Mansoura University
Faculty of Engineering
Engineering Mathematics and Physics Department

Course Name: Engineering Chemistry		Code :	CHEM 021
Exam:	Mid Term (New Programs)	Time :	60 min
Date :	9/11/2019 (Model Answer)	Total marks:	20 (A)

Note : Number of examination papers 3 other than cover sheet

Questions	Marks
1	
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Total	

Name:.....

Program.....Group: .....

Question (1)

Which of the following statements are correct and which are false? (5 Marks)

1. The heat changing for a process carried out at constant pressure, (Q_p), are equal to the changing in internal energy, (ΔE). (x)
2. The partial pressure of any component in a gas mixture (p_i) is related to the total pressure of the gas mixture (P_T) and the mole fraction of that component (y_i) through the relation: $P_T = (p_i)(y_i)$ (x)
3. Molecules in a real gas posse neglected volume and thus undergo frequent collisions with one another. (x)
4. The Third law of thermodynamics state that The entropy of an element or a compound present in the form of a perfectly ordered crystal is zero at the room temperature (x)
5. The characteristic properties of liquids arise because the individual molecules of a gas are relatively far apart. (x)
6. The volume of a liquid is specified by the volume of the container in which it is held. (x)
7. The volume fraction of any component in the gas mixture is the same as the mole fraction. (√)
8. Isochoric or isometric process is the process takes place at constant Volume (√)
9. The first law of thermodynamics mathematically may be written as $(\Delta E)_{universe} = 0$ (√)
10. Enthalpy is a property relating internal energy and the product of pressure and volume. (√)

Question # 2 Choose the correct answer(5 Marks)

1. Aggregate state of matter may be found, in .....states according to external conditions such as pressure and temperature.

a- gaseous b- liquid

c- solid d- All of them

2. Two or more ..... form homogeneous mixtures in all proportions, regardless of how different the gases may be.

a- liquids b- gaseous

c- solids d- None of them

3. Quantity of (PV/RT) for one mole is exactly one for an ideal gas at all.....

a- volume b- pressure

c- temperature d- a and b

4. The standard state for a ..... is the most stable crystalline form at the specified temperature and one atmosphere pressure.

a- Solid b- Gas

c-Liquid d- All of them

5. The entropy of a system depends on a number of factors which are .....

a- Phase changes b- Temperature

c-Processes mixing d- all of them

6. Isolated process means that ..... and at the same time the mass of the system is constant.

a- Work, W=0 and Entropy, S =0 b- Entropy, S =0 and Heat, Q =0

c- Entropy, S =0 and Work, W=0 d- Non of these

7. For a certain chemical reaction, $\Delta H^\circ_r = -35.4$ kJ and $\Delta S^\circ_r = -85.5$ J/K. The reaction .....

(a) spontaneous at all temperature. (b) spontaneous at Hight temperature.

(c) spontaneous at law temperature. (d) non spontaneous at 298 K.

8. Work is not a property of the state of a system but, ... the path taken by the process.

a- independent on b- depends on

c- a and b d- Non of these

9. The second law of thermodynamics states that .....

a- The energy of universe = zero b- The entropy of universe < zero

c- The entropy of universe > zero d- Non of these

10. The heat changing for a process carried out at constant volume,(Q_v),are equal to the changing in .....

a- Free energy b- Enthalpy

c- Entropy d- Internal energy

Question # 3 (4 Marks)

An ideal gas at 550 mm Hg occupies a bulb of unknown volume. A certain portion of this gas is withdrawn and found to occupy a 1 cm^3 at S.T.P. The pressure of the gas remaining in the bulb is 500 mm Hg. Assuming that the pressure measurements of the gas in the bulb were made at the same temperature, 25 ° C, What is the number of moles in bulb after withdrawn ?

The number of moles of the withdrawal portion (n)

$n = (1)(1)(10^{-3})/(0.08206)(273) = (4.47)(10^{-5})$ mole

For the gas in the bulb originally

$n_1 = P_1V/RT$

Number of moles after withdrawal

$n_2 = P_2V/RT$

Dividing Equation (i) by (ii)

$n_1/n_2 = P_1/P_2 = 550/500$

$n_1 = (1.1)\, n_2$

but $n_1 - n_2 = (4.47)(10^{-5})$

$\therefore 0.1\, n_2 = (4.47)(10^{-5})$

$n_2 = (4.47)(10^{-4})$

Question # 4 (2 Marks)

Calculate the pressure exerted by 0.5 mole of CO_2 in a closed vessel of volume 1.50 liter at 27 °C ; using van der Waals equation only , where van der Waal's constant b= 42.76 Cm^3/mole. neglect intermoleclur attractive and repulsive force between molecules.)

$$(P\ )(1.5\ -(0.5)(\frac{42.76}{1000}) = (\frac{22}{44})0.082x300$$

can be neglected attractive and repulsive force

P = 8.3185 atm.

Question (5) (4 Marks)

If 73 gm. of hydrogen chloride gas, (HCl), are heated isochoric ally. from a temperature of 300°k to 350° k. calculate Q, W, and ΔE (consider HCl behaves as an ideal gas during this process and specific heat is varies with temperature Cp = 6.7 +0.00084 T cal. /deg. mole)[H=1 , and Cl = 35.5]?

- $n = \frac{73}{36.5} = 2.$ mole,
- **$\Delta E = Q_V + W$**

W = zero

$$Q_V = 2\int_{300}^{350} (6.7 + 0.00084\,T - 1.98)dT = 499.3\ cal$$

ΔE = 499.3 cal

With My Best Regards and Good Luck

Examiner: Prof. Dr. Ahmed Alsarawy,Prof. Dr. Mohamed Elhalwany, and Dr. Mahmoud Hanafy

Mansoura University
Faculty of Engineering
Engineering Mathematics and Physics Department

Course Name: Engineering Chemistry		Code :	CHEM 021
Exam:	Mid Term (New Programs)	Time :	60 min
Date :	9/11/2019 (Model Answer)	Total marks:	20 (B)

Note : Number of examination papers 3 other than cover sheet

Questions	Marks
1	
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Total	

Name:.....

Program..... Group: .....

Question (1) Choose the correct answer(5 Marks)

1. Aggregate state of matter may be found, in .....states according to external conditions such as pressure and temperature.

   a- gaseous b- liquid

   c- solid d- All of them

2. Two or more ..... form homogeneous mixtures in all proportions, regardless of how different the gases may be.

   a- liquids b- gaseous

   c- solids d- Non of them

3. Quantity of (PV/RT) for one mole is exactly one for an ideal gas at all.....

   a- volume b- pressure

   c- temperature d- a and b

4. The standard state for a ..... is the most stable crystalline form at the specified temperature and one atmosphere pressure.

   a- Solid b- Gas

   c-Liquid d- All of them

5. The entropy of a system depends on a number of factors which are .....

a- Phase changes b- Temperature

c-Processes mixing d- all of them

6. Isolated process means that ..... and at the same time the mass of the system is constant.

a- Work, W=0 and Entropy, S =0 b- Entropy, S =0 and Heat, Q =0

c- Entropy, S =0 and Work, W=0 d- Non of these

7. For a certain chemical reaction, $\Delta H^\circ_r = -35.4$ kJ and $\Delta S^\circ_r = -85.5$ J/K. The reaction .....

(a) spontaneous at all temperature. (b) spontaneous at Hight temperature.

(c) spontaneous at law temperature. (d) non spontaneous at 298 K.

8. Work is not a property of the state of a system but, ... the path taken by the process.

a- independent on b- depends on

c- a and b d- Non of these

9. The second law of thermodynamics states that .....

a- The energy of universe = zero b- The entropy of universe < zero

c- The entropy of universe > zero d- Non of these

10. The heat changing for a process carried out at constant volume,(Q_v),are equal to the changing in .....

a- Free energy b- Enthalpy

c- Entropy d- Internal energy

Question # 2 (4 Marks)

An ideal gas at 440 mm Hg occupies a bulb of unknown volume. A certain portion of this gas is withdrawn and found to occupy a 1 cm^3 at S.T.P. The pressure of the gas remaining in the bulb is 400 mm Hg. Assuming that the pressure measurements of the gas in the bulb were made at the same temperature, 30 ° C, What is the number of moles in bulb after withdrawn ?

The number of moles of the withdrawal portion

$n = (1)(1)(10^{-3})/(0.08206)(273) = (4.47)(10^{-5})$ mole

For the gas in the bulb originally

$n_1 = P_1V/RT$

Number of moles after withdrawal

$n_2 = P_2V/RT$

Dividing Equation (i) by (ii)

$n_1/n_2 = P_1/P_2$

$n_1 = (1.1)\, n_2$

but $n_1 - n_2 = (4.47)(10^{-5})$

$\therefore 0.1\, n_2 = (4.47)(10^{-5})$

$\underline{n_2 = (4.47)(10^{-4})}$

Question # 3 (2 Marks)

Calculate the pressure exerted by 0.5 mole of CO_2 in a closed vessel of volume 1.50 liter at 27 °C ; using van der Waals equation only , where van der Waal's constant b= 42.76 Cm^3/mole. neglect intermoleclur attractive and repulsive force between molecules.)

$$(P\ )(1.5\ -(0.5)(\frac{42.76}{1000}) = (\frac{22}{44})0.082x300$$

can be neglected attractive and repulsive force

P = 8.3185 atm.

Question # 4(4 Marks)

If 73 gm. of hydrogen chloride gas, (HCl), are heated isochoric ally. from a temperature of 300°k to 350°k. calculate Q, W, and ΔE (consider HCl behaves as an ideal gas during this process and specific heat is varies with temperature Cp = 6.7 +0.00084 T cal. /deg. mole)[H=1 , and Cl = 35.5]?

- $n = \frac{73}{36.5} = 2.$ mole,
- **$\Delta E = Q_V + W$**

W = zero

$$Q_V = 2\int_{300}^{350}(6.7+0.00084T-1.98)dT = 499.3\ cal$$

ΔE = 499.3 cal

Question # 3 (5 Marks)

Which of the following statements are correct and which are false?

1. The heat changing for a process carried out at constant pressure, (Q_p), are equal to the changing in internal energy, (Δ E). (x)
2. The partial pressure of any component in a gas mixture (p_i) is related to the total pressure of the gas mixture (P_T) and the mole fraction of that component (y_i) through the relation: $P_T = (p_i)\ (y_i)$ (x)
3. Molecules in a real gas posse neglected volume and thus undergo frequent collisions with one another. (x)
4. The Third law of thermodynamics state that The entropy of an element or a compound present in the form of a perfectly ordered crystal is zero at the room temperature (x)
5. The characteristic properties of liquids arise because the individual molecules of a gas are relatively far apart. (x)
6. The volume of a liquid is specified by the volume of the container in which it is held. (x)
7. The volume fraction of any component in the gas mixture is the same as the mole fraction. (√)
8. Isochoric or isometric process is the process takes place at constant Volume (√)
9. The first law of thermodynamics mathematically may be written as $(\Delta E)_{universe} = 0$ (√)
10. Enthalpy is a property relating internal energy and the product of pressure and volume. (√)

With My Best Regards and Good Luck

Examiner: Prof. Dr. Ahmed Alsarawy,Prof. Dr. Mohamed Elhalwany, and Dr. Mahmoud Hanafy

Mansoura University
Faculty of Engineering
Engineering Mathematics and Physics Department

Course Name: Engineering Chemistry		**Code :**	**CHEM 021**
Exam:	**Mid Term (New Programs)**	**Time :**	**60 min**
Date :	**9/11/2019 (Model Answer)**	**Total marks:**	**20** **(C)**

Note : Number of examination papers 3 other than cover sheet

Questions	Marks
1	
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Total	

Name:.....

Program..... **Group:** .....

Question (1) (4 Marks)

An ideal gas at 550 mm Hg occupies a bulb of unknown volume. A certain portion of this gas is withdrawn and found to occupy a 1 cm^3 at S.T.P. The pressure of the gas remaining in the bulb is 500 mm Hg. Assuming that the pressure measurements of the gas in the bulb were made at the same temperature, 25 ° C, What is the number of moles in bulb after withdrawn ?

The number of moles of the withdrawal portion (n)

$n = (1)(1)(10^{-3})/(0.08206)(273) = (4.47)(10^{-5})$ mole

For the gas in the bulb originally

$n_1 = P_1V/RT$

Number of moles after withdrawal

$n_2 = P_2V/RT$

Dividing Equation (i) by (ii)

$n_1/n_2 = P_1/P_2 = 550/500$

$n_1 = (1.1)\, n_2$

but $n_1 - n_2 = (4.47)(10^{-5})$

$\therefore 0.1\, n_2 = (4.47)(10^{-5})$

$\mathbf{n_2 = (4.47)(10^{-4})}$

Question # 2 Choose the correct answer(5 Marks)

1. Aggregate state of matter may be found, in .....states according to external conditions such as pressure and temperature.

a- gaseous b- liquid

c- solid d- All of them

2. Two or more ..... form homogeneous mixtures in all proportions, regardless of how different the gases may be.

a- liquids b- gaseous

c- solids d- Non of them

3. Quantity of (PV/RT) for one mole is exactly one for an ideal gas at all.....

a- volume b- pressure

c- temperature d- a and b

4. The standard state for a ..... is the most stable crystalline form at the specified temperature and one atmosphere pressure.

a- Solid b- Gas

c-Liquid d- All of them

5. The entropy of a system depends on a number of factors which are .....

a- Phase changes b- Temperature

c-Processes mixing d- all of them

6. Isolated process means that ..... and at the same time the mass of the system is constant.

a- Work, W=0 and Entropy, S =0 b- Entropy, S =0 and Heat, Q =0

c- Entropy, S =0 and Work, W=0 d- Non of these

7. For a certain chemical reaction, $\Delta H^\circ_r = -35.4$ kJ and $\Delta S^\circ_r = -85.5$ J/K. The reaction .....

(a) spontaneous at all temperature. (b) spontaneous at Hight temperature.

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8. Work is not a property of the state of a system but, ... the path taken by the process.

a- independent on b- depends on

c- a and b d- Non of these

9. The second law of thermodynamics states that .....

a- The energy of universe = zero b- The entropy of universe < zero

c- The entropy of universe > zero d- Non of these

10. The heat changing for a process carried out at constant volume,(Q_v),are equal to the changing in .....

a- Free energy b- Enthalpy

c- Entropy d- Internal energy

Question # 3

Which of the following statements are correct and which are false? (5 Marks)

1. The heat changing for a process carried out at constant pressure, (Q_p), are equal to the changing in enthalpy, (Δ H). (√)
2. The partial pressure of any component in a gas mixture (p_i) is related to the total pressure of the gas mixture (P_T) and the mole fraction of that component (y_i) through the relation: $P_T = (p_i)\ (y_i)$ (x)
3. Molecules in a real gas posse neglected volume and thus undergo frequent collisions with one another. (x)
4. The Third law of thermodynamics state that The entropy of an element or a compound present in the form of a perfectly ordered crystal is zero at the room temperature (x)
5. The characteristic properties of liquids arise because the individual molecules of a gas are relatively far apart. (x)
6. The volume of a liquid is specified by the volume of the container in which it is held. (x)
7. The volume fraction of any component in the gas mixture is the same as the mole fraction. (√)
8. Isochoric or isometric process is the process takes place at constant Volume (√)
9. The first law of thermodynamics mathematically may be written as $(\Delta E)_{universe} = 0$ (√)
10. Enthalpy is a property relating internal energy and the product of pressure and volume. (√)

Question # 4 (2 Marks)

Calculate the pressure exerted by 0.5 mole of CO_2 in a closed vessel of volume 1.50 liter at 27 °C ; using van der Waals equation only , where van der Waal's constant b= 42.76 Cm^3/mole. neglect intermoleclur attractive and repulsive force between molecules.)

$$(P\ )(1.5\ -(0.5)(\frac{42.76}{1000}) = (\frac{22}{44})0.082x300$$

can be neglected attractive and repulsive force

P = 8.3185 atm.

Question # 5 (4 Marks)

If 73 gm. of hydrogen chloride gas, (HCl), are heated isochoric ally. from a temperature of 300°k to 350°k. calculate Q, W, and ΔE (consider HCl behaves as an ideal gas during this process and specific heat is varies with temperature Cp = 6.7 +0.00084 T cal. /deg. mole)[H=1 , and Cl = 35.5]?

- $n = \frac{73}{36.5} = 2.$ mole,
- $\Delta E = Q_V + W$

W = zero

$$Q_v = 2\int_{300}^{350} (6.7 + 0.00084T - 1.98)dT = 499.3\ cal$$

ΔE = 499.3 cal

With My Best Regards and Good Luck

Examiner: Prof. Dr. Ahmed Alsarawy,Prof. Dr. Mohamed Elhalwany, and Dr. Mahmoud Hanafy

Mansoura University
Faculty of Engineering
Engineering Mathematics and Physics Department

Course Name: Engineering Chemistry		Code :	CHEM 021
Exam:	Mid Term (New Programs)	Time :	60 min
Date :	10/11/2019 (Model Answer)	Total marks:	20 (D)

Note : Number of examination papers 3 other than cover sheet

Questions	Marks
1	
2	
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4	
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Total	

Name:.....

Program..... Group: .....

Question (1)

Which of the following statements are correct and which are false? (5 Marks)

1. The heat changing for a process carried out at constant pressure, (Q_v), are equal to the changing in internal energy, (Δ E). (√)
2. The partial pressure of any component in a gas mixture (p_i) is related to the total pressure of the gas mixture (P_T) and the mole fraction of that component (y_i) through the relation: $P_i = (P_T)(y_i)$ (√)
3. Molecules in a real gas posse neglected volume and thus undergo frequent collisions with one another. (x)
4. The characteristic properties of liquids arise because the individual molecules of a gas are relatively far apart. (x)
5. The Third law of thermodynamics state that The entropy of an element or a compound present in the form of a perfectly ordered crystal is zero at the absolute zero of temperature (√)
6. The volume of a liquid is specified by the volume of the container in which it is held. (x)
7. The volume fraction of any component in the gas mixture is the same as the mole fraction. (√)
8. Isopestic process is the process takes place at constant Volume (x)
9. The first law of thermodynamics mathematically may be written as $(\Delta E)_{universe} < 0$ (X)
10. Enthalpy is a property relating entropy and the product of pressure and volume. (x)

Question # 2 Choose the correct answer(5 Marks)

1. Aggregate state of matter may be found, in .....states according to external conditions such as pressure and temperature.

   a- gaseous b- liquid

   c- solid d- All of them

2. Two or more ..... form homogeneous mixtures in all proportions, regardless of how different the gases may be.

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4. The standard state for a ..... is the most stable purest form at the specified temperature and one atmosphere pressure.

   a- Solid b- Gas

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5. The entropy of a system depends on a number of factors which are .....

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7. For a certain chemical reaction, $\Delta H^\circ_r = +35.4$ kJ and $\Delta S^\circ_r = -85.5$ J/K. The reaction .....

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10. The heat changing for a process carried out at constant pressure,(Q_p),are equal to the changing in .....

   a- Free energy b- Enthalpy

   c- Entropy d- Internal energy

Question # 3 (4 Marks)

An ideal gas at 330 mm Hg occupies a bulb of unknown volume. A certain portion of this gas is withdrawn and found to occupy a 1 cm^3 at P= 1 atm. and T= 273 k. The pressure of the gas remaining in the bulb is 300 mm Hg. Assuming that the pressure measurements of the gas in the bulb were made at the same temperature, 27 ° C, What is the number of moles in bulb after withdrawn ?

The number of moles of the withdrawal portion

(n)

$n = (1)(1)(10^{-3})/(0.08206)(273) = (4.47)(10^{-5})$

mole

For the gas in the bulb originally

$n_1 = P_1V/RT$

Number of moles after withdrawal

$n_2 = P_2V/RT$

Dividing Equation (i) by (ii)

$n_1/n_2 = P_1/P_2 = 550/500$

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