solutions, 2024 (04 Apr Shift 1)

The Molarity (M) of an aqueous solution containing 5.85 g of NaCl in 500 mL water is : (Given : Molar Mass Na : 23 and Cl : $35.5 gmol^{-1}$)

(1) 2
(2) 20
(3) 4
(4) 0.2

Q109. Solutions, 2024 (04 Apr Shift 2)

2.7 kg of each of water and acetic acid are mixed. The freezing point of the solution will be $-x^\circ C$. Consider the acetic acid does not dimerise in water, nor dissociates in water. $x =$ _____ (nearest integer) [Given: Molar mass of water $= 18$ g mol^{-1}, acetic acid $= 60$ g mol^{-1} $K_f H_2O$: 1.86 K kg mol^{-1} K_f acetic acid: 3.90 K kg mol^{-1} freezing point: $H_2O = 273$ K, acetic acid $= 290$ K]

Q110. Solutions, 2024 (31 Jan Shift 1)

Identify the mixture that shows positive deviations from Raoult's Law

(1) $(CH_3)_2CO + C_6H_5NH_2$
(2) $CHCl_3 + C_6H_6$
(3) $CHCl_3 + (CH_3)_2CO$
(4) $(CH_3)_2CO + CS_2$

Q111. Solutions, 2024 (30 Jan Shift 1)

What happens to freezing point of benzene when small quantity of napthalene is added to benzene?

(1) Increases
(2) Remains unchanged
(3) First decreases and then increases
(4) Decreases

Q112. Solutions, 2024 (29 Jan Shift 1)

The osmotic pressure of a dilute solution is 7×10^5 Pa at 273 K. Osmotic pressure of the same solution at 283 K is _____ $\times 10^4$ Nm^{-2}. (Nearest integer)

Q113. Solutions, 2023 (30 Jan Shift 1)

Some amount of dichloromethane (CH_2Cl_2) is added to 671.141 mL of chloroform $(CHCl_3)$ to prepare 2.6×10^{-3}M solution of CH_2Cl_2(DCM). The concentration of DCM is _____ ppm (by mass).

Given: Atomic mass : $C = 12; H : 1; Cl = 35.5$ density of $CHCl_3 = 1.49 g\ cm^{-3}$

Q114. Solutions, 2022 (29 Jul Shift 2)

1.80 g of solute A was dissolved in $62.5\ cm^3$ of ethanol and freezing point of the solution was found to be 155.1 K. The molar mass of solute A is $gmol^{-1}$. [Given: Freezing point of ethanol is 156.0 K. Density of ethanol is $0.80\ g\ cm^{-3}$. Freezing point depression constant of ethanol is $2.00\ K\ kg\ mol^{-1}$]

Q115. Solutions, 2021 (25 Jul Shift 1)

CO_2 gas is bubbled through water during a soft drink manufacturing process at 298 K. If CO_2 exerts a partial pressure of 0.835 bar then x m mol of CO_2 would dissolve in 0.9 L of water. The value of x is _____. (Nearest integer)

(Henry's law constant for CO_2 at 298 K is 1.67×10^3 bar)

Q116. Solutions, 2021 (18 Mar Shift 1)

2 molal solution of a weak acid HA has a freezing point of $3.885^{\circ}C$. The degree of dissociation of this acid is _____$\times 10^{-3}$. (Round off to the Nearest Integer). [Given : Molal depression constant of water $= 1.85$ K kg mol^{-1} Freezing point of pure water$= 0^{\circ}C$]

Q117. Solutions, 2020 (06 Sep Shift 1)

The elevation of boiling point of 0.10m aqueous $CrCl_3.xNH_3$ solution is two times that of 0.05 m aqueous $CaCl_2$ solution. The value of x is .....

[Assume 100% ionisation of the complex and $CaCl_2$, coordination number of Cr as 6, and that all NH_3 molecules are present inside the coordination sphere]

Q118. Solutions, 2020 (03 Sep Shift 1)

Henry's constant (in kbar) for four gases α, β, γ and δ in water at 298 K is given below :

	α	β	γ	δ
K_H	50	2	2×10^{-5}	0.5

(density of water $= 10^3$ k gm^{-3} at 298 K) This table implies that :

(1) α has the highest solubility in water at a given pressure

(2) solubility of γ at $308K$ is lower than at $298K$

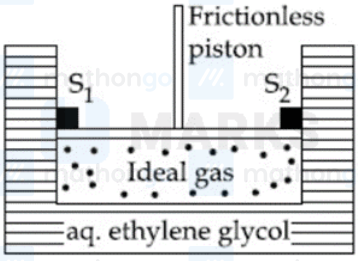
(3) The pressure of a 55.5 molal solution of δ is 250 bar

(4) The pressure of 55.5 molal solution of γ is 1 bar.

Q119. Solutions, 2020 (09 Jan Shift 2)

A cylinder containing an ideal gas (0.1mol of 1.0dm^3) is in thermal equilibrium with a large volume of 0.5 molal aqueous solution of ethylene glycol at its freezing point. If the stoppers S_1 and S_2 (as shown in the figure) are suddenly withdrawn, the volume of the gas in litres after equilibrium is achieved will be _____.

(Given, $K_f(\text{water}) = 2.0 \text{Kkgmol}^{-1}$, $R = 0.08 \text{dm}^3\text{atmK}^{-1}\text{mol}^{-1}$)



Q120. Solutions, 2020 (07 Jan Shift 1)

At 35 °C, the vapour pressure of CS_2, is 512mm Hg and that of acetone is 144 mmHg. A solution of CS_2 in acetone has a total vapour pressure of 600 mmHg . The false statement amongst the following is:

(1) Raoult's law is not obeyed by this system

(2) a mixture of 100mLCS_2 and 100mL acetone has a volume < 200mL

(3) CS_2 and acetone are less attracted to each other than to themselves

(4) heat must be absorbed in order to produce the solution at 35°C

Chapter: Electrochemistry

Q121. Electrochemistry, 2024 (09 Apr Shift 2)

Match List I with List II

	List - I (Cell)		List - II (Use/Property/Reaction)
A.	Leclanche cell	I.	Converts energy of combustion into electrical energy
B.	Ni – Cd cell	II.	Does not involve any ion in solution and is used in hearing aids
C.	Fuel cell	III.	Rechargeable
D.	Mercury cell	IV.	Reaction at anode $Zn \rightarrow Zn^{2+} + 2e^-$

Choose the correct answer from the options given below:

(1) A-II, B-III, C-IV, D-I

(2) A-I, B-II, C-III, D-IV

(3) A-III, B-I, C-IV, D-II

(4) A-IV, B-III, C-I, D-II

Q122. Electrochemistry, 2024 (08 Apr Shift 2)

The reaction; $\frac{1}{2}H_{2(g)} + AgCl_{(s)} \rightarrow H^+_{(aq)} + Cl^-_{(aq)} + Ag_{(s)}$ occurs in which of the following galvanic cell :

(1) $Ag\left|AgCl_{(s)}\right|KCl_{(soln.)}\left|AgNO_{3\,(aq.)}\right|Ag$

(2) $Pt\left|H_{2(g)}\right|HCl_{(soln.)}\left|AgCl_{(s)}\right|Ag$

(3) $Pt\left|H_{2(g)}\right|KCl_{(soln.)}\left|AgCl_{(s)}\right|Ag$

(4) $Pt\left|H_{2(g)}\right|HCl_{(soln.)}\left|AgNO_{3(aq)}\right|Ag$

Q123. Electrochemistry, 2024 (05 Apr Shift 1)

The reaction at cathode in the cells commonly used in clocks involves.

(1) reduction of Mn from +7 to +2

(2) reduction of Mn from +4 to +3

(3) oxidation of Mn from +3 to +4

(4) oxidation of Mn from +2 to +7

Q124. Electrochemistry, 2024 (05 Apr Shift 2)

The quantity of silver deposited when one coulomb charge is passed through $AgNO_3$ solution :

(1) 1 g of silver

(2) 1 electrochemical equivalent of silver

(3) 1 chemical equivalent of silver

(4) 0.1 g atom of silver

Q125. Electrochemistry, 2024 (01 Feb Shift 1)

The potential for the given half cell at 298K is $(-)$..... $\times 10^{-2}$V.

$2H^+_{(aq)} + 2e^- \rightarrow H_2\left(g\right)$

$[H^+] = 1M, P_{H_2} = 2\ atm$

(Given$2.303\ RT/F = 0.06\ V,\ \log 2 = 0.3$)

Q126. Electrochemistry, 2024 (01 Feb Shift 2)

Consider the following redox reaction: $MnO_4^- + H^+ + H_2C_2O_4 \rightleftharpoons Mn^{2+} + H_2O + CO_2$

The standard reduction potentials are given as below ($E_{red}{}^\circ$)

$E^0{}_{MnO_4^-/Mn^{2+}} = +1.51\ V;\ E^0{}_{CO_2/H_2C_2O_4} = -0.49\ V$

If the equilibrium constant of the above reaction is given as $K_{eq} = 10^x$, then the value of $x =$ _____ (nearest integer)

Q127. Electrochemistry, 2024 (31 Jan Shift 1)

One Faraday of electricity liberates $x \times 10^{-1}$ gram atom of copper from copper sulphate, x is_____.

Q128. Electrochemistry, 2023 (15 Apr Shift 1)

The number of correct statements from the following is _____

(A) Conductivity always decreases with decrease in concentration for both strong and weak electrolytes.

(B) The number of ions per unit volume that carry current in a solution increases on dilution.

(C) Molar conductivity increases with decrease in concentration.

(D) The variation in molar conductivity is different for strong and weak electrolytes.

(E) For weak electrolytes, the change in molar conductivity with dilution is due to decrease in degree of dissociation.

Q129. Electrochemistry, 2023 (12 Apr Shift 1)

For lead storage battery pick the correct statements

A. During charging of battery, $PbSO_4$ on anode is converted into PbO_2

B. During charging of battery, $PbSO_4$ on cathode is converted into PbO_2

C. Lead storage battery consists of grid of lead packed with PbO_2 as anode

D. Lead storage battery has ~38% solution of sulphuric acid as an electrolyte

Choose the correct answer from the options given below:

(1) A, B, D only

(2) B, C, D only

(3) B, C only

(4) B, D only

Q130. Electrochemistry, 2023 (06 Apr Shift 1)

The standard electrode potential of M^+/M in aqueous solution does not depend on

(1) Hydration of a gaseous metal ion

(2) Sublimation of a solid metal

(3) Ionisation of a solid metal atom

(4) Ionisation of a gaseous metal atom

Q131. Electrochemistry, 2022 (28 Jul Shift 1)

Match List-I with List-II.

List-I		List-II
A	$Cd(s)+2Ni(OH)_3(s) \rightarrow CdO(s)+2Ni(OH)_2(s)+H_2O(l)$	I Primary battery
B	$Zn(Hg)+HgO(s) \rightarrow ZnO(s)+Hg(l)$	II Discharging of secondary battery
C	$2PbSO_4(s)+2H_2O(I) \rightarrow Pb(s)+PbO_2(s)+2H_2SO_4(aq)$	III Fuel cell
D	$2H_2(g)+O_2(g) \rightarrow 2H_2O(l)$	IV Charging of secondary battery

Choose the correct answer from the options given below

(1) $A-I, B-II, C-III, C-IV$

(2) $A-IV, B-I, C-IV, C-III$

(3) $A-II, B-I, C-IV, C-III$

(4) $A-II, B-I, C-III, C-IV$

Q132. Electrochemistry, 2022 (29 Jun Shift 2)

The cell potential for the given cell at 298 K $Pt|H_2(g, 1\ bar)||H^+(aq)||Cu^{2+}(aq)|Cu(s)$ is 0.31 V. The pH of the acidic solution is found to be 3, whereas the concentration of Cu^{2+} is 10^x M. The value of x is _____.

(Given: $E^{\ominus}_{Cu^{2+}/Cu} = 0.34$ V and $\frac{2.303RT}{F} = 0.06$ V)

Q133. Electrochemistry, 2022 (28 Jun Shift 2)

For the given reactions

$Sn^{2+}+2e^- \rightarrow Sn$

$Sn^{4+}+4e^- \rightarrow Sn$ the electrode potentials are ; $E^{\circ}_{Sn^{2+}/Sn} = -0.140$ V and $E^{\circ}_{Sn^{4+}/Sn} = 0.010$ V. The magnitude of standard electrode potential for Sn^{4+}/Sn^{2+} i.e. $E^{\circ}_{Sn^{4+}/Sn^{2+}}$ is____$\times 10^{-2}$ V(Nearest integer)

Q134. Electrochemistry, 2022 (27 Jun Shift 1)

The limiting molar conductivities of NaI, $NaNO_3$ and $AgNO_3$ are 12.7, 12.0 and 13.3 $mSm^2\ mol^{-1}$, respectively (all at 25 $^{\circ}$C). The limiting molar conductivity of AgI at this temperature is____$mSm^2\ mol^{-1}$.

Q135. Electrochemistry, 2022 (25 Jun Shift 1)

In a cell, the following reactions take place

$Fe^{2+} \rightarrow Fe^{3+}+e^-\ \ E^{o}_{Fe^{3+}/Fe^{2+}} = 0.77$ V

$2I^- \rightarrow I_2+2e^-\ \ E^{0}_{I_2/I^-} = 0.54$ V

The standard electrode potential for the spontaneous reaction in the cell is $x \times 10^{-2}$ V at 298 K. The value of x is - (Nearest Integer)

Q136. Electrochemistry, 2022 (25 Jun Shift 2)

A solution of $Fe_2(SO_4)_3$ is electrolyzed for 'x' min with a current of 1.5 A to deposit 0.3482 g of Fe. The value of x is - [nearest integer]

Given : 1 F = 96500 $Cmol^{-1}$. Atomic mass of Fe = 56 $gmol^{-1}$

Q137. Electrochemistry, 2022 (24 Jun Shift 2)

The resistance of a conductivity cell containing 0.01 MKCl solution at 298 K is 1750 Ω. If the conductivity of 0.01 MKCl solution at 298 K is 0.152×10^{-3} S cm^{-1}, then the cell constant of the conductivity cell is____$\times 10^{-3}$ cm^{-1}

Q138. Electrochemistry, 2021 (27 Jul Shift 1)

The conductivity of a weak acid HA of concentration 0.001 mol L^{-1} is 2.0×10^{-5} S cm^{-1}. If $\Lambda^0_m(HA) = 190$ S cm^2 mol^{-1}, the ionization constant (K_a) of HA is equal to ____ $\times 10^{-6}$

(Round off to the Nearest Integer)

Q139. Electrochemistry, 2021 (27 Jul Shift 2)

For the cell $Cu(s)|Cu^{2+}(aq)(0.1M)||Ag^+(aq)(0.01M)|Ag(s)$ the cell potential $E_1 = 0.3095$ V. For the cell $Cu(s)|Cu^{2+}(aq)(0.01M)||Ag^+(aq)(0.001M)|Ag(s)$ the cell potential = $x \times 10^{-2}$ V. Find value of x (Round off the Nearest Integer).

[Use : $\frac{2.303RT}{F} = 0.059$ J]

Q140. Electrochemistry, 2020 (02 Sep Shift 2)

For the disproportionation reaction $2\,Cu^{+}(aq) \rightleftharpoons Cu(s) + Cu^{2+}(aq)$ at 298K,ln K (where K is the equilibrium constant) is _____$\times 10^{-1}$

Given : $\left(E^{\circ}_{Cu^{2+}/Cu^{+}} = 0.16V\ E^{\circ}_{Cu^{+}/Cu} = 0.52V \frac{RT}{F} = 0.025\right)$

Chapter: Chemical Kinetics

Q141. Chemical Kinetics, 2024 (08 Apr Shift 1)

Consider the following reaction

$$A + B \rightarrow C$$

The time taken for A to become $1/4^{th}$ of its initial concentration is twice the time taken to become $1/2$ of the same. Also, when the change of concentration of B is plotted against time, the resulting graph gives a straight line with a negative slope and a positive intercept on the concentration axis. The overall order of the reaction is _____

Q142. Chemical Kinetics, 2024 (05 Apr Shift 1)

During Kinetic study of reaction $2A + B \rightarrow C + D$, the following results were obtained :

	A [M]	B [M]	initial rate of formation of D
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.20×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

Based on above data, overall order of the reaction is _____

Q143. Chemical Kinetics, 2024 (04 Apr Shift 2)

Consider the following reaction, the rate expression of which is given below

$$A + B \rightarrow C$$
$$\text{rate} = k[A]^{1/2}[B]^{1/2}$$

The reaction is initiated by taking 1M concentration of A and B each. If the rate constant (k) is $4.6 \times 10^{-2}\ s^{-1}$, then the time taken for A to become 0.1M is _____ sec. (nearest integer)

Q144. Chemical Kinetics, 2024 (01 Feb Shift 2)

The following data were obtained during the first order thermal decomposition of a gas A at constant volume:

$A(g) \rightarrow 2\,B(g) + C(g)$

S. No	Time/s	Total pressure/(atm)
1.	0	0.1
2.	115	0.28

The rate constant of the reaction is _____ $\times 10^{-2} s^{-1}$ (nearest integer)

Q145. Chemical Kinetics, 2024 (31 Jan Shift 1)

Integrated rate law equation for a first order gas phase reaction is given by (where P_i is initial pressure and P_t is total pressure at time t)

(1) $k = \frac{2.303}{t} \times \log \frac{P_i}{(2P_i - P_t)}$

(2) $k = \frac{2.303}{t} \times \log \frac{2P_i}{(2P_i - P_t)}$

(3) $k = \frac{2.303}{t} \times \log \frac{(2P_i - P_t)}{P_i}$

(4) $k = \frac{2.303}{t} \times \frac{P_i}{(2P_i - P_t)}$

Q146. Chemical Kinetics, 2024 (31 Jan Shift 2)

$r = k[A]$ for a reaction, 50% of A is decomposed in 120 minutes. The time taken for 90% decomposition of A is _____ minutes.

Q147. Chemical Kinetics, 2024 (30 Jan Shift 1)

The rate of first order reaction is $0.04\ mol\ L^{-1}\ s^{-1}$ at 10 minutes and $0.03\ mol\ L^{-1}\ s^{-1}$ at 20 minutes after initiation. Half life of the reaction is _____ minutes. (Given $\log 2 = 0.3010, \log 3 = 0.4771$)

Round off your answer to the nearest integer.

Q148. Chemical Kinetics, 2024 (30 Jan Shift 2)

NO_2 required for a reaction is produced by decomposition of N_2O_5 in CCl_4 as by equation $2N_2O_{5(g)} \rightarrow 4\,NO_{2(g)} + O_{2(g)}$

The initial concentration of N_2O_5 is $3\ mol\ L^{-1}$ and it is $2.75\ mol\ L^{-1}$ after 30 minutes.

The rate of formation of NO_2 is $x \times 10^{-3}$ mol L^{-1} min_1, value of x is _____.

Q149. Chemical Kinetics, 2024 (27 Jan Shift 1)

Consider the following data for the given reaction

$2\,HI_{(g)} \rightarrow H_{2(g)} + I_{2(g)}$

$HI\left(molL^{-1}\right)$	0.005	0.01	0.02
Rate $\left(molL^{-1}\ s^{-1}\right)$	7.5×10^{-4}	3.0×10^{-3}	1.2×10^{-2}

The order of the reaction is _____.

Q150. Chemical Kinetics, 2024 (27 Jan Shift 2)

Time required for completion of 99.9% of first order reaction is _____ times of half life $\left(t_{1/2}\right)$ of the reaction

Q151. Chemical Kinetics, 2023 (06 Apr Shift 1)

For the adsorption of hydrogen on platinum, the activation energy is 30 kJ mol^{-1} and for the adsorption of hydrogen on nickel, the activation energy is 41.4 kJ mol^{-1}. The logarithm of the ratio of the rates of chemisorption on equal areas of the metals at 300 K is _____ (Nearest integer)

Given: $\ln 10 = 2.3$

$R = 8.3\ J\ K^{-1}\ mol^{-1}$

Q152. Chemical Kinetics, 2023 (30 Jan Shift 2)

An organic compound undergoes first order decomposition. If the time taken for the 60% decomposition is 540 s, then the time required for 90% decomposition will be is _____ s. (Nearest integer).

Given : $\ln 10 = 2.3; \log 2 = 0.3$

Q153. Chemical Kinetics, 2022 (29 Jul Shift 1)

The reaction between X and Y is first order with respect to X and zero order with respect to Y.

Experiment	$\frac{[X]}{molL^{-1}}$	$\frac{[Y]}{molL^{-1}}$	$\frac{\text{Initial rate}}{molL^{-1}min^{-1}}$
I	0.1	0.1	2×10^{-3}
II	L	0.2	4×10^{-3}
III	0.4	0.4	$M \times 10^{-3}$
IV	0.1	0.2	2×10^{-3}

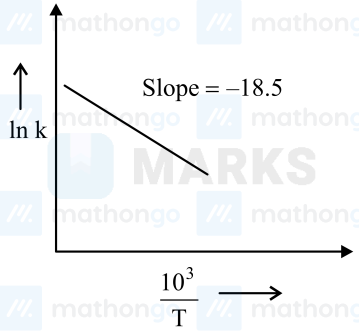
Examine the data of table and calculate ratio of numerical values of M and L.

Q154. Chemical Kinetics, 2022 (25 Jul Shift 1)

The half life for the decomposition of gaseous compound A is 240 s when the gaseous pressure was 500 Torr initially. When the pressure was 250 Torr, the half life was found to be 4.0 min. The order of the reaction is _____ (Nearest integer)

Q155. Chemical Kinetics, 2022 (24 Jun Shift 1)

The rate constants for decomposition of acetaldehyde have been measured over the temperature range $700 - 1000$ K. The data has been analysed by plotting lnk vs $\frac{10^3}{T}$ graph. The value of activation energy for the reaction is $kJmol^{-1}$. (Nearest integer) (Given : $R = 8.31\ JK^{-1}\ mol^{-1}$)



Q156. Chemical Kinetics, 2021 (01 Sep Shift 2)

Which one of the following given graphs represents the variation of rate constant (k) with temperature (T) for an endothermic reaction?