

**Chemistry 121 Summer 2008 Oregon State University
Midterm Exam 1 June 27th, 2008 10 am**

DO NOT OPEN THIS EXAM UNTIL INSTRUCTED.

CALCULATORS ARE NOT TO BE SHARED.

Instructions :

You should have with you several number two pencils, an eraser, your 3" x 5" notecard, and your University ID Card. You may use an approved calculator if you wish. If you have other notes with you, place them in a sealed backpack and place the backpack OUT OF SIGHT. Or place the notes directly on the table at the front of the room.

Fill in the front page of the Scantron answer sheet with your last name, first name, middle initial, and student identification number. Leave the class section number and the test form number blank.

This exam consists of 20 multiple-choice questions, each worth 5 points. Select the best answer by filling in the corresponding circle on the rear page of the answer sheet.

If you have any questions before the exam, please ask. If you have any questions during the exam, please raise your hand to attract the attention of a proctor. The proctor will come to you.

Present your ID card when submitting the exam. Place your open-ended portion of this exam in the appropriate stack. You may keep the question paper, but the instructor will retain the Scantron sheets, so please mark the answers you selected on the question sheet for later reference.

Scoring :

20 multiple-choice questions @ 5 pts each = 100 pts

Information not already provided in the questions

$1 \text{ L} = 1000 \text{ cm}^3$ $N_A = 6.022 \times 10^{23} \text{ particles/mol}$ $T(\text{K}) = T(\text{C}^\circ) + 273.15$ $T(\text{C}^\circ) = T(\text{K}) - 273.15$

A periodic table and a list of polyatomic ions are provided on the next two sheets. Check to see that you have them.

Also check to see that your exam does have 20 questions on it.

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18								
	1A	2A	3B	4B	5B	6B	7B		8B		1B	2B	3A	4A	5A	6A	7A	8A								
1	1 H 1.00794		KEY Atomic number → 1 Symbol → H Atomic mass → 1.0079																2 He 4.00260							
2	3 Li 6.941	4 Be 9.01218																			5 B 10.811	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.1797
3	11 Na 22.9898	12 Mg 24.3050																			13 Al 26.9815	14 Si 28.0855	15 P 30.9738	16 S 32.066	17 Cl 35.4527	18 Ar 39.948
4	19 K 39.0983	20 Ca 40.078	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.9961	25 Mn 54.9381	26 Fe 55.847	27 Co 58.9332	28 Ni 58.69	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80								
5	37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.224	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.906	46 Pd 106.42	47 Ag 107.868	48 Cd 112.411	49 In 114.818	50 Sn 118.710	51 Sb 121.75	52 Te 127.60	53 I 126.9045	54 Xe 131.30								
6	55 Cs 132.905	56 Ba 137.327	57-71 * Rare Earths	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.207	76 Os 190.23	77 Ir 192.22	78 Pt 195.09	79 Au 196.9665	80 Hg 200.59	81 Tl 204.37	82 Pb 207.2	82 Bi 208.9804	84 Po (209)	85 At (210)	86 Rn (222)								
7	87 Fr (223)	88 Ra 226.025	89-103 † Actinides	104 Rf (261)	105 Ha (262)	106 Sg (263)	107 Ns (262)	108 Hs (265)	109 Mt (266)	110 (269)	111 (272)															

*Lanthanide Series	57 La 138.906	58 Ce 140.12	59 Pr 140.9077	60 Nd 144.24	61 Pm 145	62 Sm 150.4	63 Eu 151.96	64 Gd 157.25	65 Tb 158.9254	66 Dy 162.50	67 Ho 164.9304	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
†Actinide Series	89 Ac 227.028	90 Th 232.0381	91 Pa 231.0359	92 U 238.029	93 Np 237.0482	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (254)	100 Fm (257)	101 Md (258)	102 No 259	103 Lr 262

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Table 3.1 Formulas and Names of Some Common Polyatomic Ions

Formula	Name	Formula	Name
CATION: Positive Ion			
NH_4^+	ammonium ion		
ANIONS: Negative Ions			
Based on a Group 4A element		Based on a Group 7A element	
CN^-	cyanide ion	ClO^-	hypochlorite ion
CH_3CO_2^-	acetate ion	ClO_2^-	chlorite ion
CO_3^{2-}	carbonate ion	ClO_3^-	chlorate ion
HCO_3^-	hydrogen carbonate ion (or bicarbonate ion)	ClO_4^-	perchlorate ion
Based on a Group 5A element		Based on a transition metal	
NO_2^-	nitrite ion	CrO_4^{2-}	chromate ion
NO_3^-	nitrate ion	$\text{Cr}_2\text{O}_7^{2-}$	dichromate ion
PO_4^{3-}	phosphate ion	MnO_4^-	permanganate ion
HPO_4^{2-}	hydrogen phosphate ion		
H_2PO_4^-	dihydrogen phosphate ion		
Based on a Group 6A element			
OH^-	hydroxide ion		
SO_3^{2-}	sulfite ion		
SO_4^{2-}	sulfate ion		
HSO_4^-	hydrogen sulfate ion (or bisulfate ion)		

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1. 8.0 cm is the equivalent of :

- a. 8.0×10^9 pm
- b. 8.0×10^6 nm
- c. 8.0×10^4 μm .
- d. 8.0×10^{-4} μm
- e. 8.0×10^{-6} pm.

2. An Epson inkjet printer spits out ink droplets that are about 6 picoliters in volume. What is this in m^3 ?

- a. 6×10^{-15} m^3
- b. 6×10^{-12} m^3
- c. 6×10^{-9} m^3
- d. 6×10^{-10} m^3
- e. 6×10^{12} m^3

3. Which of the following is NOT a physical property?

- a. Solid iron melts at 1535°C
- b. Solid sulfur has a yellow color
- c. Liquid water has a density of 1.0 g/mL
- d. Natural gas burns
- e. Diamond is very hard.

4. In the Martian winter the temperature at the poles drops to -120°C . The temperature at which liquid nitrogen gas boils is 77 K . Which of the following statements is correct?

- a. Nitrogen will be a gas at the Martian pole in winter.
- b. -120°C is the same as -199 K .
- c. 77 K is warmer than -120°C .
- d. -120°C is the same as 43 K .
- e. Nitrogen will be a liquid at the Martian pole in winter.

5. Which of the following statements is correct?

Densities (g/cm^3): Al 2.70 Au 19.28 Hg 13.6 Li 0.53 Olive oil 0.80

- a. Gold (Au) will sink in olive oil, but not in mercury.
- b. Lithium (Li) will sink in olive oil.
- c. Mercury (Hg) is denser than gold.
- d. The same volume of aluminum (Al) will have less mass than the equivalent volume of gold.
- e. 5 g of Li will have a smaller volume than 10 g of gold.

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6. How many significant figures are there in the number 0.002040100?

- a. 10
- b. 9
- c. 7
- d. 5
- e. 3

7. Which answer has the correct number of significant figures for the expression below?

$$1.012 + 1.6 + 0.0123$$

- a. 2.6243
- b. 2.624
- c. 2.62
- d. 2.6
- e. 2.

8. The price of tomatoes at the Corvallis Farmer's Market is \$ 1.78/lb. If you living in Paris the tomatoes would be priced in Euros/kg. What is the European price for a kg of tomatoes? Note : take 1 Euro = 1.45 \$; 1 kg = 2.205 lb.

- a. 1.17 Euros
- b. 1.45 Euros
- c. 1.78 Euros
- d. 2.71 Euros
- e. 5.69 Euros

9. Which is the correct definition of atomic number?

- a. The number of particles in the nucleus.
- b. The number of protons in the nucleus.
- c. The number of neutrons in the nucleus.
- d. The number of protons plus neutrons in the nucleus.
- e. The mass of a nucleus.

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10. Which symbol is correct for the element germanium (Ge) with 41 neutrons?

- a. ${}^{73}_{41}\text{Ge}$
- b. ${}^{32}_{41}\text{Ge}$
- c. ${}^{41}_{72}\text{Ge}$
- d. ${}^{41}_{32}\text{Ge}$
- e. ${}^{73}_{32}\text{Ge}$

11. A metal consists of 2 naturally occurring isotopes, one with a mass of 62.9298 u, abundance 69.17% , and the second with a mass of 64.9278 u, abundance 30.83%. What is the metal?
HINT: Find its atomic mass.

- a. W (tungsten).
- b. Na (sodium)
- c. Mg (magnesium)
- d. Au (gold)
- e. Cu (copper)

12. How many moles does 59.85 g of Ti correspond to?

- a. 2.87×10^2
- b. 1.25
- c. 9.94×10^{-23}
- d. 1.00
- e. 0.80

13. How many atoms are there in 1.25 mol Ti?

- a. 6.02×10^{23}
- b. 2.88×10^{25}
- c. 2.61×10^{-2}
- d. 7.53×10^{23}
- e. 1.26×10^{22}

14. Which element is a metal in the 5 period that has a Z value 5 less than the only metalloid in group 6A?

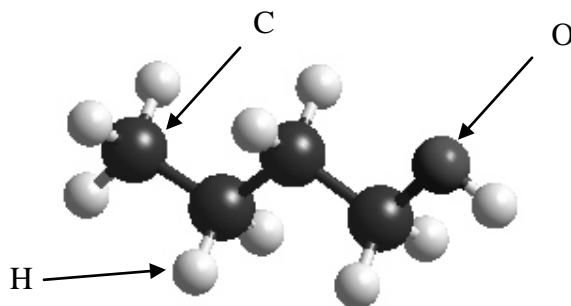
- a. Copper (Cu)
- b. Tellurium (Te)
- c. Silver (Ag)
- d. Boron (B)
- e. Gold (Au)

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15. Pick the correct set of elements for a halogen, an alkali metal, and a noble gas in that order.

- a. Br, K, Ar
- b. Cl, Mg, He
- c. S, Br, K
- d. Ne, O, K
- e. Cs, I, Xe

16. From the model given, select the correct molecular and condensed formula (in that order)..



- a. $C_4H_{10}O$, $CH_3CH_2CH_2CH_2OH$
- b. C_4H_9O , $CH_3CH_2CH_3OH$
- c. $CH_3CH_2CH_2CH_2OH$, $C_4H_{10}O$
- d. $C_4H_{10}O$, $CH_3CH_2CH_2CH_3OH$
- e. $C_4H_{10}O$, $CH_3CH_2CH_3OH$

17. What is the correct definition of an isomer?

- a. two compounds with different molecular formulas but the same structure
- b. two compounds with the same molecular formula and condensed formula
- c. two compounds with the same molecular formula but different structures
- d. two compounds with the same melting point
- e. two compounds, one of which is a gas, and one of which is a liquid

18. Which of the following statements is NOT TRUE?

- a. metals form cations
- b. elements from group 2A form positive ions
- c. elements from group 6A form negative ions
- d. non-metals form anions
- e. elements always make just one anion or cation

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19. Predict the ions formed from tellurium (Te) and cesium (Cs).

- a. Te^- and Cs^+
- b. Te^{2-} and Cs^+
- c. Te^- and Cs^{2+}
- d. Te^{2+} and Cs^-
- e. Te^{2+} and Cs^{7-}

20. Select the polyatomic ion from the table at the beginning of the exam that best fits the following description. This ion is an oxoanion of a group 5A element; it also contains hydrogen. Its charge is the same magnitude as that of the only common polyatomic cation.

- a. NO_2^-
- b. HSO_4^-
- c. HPO_4^{2-}
- d. NH_4^+
- e. H_2PO_4^-