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Chemistry - II: CE-BS-203 T Total Credits: 02

Question Bank- Multiple Choice Queestions

Unit 1

Which postulate is not correct for kinetic theory of gases?

A. Molecular collisions are perfectly elastic

B. No intermolecular attractive forces

C. Applicable to all gases

D. Law of classical mechanics are valid

Which equation you cannot derive from kinetic theory of gases?

A. Charles Law

B. Avogadro law

C. Ideal gas equation

D. Van der Waals equation

In the Maxwell distribution of molecular velocities, the fraction of molecules with velocities between ‘c’ and ‘c+dc’ can be represented by which expression:

A. P(c) dc

B. dN / N

C. Both P(c) dc and dN / N

D. None out of P(c) dc and dN / N

The correct order of average velocity (1), most probable velocity (2) and root mean square velocity (3) is:

A. 1 less than 2less than 3

B. 2 less than 1less than 3

C. 3 less than 2 less than 1

D. 3 less than 1 less than 2

The mean free path for a gas molecule will be:

A. Proportional to T & Proportional to P

B. Proportional to T & Inversely Proportional to P

C. Inversely Proportional to T & Proportional to P

D. Inversely Proportional to T & Inversely Proportional to P

Which statement regarding the compressibility factor (Z) for gases is incorrect?

A. Equals to zero for real gases

B. Equals to unity for ideal gases

C. Is greater than one for some gases

D. Is less than one for some gases

The van der Waals equation of state approaches ideal gas equation under which of the conditions?

A. High T & High P

B. High T & Low P

C. Low T & High P

D. Low T & Low P

The temperature at which the second coefficient in the Virial Equation of state approaches zero is known as:

A. Boyle's temperature

B. Critical temperature

C. Reduced temperature

D. Inversion temperature

Which statement is not correct regarding principle of corresponding states?

A. It is a general equation, does not depend on any gas characteristics

B. It involves Critical phenomenon (Tc, Pc & Vc)

C. The expression contains reduced temperature and reduced pressure

D. It can be derived from ideal gas equation

The temperature at which the second coefficient in the Virial Equation of a real gas approaches zero is known as:

A. Boyle's temperature

B. Critical temperature

C. Reduced temperature

D. Inversion temperature

The compressibility factor of an ideal gas is:

A. Zero

B. Infinite

C. Unity

D. Equal to 2.5

A gas cannot be liquefied if the temperature of the gas is greater than:

A. Critical Temperature

B. Boyle's Temperature

C. Reduced Temperature

D. Inversion Temperature

The pressure of a real gas will be ……..that of ideal gas.

A. Same as

B. Greater than

C. Less than

D. Cannot compare

Unit 2

The de-Broglie hypothesis is associated with:

A. Wave nature of electrons only
B. Wave nature of alpha-particles only
C. Wave nature of radiations
D. Wave nature of all material particles

De-Broglie equation states the

A. dual nature
B. particle nature
C. wave nature
D. none of these

The momentum of an electron that emits a wavelength of 2 Angstron will be

A. 6.4 × 10^-36 kgms^-1
B. 3.3 × 10^-24 kgms^-1
C. 3.3 × 10^-34 kgms^-1
D. none of these

What is the de-Broglie wavelength of an electron accelerated from rest through a potential difference of 100 volts

A. 12.3 A
B. 1.23 A
C. 0.123 A
D. None of these

The Energy of the particle is proportional to

A. n
B. n^-1
C. n^2
D. n^-2

For a particle inside a box, the potential is maximum at x equals to

A. L
B. 2L
C. L/2
D. 3L

The Eigen value of a particle in a box is

A. L/2
B. 2/L
C. root L/2
D. root 2/L

What is the minimum Energy possessed by the particle in a box

A. Zero
B. n2h2/8mL2
C. n2h2/8mL
D. n2h/2mL

Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom

A. 3.9 X 10 ^-29 J
B. 4.9 X 10^-29 J
C. 5.9 X 10^-29 J
D. 6.9 X 10^-29 J

Which of the following is not a characteristic of wave function

A. Continuous
B. Single valued
C. Differentiable
D. Physically Significant

Calculate the minimum uncertainty in the momentum of a 4He atom confined to 0.40 nm.
A. 2.02 X 10 ^-25 kg m/s
B. 2.53 X 10^-25 kg m/s
C. 2.64 X 10^-25 kg m/s
D. 2.89 X 10^-25 kg m/s
The uncertainty in the location of a particle moving with velocity 7.28 X 10 ^ 7m /s is two times its de-Broglie wavelength. What is the uncertainty in measuring the velocity
A. 5.79 X 10 ^6 m/s
B. 6.12 X 10^6 m/s
C. 7.63 X 10^6 m/s
D. 8.45 X 10^6 m/s
The walls of a particle in a box are supposed to be

A. Small but infinitely hard
B. Infinitely large but soft
C. Soft and Small
D. Infinitely hard and infinitely large

The solution to the Schrodinger equation for a particle bound in a one-dimensional, infinitely deep potential well, indexed by a quantum number n, indicates that in the middle of the well, the probability density vanishes for.

A. all states except the ground state
A. states of even n(n = 2)
B. Ground state (n = 1) only
C. states of odd n(n = 3)

According to postulate of quantum mechanics the operator for energy E is called

A. Hamiltonian operator H
B. Laplacian operator
C. linear operator
D. none of these

Which of the following is not the condition for Eigen function of the Schrondinger's equation

A. chi must be single values
B. chi must be continuous
C. chi must become zero at infinity
D. chi must be infinite

An electron is confined to an infinite one dimensional box of width 4A. Calculate its energy in the 4th energy level

A. 37.68 eV
B. 33.71 eV
C. 28.42 eV
D. 22.65 eV

If a function is both orthogonal and normalized then it is called as

A. Orthonormal
B. Orthoparallel

C. Orthorombic
D. It is not possible

Find commutator of [d/dx, d2/dx2]

A. -1
B. 1
C. 0
D. 2

Calculate the uncertainty in position of a 50 gm bullet with velocity 30m/s accurate to 0.01%

A. 0.703×10^-3m
B. 7.03 ×10^-3m
C. 1.23×10^-12m
D. None of the above

The square of amplitude of electron wave (chi square) at any point gives the ___.

A. displacement of electron
B. density of electron
C. Probability amplitude
D. all of the above

Find the commutator of [x, d/dx].

A. 1
B. (-) 1
C. 0
D. 2

Wavelength associated with an electron moving with a velocity of 10^8 cm/s is ___.

A. 74.7 A
B. 7.27 A
C. 0.727 A
D. 0.277 A

Unit 3

Order of the reaction cannot be.

A. Whole number
B. Fractional value
C. Negative
D. None of Whole number, Fractional value and Negative

Select correct definition of Threshold energy out of the following.

A. Energy difference between reactants and products
B. Extra energy that must be supplied for the reaction to happen
C. Total energy that must be possessed by the reactants to undergo reaction
D. Energy difference lowered by using catalyst

What is not correct regarding catalysts?

A. It is regenerated in the chemical reaction

B. It never undergo chemical reaction with any chemical species
C. It may speed up a chemical reaction
D. It may sometimes slow down a chemical reaction
Which statement out of the following is incorrect regarding enzymes?
A. It is regenerated in the chemical reaction
B. It never undergo chemical reaction with any chemical species
C. It may speed up a chemical reaction
D. It can be damaged by increase in temperature
Which one is an example of pseudofirst order reaction?
A. Saponification of an ester
B. Reaction between persulfate and iodide ions
C. Radioactive decay
D. Acid catalyzed hydrolyssis of ester
Which one can be an example of zero order reaction?
A. Substrate converting to products using enzymes
B. HI decomposition to H2 and I2
C. Radioactive decay
D. Acid catalyzed hydrolysis of ester
Which statement is correct regarding activated complex formed during a chemical reaction?
A. It can be isolated
B. It is another name of intermediate
C. It has the lowest energy in PE-reaction coordinate diagram
D. It has the highest energy in PE- reaction coordinate diagram
Which statement out of the following is incorrect regarding intermediate formed during a chemical reaction?
A. It can be isolated
B. It is highly reactive
C. It has lower energy as compared to reactants
D. It has lower energy as compared to products
Which statement out of the following is incorrect regarding steady state approximation?
A. It is related to the intermediate
B. It is related to activated complex
C. Net rate of formation of species is zero
D. It is related to multistep reactions
Determine order of the reaction for a chemical reaction, (aA + bB) » Products. A) If rate of the reaction is doubled when [A] is doubled. B) When [B] is doubled, rate of the reaction increases by four times.
A. 0
B. 1
C. 2
D. 3
Rate of a chemical reaction is doubled after 10 °C rise from 27 °C. Calculate activation energy for the same.
A. 102 kJ /mol
B. 51 kJ/ mol
C. 26 kJ/ mol

D. 12 kJ/ mol

The rate constant of a first order reaction is 0.0154 s-1. Calculate its half life time.

A. 4.5 s

B. 45 s

C. 450 s

D. 0.45

Unit 4

Calculate Kp for the reaction of H_2 with N_2 to give NH_3 at 25 deg C. delta G for this reaction is - 32.7 kJ/mol of N2.

A. 1.78

B. - 5.4×10^ 5

C. 5.4

D. 5.4×10^ 5

The ratio of chemical potential to free energy of a pure substance at constant temperature and pressure is

A. 0

B. 1

C. infinity

D. None of these

If an ideal solution is formed by mixing two pure liquids in any proportion, then the ----- of mixing is zero.

A. Volume

B. Entropy

C. Free Energy

D. All of the above

Chemical potential is –

A. Extensive property

B. Intensive property

C. Force driving the chemical system to equilibrium

D. Both B and C

For a real gas, the chemical potential is given by-

A. RT d ln P

B. RT d ln f

C. T d ln P

D. RT ln f

For an ideal gas, the chemical potential is given by-

A. RT d ln P

B. RT d ln f

C. T d ln P

D. RT ln f

The unit of fugacity is the same as that of the-
A. Pressure
B. Temperature
C. Volume
D. Molar concentration

Fugacity is a measure of the-
A. Escaping tendency of the same substance in different phases of the system
B. Relative volatility of a mixture of two miscible liquids
C. Behavior of ideal gases
D. None of these

For an ideal gas, the fugacity is equal to pressure and _____
A. f/p=1
B. f/p=0
C. f/p varies
D. f/p greater than 1

A system is said to be at equilibrium, if the entropy of the system has reached _____ value
A. Minimum
B.Zero
C.Maximum
D.None of these

About Gibbs-Duhem equation
A.States that n1du1+n2du2= 0
B. It is applicable only to binary systems
C. Not applicable for gas-liquid equilibria involved in distillation
D. None of these

In the reaction; $N_2 + O_2 = 2NO$, increasing the pressure will result in
A.Shifting the equilibrium towards right
B.Shifting the equilibrium towards left
C.No change in equilibrium condition
D.None of these

In which of the following reaction equilibria, the value of equilibrium constant Kp will be more than Kc?
A. 2HI in eq with $H_2 + I_2$
B. N_2O_4 in eq with $2NO_2$
C. $2SO_2 + O_2$ in eq with $2SO_3$
D. None of these

The free energy change for a chemical reaction in terms of equilibrium constant is given by
A. RT ln K
B. – RT ln K
C. – R ln K
D. R ln K

Which of the following will not shift the equilibrium of a reaction

A. Adding more reactants
B. Increasing the temperature
C. Adding a catalyst
D. Taking away products

The reaction $2SO_2(g) + O_2(g)$ in eq with $2SO_3$ (g), was started by taking one mole each of SO2 (g) and SO3 (g) in a 5.00 dm^3 vessel. The equilibrium was allowed to be reached at 1000 K and the reaction mixture contained 0.85 moles of $SO_3(g)$. Calculate Kc for the reaction.

A. 2.8 * 10 ^2 mol-1dm^3
B. 2.8 * 10 ^-2 mol-1dm^3
C. 1.8 * 10 ^2 mol-1dm^3
D. 2.1 * 10 ^2 mol-1dm^3

The equilibrium constant for the reaction: H2(g)+I2(g) in eq with 2HI(g) is 64, at 923K. The initial concentrations of H2 and HI are 6 and 3 mollit-1 respectively. The equilibrium concentration (in mol/lit) of I2 is –

A. 3.16 mol^-1dm^3
B. 0.16 mol^-1dm^3
C. 5.68 mol^-1dm^3
D. 2.84 mol^-1dm^3

When sulphur (in the form of S8) is heated to 900K, at equilibrium, the pressure of S8 falls by 30% from 1.0 atm, because S8(g) is partially converted into S2(g). Find the value of Kp for this reaction.

A. 2.55 bar^3
B. 2.96 bar^3
C. 2.05 bar^3
D. 6.15 bar^3

The vapour density of N2O4 at a certain temperature is 30. What is the percentage dissociation of N2O4 to NO2 at this temperature

A. 53.3
B. 76.6
C. 26.7
D. 85.5

For the reaction CO (g) + H2O (g) in eq with CO2(g) + H2 (g); Kc = 1.00 at 1100 K. 2.00 moles each of CO and H2O and 1.00 mole each of CO2 and H2 are mixed in a vessel at this temperature. Predict in which direction the reaction would occurs in order to attain the equilibrium.

A. Already in equilibrium
B. Forward direction
C. Backward direction
D. Equilibrium will not be attained

For the reaction CO (g) + H2O (g) in eq with CO2(g) + H2 (g); Kc = 1.00 at 1100 K. 2.00 moles each of CO and H2O and 1.00 mole each of CO2 and H2 are mixed in a vessel at this temperature. Predict the number of moles of CO2 in the equilibrium.

A. 1.0 mol
B. 1.50 mol
C. 2.0 mol
D. 0.50 mol

The equilibrium constant Kc for the reaction, H2(g) + I2 (g) in eq with 2HI (g) is 50 at 743 K. Exactly 1 mol each of H2 and I2 are heated in a 30 dm3 vessel at 743 K. How many moles of I2 remain unreacted when equilibrium is established?

A. 1.0 mol
B. 1.50 mol
C. 0.22 mol
D. 1.56 mol

Phosphorus pentachloride is 41.7% dissociated at 453K under 1 bar pressure. Calculate K (bar), for the reaction.

A. 0.308
B. 20.8
C. 0.21
D. 21.8

22.6 *g* of an aqueous solution of ethanol contains 4.6 *g* ethanol. If change of chemical potential of ethanol is –10 *kJ*. Find change of chemical potential for water

A. +1 *kJ*
B. -1 *kJ*
C. +10 *kJ*
D. -10 *kJ*

The fugacity coefficient is defined as

A. Pressure/fugacity
B. Fugacity/pressure
C. Fugacity *pressure
D. Fugacity/Volume