

Menofia University  
Faculty of Electronic  
Engineering  
Dept of Phy and Math  
Engineering

Engineering Chemistry  
Final Exam  
22-1-2020

Marks=90 marks  
Code: 007 فر  
Time: 3 hr

### تعليمات الامتحان

أجابه الأسئلة الخاصة بالدكتور محمود محفوظ تبدأ من الجانب الأيمن لكراسة الإجابة  
أجابه الأسئلة الخاصة بالدكتور / خالد محمود تبدأ من الجانب الأيسر لكراسة الإجابة  
تبدأ إجابة كل سؤال في صفحة جديدة مع كتابة رقم السؤال واضحا اعلي الصفحة  
يراعي أن تكون الإجابات منظمة ومرتبطة حسب ترتيب أرقام الأسئلة ويخط واضح مستخدما القلم الجاف  
لن تصحح الإجابات المكتوبة باللغة العربية أو القلم الرصاص أو الأقلام الملونة

### First question

(22 Marks)

Choose the best correct answer:

(11 marks)

أكتب رقم السؤال فقط وإمامة الحرف a او b او c ..... الدال على الإجابة الصحيحة

1-The bond formed between ammonia  $\text{NH}_3$  and hydrogen ion ( $\text{H}^+$ ) to give ammonium ion ( $\text{NH}_4^+$ ) is ..... bond

(a) Ionic (b) Covalent (c) Coordinate (d) Hydrogen

2- Arrange the following substances in terms of *DECREASING* boiling points:

$\text{N}_2$ ,  $\text{O}_2$ , NO

(a)  $\text{N}_2 > \text{O}_2 > \text{NO}$  (b)  $\text{NO} > \text{N}_2 > \text{O}_2$  (c)  $\text{NO} > \text{O}_2 > \text{N}_2$  (d)  $\text{N}_2 > \text{NO} > \text{O}_2$

3-The bond between hydrogen and oxygen atoms within a water molecule ( $\text{H}_2\text{O}$ ) is called:

(a) Hydrogen bond. (b) Pure covalent bond (c) polar covalent bond (d) Both a and b

4- What is the intermolecular force in  $\text{MgCl}_2$  (aqueous) محلول مائي?

(a) Ion-ion (b) Dipole-dipole (c) Ion-dipole (d) Hydrogen bonding.

5-Which of the following are classified as intermolecular forces?

(a) Covalent bonding and ion-dipole interactions (b) Ionic bonding and covalent bonding  
(c) Hydrogen bonding and ion-dipole interaction (d) Ionic bonding and hydrogen bonding

6- Thallium-208 has a half-life of 3.053 min. How long will it take for 120 g to decay to 7.50 g?

(a) 9.16 min (b) 12.21 min (c) 6.11 min (d) 21.12 min

7- When a  $\beta$  (beta) particle is emitted ينبعث from the nucleus a .....

(a) neutron is emitted (b) proton changes into a neutron  
(c) neutron changes into a proton (d) proton is emitted

8- Which of the following are the correct values of (n) and (l) for (4f) sublevel?

(a)  $n = 4, l = 0$  (b)  $n = 4, l = 3$  (c)  $n = 3, l = 3$  (d)  $n = 3, l = 1$

9- The four quantum numbers for the electron in a hydrogen atom ( $1\text{H}$ ) are:

(a)  $n = 2, l = 1, m_l = 1, m_s = 0$  (b)  $n = 1, l = 0, m_l = 0, m_s = +1/2$   
(c)  $n = 1, l = 2, m_l = -2, m_s = -1/2$  (d)  $n = 1, l = 1, m_l = -2, m_s = +1/2$

10-If P, V, M, T, and R are the pressure, volume, molar mass, temperature and universal gas constant respectively, then the density of an ideal gas is given by:

(a)  $\text{RT/PM}$  (b)  $\text{PM/RT}$  (c)  $\text{P/RT}$  (d)  $\text{M/V}$

11- What must remain constant for the equation of state  $P_1 \times V_1 / T_1 = P_2 \times V_2 / T_2$  to be true?

(a) Volume (b) Number of Moles (c) Pressure (d) Temperature

(B) Write down (✓) or (x) for the following statements.

(11 Marks)

اكتب رقم السؤال ثم ضع امامه علامه صح او غلط فقط

1-  ${}_{90}^{232}\text{Th}$  is converted into  ${}_{82}^{208}\text{Pb}$  through the emissions of a series of  $\alpha$  and  $\beta^-$  particle, the number of  $\alpha$  particles emitted in this nuclear decay = 8.

2- 1 gram of any gas at S.T.P. ( $0^\circ\text{C}$ , 1 atmo) occupies a volume of 22.4 Liter.

3- The following nuclear reaction  ${}_{6}^{12}\text{C} + {}_{82}^{207}\text{Pb} \longrightarrow {}_{87}^{218}\text{Fr} + {}_{1}^1\text{H}$  represents Nuclear fission.

4- The covalent bond is formed when hydrogen atom is located between two atoms having higher electronegativity like F, O and N.

5- The correct electronic configuration for  ${}_{35}\text{Br}$  is :  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$ .

6- At constant pressure, the volume of a given quantity of a gas is increased or decreased by  $1/273$  of its volume at  $0^\circ\text{C}$  for every one degree centigrade rise or fall of temperature.

7- The 3<sup>rd</sup> energy level of an atom will contain 3-sublevels, 9 orbitals and 18 electrons.

8- Relative strength of *intermolecular forces* is arranged as follows:

Ion-Dipole > Hydrogen-bond > Dipole-Dipole > London Dispersion

9- Building up principle concerning the distribution of electrons in levels (shells), whereas, Hund's rule concerning the distribution of electrons in orbitals.

10- The ionic bond is formed between two elements, the difference in electronegativity between them is more than 1.7.

11- The source of energy produced by the sun is the fusion of hydrogen isotopes.

### Second question

(23 Marks)

(A) Write the scientific terms for the following:

اكتب المصطلح العلمي للعبارة الاتية

(6 Marks)

1- It defines the number of orbitals in a certain energy sublevel and their orientation in space.

2- The total pressure of a mixture of gases [that does not react chemically with each other] is equal to the sum of the partial pressure of the individual gases.

3- The addition of an electron to a proton in the nucleus led to the transformation of proton into neutron in a radioactive decay.

(B) Write equations for the following nuclear decay reactions. Make sure that both mass numbers and atomic numbers are balanced on each side.

(4 Marks)

(1)  ${}_{36}^{76}\text{Kr}$  Undergoes electron capture

(2) The alpha decay of  ${}_{86}^{198}\text{Rn}$

(C) Determine the location of the following elements at the periodic table of elements:

${}_{11}\text{Na}$ ,  ${}_{17}\text{Cl}$

(4 Marks)

(D) Predict the order of *increasing* boiling points for the following compounds:

H<sub>2</sub>S; H<sub>2</sub>O; CH<sub>4</sub>; H<sub>2</sub>; NaCl. (2 Marks)

(E) Identify **حدد** the type of intermolecular force in the following compounds: (2 Marks)

(1) Between H<sub>2</sub>O molecules.

(2) Between HCl (gas) molecules.

(F) Solve the following problems :

1- Determine the volume of a gas at S.T.P (standard conditions) (zero °C, 1 atm.), if this volume equals to 20 L at 127 C and under pressure of 2 atm. (2 Marks)

$$R = 0.0821 \text{ L atm/mol K}$$

2- Compute relative rates of effusion of H<sub>2</sub>, CO<sub>2</sub> through an orifice (ثقب) . (2 Marks)

(G) Answer the following question :

1- What is the maximum number of electrons that can occupy each of the following subshells:

(a) 3p

(b) 4d

(1 Mark)

6 ← Atomic Number = Number of Protons = Number of Electrons										2					
C ← Chemical Symbol										He					
CARBON ← Chemical Name										HELIUM					
12 ← Atomic Weight = Number of Protons + Number of Neutrons										4					
METALS										NON-METALS					
										5	6	7	8	9	10
										B	C	N	O	F	Ne
										BORON	CARBON	NITROGEN	OXYGEN	FLUORINE	NEON
										11	12	14	16	19	20
										13	14	15	16	17	18
										Al	Si	P	S	Cl	Ar
										ALUMINUM	SILICON	PHOSPHORUS	SULFUR	CHLORINE	ARGON
										27	28	31	32	35	40
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
TITANIUM	VANADIUM	CHROMIUM	MANGANESE	IRON	COBALT	NICKEL	COPPER	ZINC	GALLIUM	GERMANIUM	ARSENIC	SELENIUM	BROMINE	KRYPTON	
48	51	52	55	56	59	59	64	65	70	73	75	79	80	84	
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
ZIRCONIUM	NIOBIUM	MOLYBDENUM	TECHNETIUM	RUTHENIUM	RHODIUM	PALLADIUM	SILVER	CADMIUM	INDIUM	TIN	ANTIMONY	TELLURIUM	IODINE	XENON	
91	93	96	98	101	103	106	108	112	115	119	122	128	127	131	
72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
HAFNIUM	TANTALUM	TUNGSTEN	RHENIUM	OSMIUM	IRIDIUM	PLATINUM	GOLD	MERCURY	THALLIUM	LEAD	BISMUTH	POLONIUM	ASTATINE	RADON	
178	181	184	186	190	192	195	197	201	204	207	209	209	210	222	
104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	
Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Uuq	Uup	Uuh	Uus	Uuo	
RUTHERFORDIUM	DUBNIUM	SEABORGIUM	BOHRIUM	HASSIUM	MEITNERIUM	DARMSTADTIUM	ROENTGENIUM	COPERNICIUM	UNUNTRIUM	UNUNQUADIUM	UNUNPENTIUM	UNUNHEXIUM	UNUNSEPTIUM	UNUNOCTIUM	
267	270	271	274	277	278	281	281	285	286	289	289	291	294	294	

GOOD LUCK