EX3 CHEM101(DTM) FORM E 21 Nov rm 100 HELD (11:30 Class)

Name KEY E **(Print last name in CAPS)**

SECTION _____**(same as your lab section)**

1.	**Fill in your ID, the department=CHEM, Course no. = 101, and Section= your lab section. Blacken the corresponding letters and numbers.**
2.	Read each question carefully before answering.
3.	Mark the choice that best answers the question or completes the statement.
4.	Use the scantron provided. Use a no. 2 pencil and clearly mark your choice. If you change an answer, completely erase your previous mark.
5.	Answer each question. There is no penalty for guessing. However, multiple answers are graded as incorrect, and blank answers are graded as incorrect.
6.	On the scantron, fill in your last name, first name and initial. Blacken the corresponding letters.
7.	Use the test for scratch paper.
8.	Mark your answers on the test so you can check them with the key /
9.	***Turning in a blank scantron results in a grade of zero. ***
10.	You may be asked to turn in <u>both</u> the scantron and the exam, have your PHOTO ID and your calculator ready to be checked when you do so.
11.	Work at a steady pace and you will have ample time to finish.
12.	The keys will be posted on my class web page as soon as possible. You may check your grade at the class web site. Your password is the middle 5 numbers of your student ID followed by the first letter of your last name in CAPS. Be patient and give the webmaster time to enter all of this information.

There are 30 questions for 150 points. Good Luck!

E

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Possibly Useful Information

$M = \frac{\text{mol solute}}{\text{L soln}}$ $M_1V_1 = M_2V_2$ $\text{density} = \frac{\text{mass}}{\text{volume}}$ $\lambda\nu = c$

$\frac{w}{w}\% = \frac{\text{mass}}{\text{total mass}} \times 100$ $E = mc^2$ $E = h\nu$ $\lambda = h/mv$ $1\ \text{Å} = 1 \times 10^{-10}\text{m}$

$PV = nRT$ $\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$ $R = 0.08206\ \frac{\text{L·atm}}{\text{mol·K}}$

A periodic table is also provided on the last page of this exam.

Q.1	Lone pair vs lone pair repulsion is greater than bonding-pair vs bonding pair repulsion.
(a.)	TRUE
b.	FALSE

Q.2	Pi-bonds result from head-on overlap of atomic orbitals.
a.	TRUE
(b.)	FALSE

Q.3	A container with a volume of 10.0 L contains 2.80 g N_2 gas, 0.403 g H_2 gas and 79.9 g of argon gas. At 25°C what is the pressure in that container?
a.	0.471 atm
b.	6.43 atm
c.	3.20 atm
(d.)	5.62 atm
e.	2.38 atm

$\frac{2.80}{28.0} = 0.100$ mol N_2

$\frac{0.403}{2.016} = 0.1999 \Rightarrow 0.200$ mol H_2

$\frac{79.9}{39.948} = 2.000$ mol Ar

total n = 2.00 + 0.100 + 0.200 = 2.30

$P_{TOT.} = \frac{nRT}{V} = \frac{(2.30)(.08206)(298)}{10.0}$

$P_{TOT.} = 5.624 \Rightarrow$ **5.62 atm**

Q.4	The total number of valence electrons in the oxalate ion, $C_2O_4^{2-}$, is …
a.	28
b.	32
(c.)	34
d.	36
e.	30

$A = 2(4) + 4(6) + 2 = 34e^-$

Q.5	A 35.1 g sample of methane gas, CH_4 has a volume of 5.20 L at a pressure of 2.70 atm. What is the temperature of this gas?
a.	4.87 K
b.	129 K
c.	275 K
(d.)	78.1 K
e.	46.3 K

$PV = nRT$

$T = \frac{PV}{nR} = \frac{(2.70)(5.20)}{\left(35.1/16.04\right)(.08206)}$

$T = 78.18\ K$

Q.6	In valence bond theory, it is assumed that the covalent bonds are formed when atomic orbitals on different atoms overlap and electrons are shared.
(a.)	TRUE
b.	FALSE

Q.7	Hybridization refers to the mixing of atomic orbitals on one atom to form a new set of hybrid orbitals
(a.)	TRUE
b.	FALSE

Q.8	In a molecule the C — C — H bond angle is 120°. What is the hybridization on that central atom?
a.	sp
(b.)	sp^2
c.	sp^3
d.	s^2p^2
e.	s^2p

Q.9	A Lewis acid is an electron-pair donor.
a.	TRUE
(b.)	FALSE

Q.10	The SI unit of pressure is the atmosphere.
a.	TRUE
(b.)	FALSE

Q.11	Gases have low densities
(a.)	TRUE
b.	FALSE

Q.12 What volume does 28.0 grams of N_2 occupy at STP?

a. 11.2 L
b. 22.4 L
c. 5.60 L
d. 44.8 L
e. 33.6 L

28.0 g = 1 mol

Q.13 A Brønsted-Lowry base is a proton acceptor.

a. TRUE
b. FALSE

Q.14 The bond angles in the square planar geometry are 120° in the plane.

a. TRUE
b. FALSE

Q.15 At the same temperature and pressure, the volume of an ideal gas is always 22.414 L.

a. TRUE
b. FALSE

Q.16 In the triiodide ion, I_3^-, the oxidation number of I is -1.

a. TRUE
b. FALSE

Q.17 A species that is oxidized in a chemical reaction will show an algebraic decrease in its oxidation number.

a. TRUE
b. FALSE

Q.18 Argon has a density of 1.78 g/L at STP. How many of the following gases have a density at STP greater than that of argon?

46 709 18 4

NO_2 $C\ell_2$ NH_3 He

$d = \frac{m}{V}$

a. 0
b. 1
c. 2
d. 3
e. 4

Ar = 39.9 g/mol

Q.19 A 0.307 g sample of a triprotic acid is completely neutralized by 35.2 mL of 0.106 M NaOH. What is the molar mass of this acid?

a. 247 amu
b. 171 amu
c. 151 amu
d. 82.7 amu
e. 165 amu

$H_3A + 3\,NaOH \rightarrow Na_3A + 3\,H_2O$

$(0.0352)(0.106) = 3.731\times10^{-3}$ mol NaOH

3.731×10^{-3} mol NaOH $\times \frac{1\ H_3A}{3\ NaOH} = 1.2437\times10^{-3}$ mol acid

$MW = \frac{0.307\ g}{1.24\times10^{-3}\ mol} = 247$ amu

Q.20 How many of the following molecules are not linear?

NH_3 HCN CO CO_2

a. 0
b. 1
c. 2
d. 3
e. 4

Q.21 When the following half-reaction is balanced in acidic solution the sum of the lowest integer coefficients is … (include electrons)

$N_2H_4 \rightarrow N_2$

a. 3
b. 6
c. 9
d. 10
e. 11

$N_2H_4 \longrightarrow N_2 + 4H^+ + 4e^-$

$1 + 1 + 4 + 4 = 10$

Q.22 How many lone pairs are there in the molecule SO_2?

a. 2
b. 6
c. 7
d. 9
e. 12

N = 3(8) = 24
A = 3(6) = 18
S 6
L 12 ⇒ 6 LP

Q.23	Which indication of relative acid strength is incorrect?
a.	$HC\ell > HF$ ✓
b.	$HC\ell O_2 > HC\ell O$ ✓
c.	$H_2SO_4 > H_2SO_3$ ✓
(d.)	$H_2SO_3 > HNO_3$ ✗
e.	$CH_3COOH > CH_3CH_2OH$ ✓

Q.24	The molecule benzene contains ionic bonding.
a.	TRUE
(b.)	FALSE

Q.25	The concept of acids and bases which speaks of electron pairs is an inherent part of the Brønsted-Lowry theory.
a.	TRUE
(b.)	FALSE

Q.26	PO_4^{3-} is amphiprotic.
a.	TRUE
(b.)	FALSE

Q.27	The N—H bond in ammonia is more polar than the O—H bond in water.
a.	TRUE
(b.)	FALSE

Q.28	The Lewis structure for $CH_3C\ell$ has 9 lone pairs.
a.	TRUE
(b.)	FALSE

Q.29	The hybrid orbitals on the boron atom in BF_3 are sp^3.
a.	TRUE
(b.)	FALSE

Q.30	The bonds between oxygen and hydrogen in the water molecule are σ sp^2-1s.
a.	TRUE
(b.)	FALSE

End of Test

KEY Ex3 FORM E Magnuson 101 21 Nov 2003

Total points = 150 Each question =5 points

	1	A
	2	B
	3	D
	4	C
	5	D
	6	A
	7	A
	8	B
	9	B
	10	B
	11	A
	12	B
	13	A
	14	B
	15	B
	16	B
	17	B
	18	C
	19	A
	20	B
	21	D
	22	B
	23	D
	24	B
	25	B
	26	B
	27	B
	28	B
	29	B
	30	B