NEET UG (2024)
Chemistry
Quiz-9

SECTION - A

51. For a zero order reaction:

(1) $t_{1/2} \propto a$ (2) $t_{1/2} \propto \frac{1}{a}$

(3) $t_{1/2} \propto a^2$ (4) $t_{1/2} \propto \frac{1}{a^2}$

52. Which of the following is a state function:

(1) Enthalpy (2) Heat

(3) Work (4) None of these

53. In van der Waals equation of state for a non-ideal gas, the term that accounts for intermolecular forces of attraction is:

(1) V – nb (2) RT

(3) $[P + (an^2/V^2)]$ (4) 1/RT

54. Half-life period of a first-order reaction is 1386 seconds. The specific rate constant of the reaction is:

(1) $5.0 \times 10^{-2}\ s^{-1}$

(2) $5.0 \times 10^{-3}\ s^{-1}$

(3) $0.5 \times 10^{-2}\ s^{-1}$

(4) $0.5 \times 10^{-3}\ s^{-1}$

55. Match the conditions and their relations respectively?

(a) Isotherm (b) Isobar

(c) Isochore

(1) constant temperature, constant pressure, constant volume.

(2) constant pressure, constant volume, constant temperature.

(3) constant volume, constant pressure, constant temperature.

(4) constant pressure, constant temperature, constant volume.

56. Select the correct statements for a real gas.

(1) In low pressure regions repulsive forces dominate.

(2) Volume of the gas particles is not negligible in a low pressure region.

(3) Gas behaves ideally at low pressure and low temperature.

(4) In a high pressure region repulsive forces dominate.

57. Molecularity can never by equal to:

(1) 1

(2) 2

(3) 3

(4) 0

58. 'a' and 'b' are the van der Waals constants for gases. Chlorine is more easily liquefied than ethane (C_2H_6) because:

(1) 'a' for Cl_2 < 'a' for C_2H_6

(2) 'b' for Cl_2 = 'b' for C_2H_6

(3) 'a' for Cl_2 > 'a' for C_2H_6

(4) 'b' for Cl_2 > 'b' for C_2H_6

59. Warming ammonium chloride with sodium hydroxide in a test tube is an example of:

(1) Closed system

(2) Isolated system

(3) Open system

(4) None of these

60. Consider the reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

The equality relationship between $\frac{d[NH_3]}{dt}$ and $\frac{d[H_2]}{dt}$ is:

(1) $+\frac{d[NH_3]}{dt} = -\frac{3}{2}\frac{d[H_2]}{dt}$

(2) $\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt}$

(3) $\frac{d[NH_3]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt}$

(4) $+\frac{d[NH_3]}{dt} = -\frac{2}{3}\frac{d[H_2]}{dt}$

61. If a real gas has a critical temperature and a critical pressure of 40°C and 10 atm respectively, then the liquefaction of the gas is possible at:

(1) 50°C and 8 atm

(2) 45°C and 8 atm

(3) 25°C and 12 atm

(4) 45°C and 12 atm

62. **Assertion:** Specific heat is an intensive property.
Reason: Heat capacity is an intensive property.

(1) Both assertion and reason are true and the reason is the correct explanation of the assertion.

(2) Both assertion and reason are true but the reason is not the correct explanation of the assertion.

(3) Assertion is a true statement but reason is false.

(4) Both assertion and reason are false statements.

63. For the reaction A + B ⇌ C + D, doubling the concentration of both the reactants increases the reaction rate 8 times and doubling the initial concentration of only B simply doubles the reaction rate. The rate law is given as:

(1) $r = K[A][B]$
(2) $r = K[A]^2[B]$
(3) $r = K[A][B]^2$
(4) $r = K[A]^{1/2}[B]^{1/2}$

64. Calculate the compressibility factor for CO_2, if one mole of it occupies 4 litre at 300 K and 4 atm.
($R = 0.082$ L atm K^{-1} mol^{-1})

(1) 0.65 (2) 1.25
(3) 0.35 (4) 1.05

65. Identify the path function from the following:

(1) Work
(2) Entropy
(3) Enthalpy
(4) Internal energy

66. For a hypothetical reaction $x + y \rightarrow A + B$, rate = $k[x]^{5/2}[y]^{-1/2}$. On doubling the concentration of x and y, the rate will become:

(1) 2 times
(2) 4 times
(3) 8 times
(4) Remains the same

67. Which of the following is an incorrect statement?

(1) van der Waals constant 'a' is a measure of repulsive force
(2) van der Waals constant 'b' is also called co-volume or excluded volume
(3) 'b' is expressed in L/mol
(4) 'a' is expressed in atm L^2/mol^2

68. Match column I with column II, and choose the correct combination from the options given below:

	Column I		**Column II**
A.	Adiabatic process	I.	At constant temperature
B.	Isolated system	II.	No transfer of heat
C.	Isothermal change	III.	Heat
D.	Path function	IV.	No exchange of energy and matter

	(A)	**(B)**	**(C)**	**(D)**
(1)	(II)	(IV)	(III)	(I)
(2)	(III)	(IV)	(I)	(II)
(3)	(IV)	(III)	(II)	(I)
(4)	(II)	(IV)	(I)	(III)

69. Indicate the incorrect statement for equal volumes of $N_2(g)$ and $CO_2(g)$ at 25 degree Celsius and 1 atm.

(1) The average translational K.E. per molecule is the same for N_2 and CO_2.
(2) The rms speed remains the same for both N_2 and CO_2.
(3) The density of N_2 is less than that of CO_2.
(4) The total translational K.E. of both N_2 and CO_2 is the same.

70. The plot of log k versus 1/T of a first order reaction is linear with a:

(1) Positive slope and zero intercept.
(2) Positive slope and non-zero intercept.
(3) Negative slope and non-zero intercept.
(4) Negative slope and zero intercept.

71. In which one of the following sets, all the properties belong to same category (all extensive or all intensive)?

(1) Mass, volume, pressure
(2) Temperature, pressure, volume
(3) Heat capacity, density, entropy
(4) Enthalpy, internal energy, volume

72. At a constant temperature a gas occupies a volume of 200 mL at a pressure of 0.720 bar. It is subjected to an external pressure of 0.900 bar. What is the resulting volume (mL) of the gas?

(1) 200 mL (2) 160 mL
(3) 320 mL (4) 400 mL

73. The gaseous reaction $A(g) \rightarrow 2\,B(g) + C(g)$ obeys first order kinetics. If the initial pressure = 90 mm and pressure after 10 minutes = 180 mm. The velocity constant 'k' of the reaction is

(1) $1.15 \times 10^{+3}\ s^{-1}$ (2) $2.30 \times 10^{+3}\ s^{-1}$
(3) $3.45 \times 10^{-3}\ s^{-1}$ (4) $1.15 \times 10^{-3}\ s^{-1}$

74. The average velocity of gas molecules is 400 m/s. Calculate its r.m.s. velocity at the same temperature.

(1) 434 m/s (2) 416 m/s
(3) 228 m/s (4) 114 m/s

75. **Assertion:** Acid catalysed hydrolysis of esters is a pseudo first order reaction.
Reason: Water is present in excess in the given reaction.

(1) Both Assertion and Reason are correct and Reason is correct explanation for Assertion.
(2) Both Assertion and Reason are correct but Reason is not correct explanation for Assertion.
(3) Assertion is correct but Reason is incorrect.
(4) Both Assertion and Reason are incorrect.

76. Which of the following represents the value of gas constant, R in cal/K mol?

(1) 1.987 (2) 8.31×10^7

(3) 0.082 (4) 8.314

77. In the first order reaction $t_{99.9\%}$ is 60 minutes. $t_{50\%}$ of the reaction would be nearly:

(1) 360 minutes (2) 600 minutes

(3) 6 minutes (4) 60 minutes

78. For one mole of gas the average kinetic energy is given as E. The u_{rms} of gas is:

(1) $\sqrt{\frac{2E}{M}}$ (2) $\sqrt{\frac{3E}{M}}$

(3) $\sqrt{\frac{2E}{3M}}$ (4) $\sqrt{\frac{3E}{2M}}$

79. Unit of rate constant for n^{th} order reaction is:

(1) $\left(\frac{mol}{L}\right)^{\frac{n}{2}} sec^{-1}$ (2) $\left(\frac{mol}{L}\right)^{-\frac{n}{2}} sec^{-1}$

(3) $\left(\frac{mol}{L}\right)^{1-n} sec^{-1}$ (4) $\left(\frac{mol}{L}\right)^{1-n} sec^{1-n}$

80. Ratio of rates of diffusion of He and CH_4 (under identical conditions) is:

(1) 1/2 (2) 3

(3) 1/3 (4) 2

81. Match the following:

	Rate Equation		Units of K
A.	Rate = K[A]	P.	mol L^{-1} sec^{-1}
B.	Rate = K[A][B]	Q.	L^2 $mol^{-2}sec^{-1}$
C.	Rate = K[A] $[B]^2$	R.	sec^{-1}
D.	Rate = K	S.	L mol^{-1} sec^{-1}

The correct matching is:

(1) A → S; B → R; C → P; D → Q

(2) A → R; B → S; C → Q; D → P

(3) A → P; B → Q; C → R; D → S

(4) A → Q; B → P; C → S; D → R

82. A toy balloon can occupy 500 mL at 27°C. The maximum stretching capacity of the balloon is three times the volume at 27°C. The temperature above which the balloon will burst, if pressure of the balloon does not change is:

(1) 900 K

(2) 647°C

(3) 300 K

(4) 225°C

83. In Arrhenius equation, the fraction of effective collisions is given by

(1) $k = Ae^{-E_a/RT}$

(2) A

(3) $e^{-E_a/RT}$

(4) RT

84. What is the density of N_2 gas at 227 degree Celsius and 5.00 atm pressure?
(R = 0 .082 L atm K^{-1} mol^{-1})

(1) 1.41 g/L (2) 2.47 g/L

(3) 9.41 g/L (4) 3.41 g/L

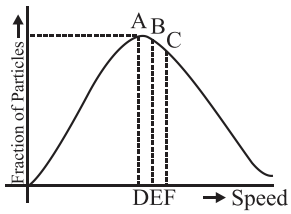
85. The rate constant k_1 and k_2 for two different reactions are $10^{16}.e^{-2000/T}$ and $10^{15}e^{-1000/T}$ respectively. The temperature at which $k_1 = k_2$ is:

(1) 1000 K (2) $\frac{2000}{2.303}$ K

(3) 2000 K (4) $\frac{1000}{2.303}$ K

SECTION – B

86. Match the column:



	Column I		Column II
A.	Speed at point 'A'	P.	$\sqrt{\frac{8RT}{\pi M}}$
B.	Speed at point 'B'	Q.	$\sqrt{\frac{3RT}{M}}$
C.	Speed at point 'C'	R.	U_{rms}
D.	The speed possessed by maximum fraction	S.	$\sqrt{\frac{2RT}{M}}$

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

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

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

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

87. The rate constant for a first order reaction whose half-life is 480 seconds, is:

(1) 2.88×10^{-3} sec^{-1}

(2) 2.72×10^{-3} sec^{-1}

(3) 1.44×10^{-3} sec^{-1}

(4) 1.44 sec^{-1}

88. At 400 K, the root mean square (u_{rms}) speed of a gas X (molecular weight = 40) is equal to the most probable speed of gas Y at 60 K. The molecular weight of the gas Y is:

(1) 2 u (2) 4 u
(3) 6 u (4) 10 u

89. The slope of Arrhenius Plot ((ℓn K v/s 1/T) of first order reaction is -5×10^3 K. The value of E_a of the reaction is.

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

(1) 83.0 kJ mol^{-1}
(2) 166 kJ mol^{-1}
(3) –83 kJ mol^{-1}
(4) 41.5 kJ mol^{-1}

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

(1) 8 (2) –8
(3) 12 (4) –12

91. The hydrolysis of ethyl acetate,

$$CH_3COOC_2H_5 + H_2O \xrightarrow{H^+} CH_3COOH + C_2H_5OH$$

is a reaction of:

(1) 1st order (2) 3rd order
(3) 2nd order (4) Zero order

92. **Assertion:** The pressure of a gas is directly proportional to the density of gas at a constant temperature and molecular mass.

Reason: The molecular weight of a vapour of a substance can be calculated using the expression $M = \frac{dRT}{P}$, where M is the molecular weight of the vapour, d is its density and P is the pressure of the vapour, R is the gas constant and T is the temperature.

(1) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(2) Assertion is correct, reason is correct; reason is not a correct explanation for assertion.
(3) Assertion is correct, reason is incorrect.
(4) Assertion is incorrect, reason is correct.

93. An ideal gas expands isothermally from 10^{-3} m^3 to 10^{-2} m^3 at 300 K against a constant pressure of 10^5 Nm^{-2}. The work done by the gas is:

(1) +270 kJ (2) –900 J
(3) +900 kJ (4) –900 kJ

94. If a gas is allowed to expand at constant temperature, then which of the following does hold true?

(1) The kinetic energy of the gas molecules decreases.
(2) The kinetic energy of the gas molecules increases.
(3) The kinetic energy of the gas molecules remains the same.
(4) Cannot be predicted.

95. For the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, if $\frac{d[NH_3]}{dt} = 6 \times 10^{-3}$ mol L^{-1} s^{-1}, the value of the rate of disappearance of N_2 is:

(1) 12×10^{-3} mol L^{-1} s^{-1}
(2) 3×10^{-2} mol L^{-1} s^{-1}
(3) 3×10^{-3} mol L^{-1} s^{-1}
(4) 1.5×10^{-2} mol L^{-1} s^{-1}

96. The ratio (a/b) (a and b being the van der Waal's constants of real gases) has the units of:

(1) atm mol^{-1} (2) L mol^{-1}
(3) atm L mol^{-1} (4) atm L mol^{-2}

97. For the reaction,
$3A + 2B \rightarrow C + D$
the differential rate law can be written as:

(1) $\frac{1}{3}\frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]^n[B]^m$
(2) $-\frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]^n[B]^m$
(3) $+\frac{1}{3}\frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]^n[B]^m$
(4) $-\frac{1}{3}\frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]^n[B]^m$

98. Which of the following gase can be liquefied easily?

(1) N_2 (2) O_2
(3) H_2 (4) NH_3

99. Two moles of an ideal gas expand spontaneously in vacuum. The work done is:

(1) 2 J (2) 4 J
(3) 0 (4) Infinite

100. If two moles of an ideal gas at 546 K occupy a volume of 44.8 L, the pressure must be:

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

57. (4)
(NCERT Class XII Page No. 69-70)
Molecularity of a reaction cannot be zero, fractional or more than 3.

58. (3)
(Old NCERT Class XI Page No. 151-152)

As $\left(b_{Cl_2} < b_{C_2H_6}\right)$ and for liquefaction $\left(a_{Cl_2} > a_{C_2H_6}\right)$

59. (3)
(NCERT Class XI Page No. 137)
Warming ammonium chloride with sodium hydroxide in a test tube is an example of an open system, because here the system exchanges energy as well as matter with its surroundings.

60. (4)
(NCERT Class XII Page No. 64-66)
For the given reaction
$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$;
Rate of reaction in terms of NH_3 and H_2 is:

$$+\frac{d[NH_3]}{dt} \times \frac{1}{2} = -\frac{d[H_2]}{dt} \times \frac{1}{3}$$

$$+\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt} \times \frac{1}{3} \times \frac{2}{1}$$

$$+\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt} \times \frac{2}{3}$$

61. (3)
(Old NCERT Class XI Page No. 152-153)
Since, $T_C = 40^\circ C$, $P_C = 10$ atm, and for liquefaction $T < T_C$ and $P > P_C$

62. (3)
(NCERT Class XI Page No. 144)
Any quantity whose prefix is molar or specific, that is, molar volume, specific heat, specific heat capacity etc., are intensive properties.
Heat capacity is an extensive property.

63. (2)
(NCERT Class XII Page No. 66-67)
Let the rate law for the reaction $A + B \rightleftharpoons C + D$ is: rate $= k[A]^x[B]^y$

$r_1 = k[A]^x[B]^y$ …(i)

$8r_1 = k[2A]^x[2B]^y$ ...(ii)

$2r_1 = k[A]^x[2B]^y$ …(iii)

Now eq (i)/eq (iii):

$$\frac{r_1}{2r_1} = \frac{k[A]^x[B]^y}{k[A]^x[2B]^y}$$

$$\frac{1}{2} = \left(\frac{1}{2}\right)^y$$

$y = 1$

Now eq (ii)/eq (iii):

$$\frac{8r_1}{2r_1} = \frac{k\,[2A]^x\,[2B]^y}{k\,[A]^x\,[2B]^y}$$

$4 = 2^x$

$2^2 = 2^x$

$x = 2$

Thus, rate law is : rate $= k[A]^2[B]^1$

64. (1)
(Old NCERT Class XI Page No. 151-152)
$Z = PV/nRT$

$= (4\text{ atm} \times 4\text{ L})/(1\text{ mol} \times 0.0821\text{ L atm mol}^{-1}\text{ K}^{-1} 300\text{ K})$

$Z = 0.65$

65. (1)
(NCERT Class XI Page No. 138)
Path function: depends on the path by which the system has achieved a particular state; can't have any definite or particular value in any particular state of the system. Example: Heat, Work etc.

66. (2)
(NCERT Class XII Page No. 68-69)
Rate $= k[x]^{5/2}[y]^{-1/2}$

Now, put, $x = 2x$ and $y = 2y$

Rate $= k(2)^{5/2}[x]^{5/2}(2)^{-1/2}[y]^{-1/2}$

Rate $= k(2)^2[x]^{5/2}[y]^{-1/2}$

67. (1)
(Old NCERT Class XI Page No. 151)
van der Waals constant 'a' is a measure of attractive forces.

68. (4)
(NCERT Class XI Page No. 137-139)
Adiabatic Process - No transfer of heat.
Isolated system - No exchange of energy and matter.
Isothermal change - At constant temperature
Path function – Heat

69. (2)
(Old NCERT Class XI Page No. 148)

(1) $PV = (2/3)$ K.E. = nRT; at the same temperature, translational KE is the same. Hence, option (1) is correct.

(2) $u_{rms} = \sqrt{\frac{3RT}{M}}$. The mass of N_2 and CO_2 are different. Hence, option (2) is incorrect.

(3) $PM = dRT$; so, $d = (PM/RT)$. So, density is directly proportional to molar mass. Hence, option (3) is correct.

(4) Since the average K.E. is the same and the total number of moles is also the same. so total K.E. shall also be the same. Hence option (4) is correct.

70. (3)

(**NCERT Class XII Page No. 78-81)**

$$\log k = \log A - \frac{E_a}{2.303RT}$$

$y = C - mx$ (straight line graph)

$m =$ slope $=$ negative

$C = \log A =$ positive

71. (4)

(**NCERT Class XI Page No. 144)**

An intensive property is one that does not depend on the mass of the substance or system.

An extensive property of a system depends on the size of the system or the amount of matter in the system. Enthalpy, internal energy and volume all are examples of extensive properties.

72. (2)

(Old NCERT Class XI Page No. 145)

$$P_1V_1 = P_2V_2$$

$$0.72 \times 200 = 0.9 \times V_2$$

$$V_2 = \frac{0.72 \times 200}{0.9} = 160 \text{ mL}$$

73. (4)

(**NCERT Class XII Page No. 74-75)**

A	$\rightarrow$	2B +	C
90		–	–
90 – P		2P	P

Now, $90 - P + 2P + P = 180$

$P = 45$

$\therefore 90 - P = 45, P = 45$

$$k = \frac{2.303}{t}\log\frac{P_0}{P_0 - P} = \frac{2.303}{(10 \times 60)}\log\frac{90}{45}$$

$$k = 1.15 \times 10^{-3} \text{ s}^{-1}$$

74. (1)

(Old NCERT Class XI Page No. 148)

$$C_{av} = \sqrt{\frac{8RT}{\pi M}}$$

$$C_{rms} = \sqrt{\frac{3RT}{M}}$$

$$\frac{C_{rms}}{C_{av}} = \frac{\sqrt{\frac{3RT}{M}}}{\sqrt{\frac{8RT}{\pi M}}} = \sqrt{\frac{3\pi}{8}} = 1.085$$

$$\therefore 1.085 \times C_{av} = 1.085 \times 400 = 434 \text{ ms}^{-1}$$

75. (1)

(**NCERT Class XII Page No. 77-78)**

Hydrolysis of ethyl acetate can be seen as,

$$\underset{\text{Ethyl acetate}}{CH_3COOC_2H_5} + H_2O \xrightarrow{H^+} \underset{\text{Acetic acid}}{CH_3COOH} + \underset{\text{Ethyl alcohol}}{C_2H_5OH}$$

Rate of reaction is as follows:

$$\text{Rate} = k[CH_3COOC_2H_5][H_2O]$$

Since water is in excess in this reaction, the rate of reaction only depends upon concentration of ethyl acetate. So, this reaction is a pseudo first order reaction.

76. (1)

(Old NCERT Class XI Page No. 145)

R is as follows in cal / K mol

$R = 1.987$ cal/K mol

77. (3)

(**NCERT Class XII Page No. 76-77)**

$$t_{99.9\%} = 10.t_{50\%}$$

$$\therefore t_{50\%} = 6 \text{ minutes}$$

78. (1)

(Old NCERT Class XI Page No. 148)

Average K.E. $= \frac{3}{2}RT$

or $2E = 3RT$ …(i)

Again we have, $u_{rms} = \sqrt{\frac{3RT}{M}}$

$$\therefore u_{rms} = \sqrt{\frac{2E}{M}}$$

79. (3)

(**NCERT Class XII Page No. 66-68)**

Unit of rate constant for n^{th} order reaction

$= (\text{conc.})^{1-n} \text{time}^{-1}$

$= (\text{mol / L})^{1-n} \text{sec}^{-1}$

80. (4)

(Old NCERT Class XI Page No. 149)

$$\frac{r_{He}}{r_{CH_4}} = \sqrt{\frac{M_{CH_4}}{M_{He}}} = \sqrt{\frac{16}{4}} = 2$$

81. (2)

(NCERT Class XII Page No. 66-68)

(A) rate $= K[A]^1$

First order reaction.

Unit of $K = \sec^{-1}$

(B) rate $= K\,[A]^1[B]^1$.

Second order reaction

Unit of $K = L\,mol^{-1}sec^{-1}$

(C) rate $= K[A]^1[B]^2$

Third order reaction.

Unit of $K = L^2\ mol^{-2}\,sec^{-1}$

(D) rate $= K$

Zero order reaction

Unit of $K = mol\,L^{-1}sec^{-1}$

82. (1)

(Old NCERT Class XI Page No. 145)

$V_1 = 500$ mL

$V_2 = 1500$ mL

$T_1 = 300$ K at constant pressure

According to Charles' law:

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{500}{300} = \frac{1500}{T_2}$$

$T_2 = 900\,K$ and $627^\circ C$

83. (3)

(NCERT Class XII Page No. 82-83)

Fraction of effective collisions or fraction of molecules having energy greater than or equal to activation energy is $e^{-E_a/RT}$.

84. (4)

(Old NCERT Class XI Page No. 145-146)

Given.

$T = 273 + 227 = 500$ K and $P = 5.00$ atm

Using, $PM = dRT$

$$5\ atm \times (28\ g\ mol^{-1})$$

$$= d \times (0.082\ L\ atm\ K^{-1}\ mol^{-1}) \times 500\ K$$

$$d = 3.41\ g/L$$

85. (4)

(NCERT Class XII Page No. 79-81)

$k_1 = 10^{16} \cdot e^{-2000\ T}$ $k_2 = 10^{15} \cdot e^{-1000/T}$

$k_1 = k_2$

$10^{16} \cdot e^{-2000/T} = 10^{15} \cdot e^{-1000/T}$

$$\log 10 - \frac{2000}{2.303\ T} = \frac{-1000}{2.303\ T}$$

$$1 = \frac{-1000}{2.303\ T} + \frac{2000}{2.303\ T}$$

$$1 = \frac{1000}{2.303\ T} \Rightarrow T = \frac{1000}{2.303}\ K$$

86. (1)

(Old NCERT Class XI Page No. 147-148)

P. Speed at point 'A' $= \sqrt{\frac{2RT}{M}}$

Q. Speed at point 'B' $= \sqrt{\frac{8RT}{\pi M}}$

R. Spew at point 'C' $= \sqrt{\frac{3RT}{M}}$ or U_{rms}

S. The speed possessed by maximum fraction $= \sqrt{\frac{2RT}{M}}$

87. (3)

(NCERT Class XII Page No. 76-77)

For first order reaction, $k = \frac{0.693}{t_{1/2}}$

where $k =$ rate constant

$t_{1/2} =$ half-life period $= 480$ sec.

$$\therefore\quad k = \frac{0.693}{480} = 1.44 \times 10^{-3} sec^{-1}$$

88. (2)

(Old NCERT Class XI Page No. 147-148)

$u_{rmss} = u_{mp}$

So, $\sqrt{\frac{3RT}{M}} = \sqrt{\frac{2RT}{M}}$

So, $\frac{3 \times 400}{40} = \frac{2 \times 60}{M}$

So, $M = 4$ u

89. (4)

(NCERT Class XII Page No. 79-81)

$$\ell n\, k = \ell n\, A - \frac{E_a}{R}\left(\frac{1}{T}\right)$$

In $\ell n\, k$ v/s $\frac{1}{T}$ graph

$$\text{Slope} = -\frac{E_a}{R}$$

$$-5 \times 10^3 = \frac{-E_a}{8.314}$$

$$E_a = 5 \times 10^3 \times 8.314$$

$$= 41500\ J\ mol^{-1} = 41.5\ kJ/mol$$

90. (1)

(**NCERT Class XI Page No. 140)**

Work done on system i.e., $W = 10$ kJ .

Heat released, $q = -2$ kJ

So, $\Delta U = q + W = -2 + 10 = 8$ kJ

91. (1)

(**NCERT Class XII Page No. 78)**

Acidic hydrolysis of an ester is a pseudo first order reaction or pseudo unimolecular reaction.

For this reaction, rate law is:

$$\text{rate} = k\left[CH_3COOC_2H_5\right]^1$$

Hence, order of reaction is 1.

92. (1)

(Old NCERT Class XI Page No. 145-146)

The pressure of a gas is directly proportional to the density of gas at a constant temperature and molecular mass. (True)

The molecular weight of a vapour of a substance can be calculated using the expression $M = \frac{dRT}{P}$, where M is the molecular weight of the vapour, d is its density and P is the pressure of the vapour, R is the gas constant and T is the temperature. (True).

Hence,

Assertion is correct, reason is correct; reason is a correct explanation for assertion.

93. (2)

(**NCERT Class XI Page No. 141-142)**

$$w = -PdV = -P(V_2 - V_1)$$

$$= -10^5\ \text{Nm}^{-2}(10^{-2} - 10^{-3})\text{m}^3$$

$$= -10^5\ \text{Nm}^{-2}(9\times10^{-3})\ \text{m}^3$$

$$= -9\times10^2\ \text{Nm} = -900\ \text{J} \quad (\because 1\ \text{J} = 1\ \text{Nm})$$

94. (3)

(Old NCERT Class XI Page No. 149-150)

At constant temperature, the kinetic energy of the gas molecules remains the same.

95. (3)

(**NCERT Class XII Page No. 63-64)**

For the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, rate in terms of N_2 and NH_3 is:

$$\text{Rate} = -\frac{d[N_2]}{dt} = +\frac{d[NH_3]}{dt}\times\frac{1}{2}$$

Hence rate of disappearance of N_2 will be

$$-\frac{d[N_2]}{dt} = 6\times10^{-3}\ \text{mol L}^{-1}\ \text{s}^{-1}\times\frac{1}{2}$$

$$= 3\times10^{-3}\ \text{mol L}^{-1}\ \text{s}^{-1}$$

96. (3)

(Old NCERT Class XI Page No. 150-151)

Units of $a = \text{atm L}^2\ \text{mol}^{-2}$

Units of $b = \text{L mol}^{-1}$

97. (4)

(**NCERT Class XII Page No. 62-64)**

For the given reaction; $3\text{ A} + 2\text{ B} \rightarrow \text{C} + \text{D}$

Differential rate law is:

$$-\frac{d[A]}{dt}\times\frac{1}{3} = -\frac{d[B]}{dt}\times\frac{1}{2} = +\frac{d[C]}{dt} = +\frac{d[D]}{dt}$$

$$= k[A]^n[B]^m$$

Hence, in terms of A and C ;

$$-\frac{d[A]}{dt}\times\frac{1}{3} = +\frac{d[C]}{dt} = k[A]^n[B]^m$$

98. (4)

(Old NCERT Class XI Page No. 154-155)

The gas having high intermolecular forces is liquefied easily.

99. (3)

(**NCERT Class XI Page No. 140-142)**

In a vacuum, P_{ext} is zero, because there is no external pressure acting on the gas. So, work done will be zero.

100. (1)

(Old NCERT Class XI Page No. 145)

$$P = \frac{nRT}{V} = \frac{2\times0.0821\times546}{44.8} = 2\ \text{atm}$$