

Name _____ Lab. Instructor _____

Signature _____ Rec. Instructor _____

INSTRUCTIONS

1. Fill out answer sheet as follows, using **pencil only**. (**Ink will not record**).
 - a) Print your last name, starting at the far left, **FILL IN THE CORRESPONDING LETTER UNDER EACH LETTER IN YOUR LAST NAME**.
 - b) Leaving one space after the last name, print your first name and **FILL IN THE CORRESPONDING LETTER UNDER EACH LETTER IN YOUR FIRST NAME**.
 - c) MI means "middle initial". Leave one space after your first name, print your middle initial, **FILL IN THE CORRESPONDING LETTER UNDER YOUR MIDDLE INITIAL**.
 - d) Place your signature on the line above your printed name.
 - e) You **MUST** indicate your two-digit section number.
 1. Locate your **LAB day/time FIRST**,
 2. Find your **TA'S NAME**,
 3. Fill in the **TWO-DIGIT NUMBER** for your section on the answer sheet starting in **COLUMN "K"** in the **SPECIAL CODES SECTION**.
 - f) Fill in the **IDENTIFICATION NUMBER** starting in **COLUMN A** with your Carmen ID Number.
 - g) **DO NOT** fill in sex or birth date.

Find lab day/time, then T.A. and enter two digit section number.

Monday 8:30		Friday 8:30	
Kamakshi Singh	24	James Lu	28
Bryan Sears	25	Brenda Wray	29
Ashley Katana	26	Annie Agin	30
Yucheng Pang	27	Yuning Chang	31
		Yucheng Pang	32

2. When the proctor gives the signal, but not before, check to see that there are 6 numbered pages, and a Periodic Table.
3. There are 25 multiple choice questions for a total score of 175 points.
4. You must mark answers on the answer sheet in PENCIL. Fill in all answers COMPLETELY with PENCIL. If you wish to change an answer, erase the unwanted mark COMPLETELY.
5. Use the blank page for scratch work, but note that only the marks you make on the answer sheet will be observed by the grading equipment.
6. The time allowed is 1 hour, 18 minutes.
7. At the end of the examination, you must hand in the ANSWER SHEET before leaving the room

Grandinetti Chem 121 Midterm 2

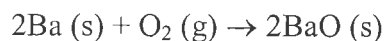
1. Calculate the kinetic energy in joules of an 80.0 g bullet traveling at 300.0 m/s.

- A) 3.60×10^6
- B) 1.20×10^4
- C) 3.60×10^3
- D) 12.0
- E) 80.0

2. The change in the internal energy of a system that releases 2,500 J of heat and that does 7,655 J of work on the surroundings is _____ J.

- A) -10,155
- B) -5,155
- C) -1.91×10^7
- D) 10,155
- E) 5,155

3. The value of ΔH° for the reaction below is -1107 kJ:



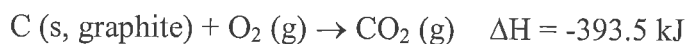
How many kJ of heat are released when 5.75 g of Ba (s) reacts completely with oxygen to form BaO (s)?

- A) 96.3
- B) 26.3
- C) 46.4
- D) 23.2
- E) 193

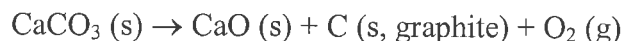
4. The ΔH for the solution process when solid sodium hydroxide dissolves in water is 44.4 kJ/mol. When a 13.9-g sample of NaOH dissolves in 250.0 g of water in a coffee-cup calorimeter, the temperature increases from 23.0 °C to _____ °C. Assume that the solution has the same specific heat as liquid water, i.e., 4.18 J/g-K.

- A) 35.2 °C
- B) 24.0 °C
- C) 37.8 °C
- D) 37.0 °C
- E) 40.2 °C

5. Given the following reactions



the enthalpy of the reaction



is _____ kJ.

A) 215.4

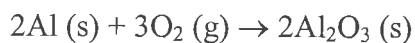
B) 571.6

C) -215.4

D) -571.6

E) 7.01×10^4

6. The value of ΔH° for the following reaction is -3551 kJ:



The value of ΔH_f° for $\text{Al}_2\text{O}_3 (\text{s})$ is _____ kJ.

A) -3351

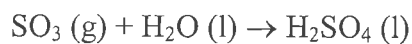
B) -1676

C) -32.86

D) -16.43

E) +3351

7. Given the data in the table below, $\Delta H_{\text{rxn}}^\circ$ for the reaction



is _____ kJ.

Substance	ΔH_f° (kJ/mol)
$\text{SO}_2 (\text{g})$	-297
$\text{SO}_3 (\text{g})$	-396
$\text{SO}_2\text{Cl}_2 (\text{g})$	-364
$\text{H}_2\text{SO}_4 (\text{l})$	-814
$\text{H}_2\text{O} (\text{l})$	-286

- A) -132
- B) 1496
- C) 704
- D) -704
- E) -2.16×10^3

8. When a system _____, ΔE is always negative.

- A) absorbs heat and does work
- B) gives off heat and does work
- C) absorbs heat and has work done on it
- D) gives off heat and has work done on it
- E) none of the above is always negative

9. Which of the following statements is true?

- A) Enthalpy is an intensive property.
- B) The enthalpy change for a reaction is independent of the state of the reactants and products.
- C) Enthalpy is a state function.
- D) H is the value of q measured under conditions of constant volume.
- E) The enthalpy change of a reaction is the reciprocal of the ΔH of the reverse reaction.

10. For which one of the following reactions is the value of $\Delta H^\circ_{\text{rxn}}$ equal to ΔH°_f for the product?

- A) $\text{H}_2(\text{g}) + 1/2 \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$
- B) $\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}_2(\text{l})$
- C) $2 \text{C}(\text{s, graphite}) + 2 \text{H}_2(\text{g}) \rightarrow \text{C}_2\text{H}_4(\text{g})$
- D) $1/2 \text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{NO}_2(\text{g})$
- E) all of the above

11. The energy of a photon that has a wavelength of 12.3 nm is _____ J.

- A) 1.51×10^{-17}
- B) 4.42×10^{-23}
- C) 1.99×10^{-25}
- D) 2.72×10^{-50}
- E) 1.62×10^{-17}

12. What color of visible light has the highest energy?

- A) violet
- B) blue
- C) red
- D) green
- E) yellow

13. When the electron in a hydrogen atom moves from $n = 6$ to $n = 2$, light with a wavelength of _____ nm is emitted.

- A) 93.8
- B) 434
- C) 487
- D) 657
- E) 411

14. What is the de Broglie wavelength (m) of a 25 g object moving at a speed of 5.0 m/s?

- A) 1.9×10^{32}
- B) 5.3×10^{-33}
- C) 6.6×10^{-36}
- D) 3.32×10^{-36}
- E) 3.02×10^{45}

15. The principal quantum number of the first d subshell is _____.

- A) 1
- B) 2
- C) 3
- D) 4
- E) 0

16. $[\text{Ar}]4s^23d^{10}4p^3$ is the electron configuration of a(n) _____ atom.

- A) As
- B) V
- C) P
- D) Sb
- E) Sn

17. Which one of the following represents an acceptable set of quantum numbers for an electron in an atom? (arranged as n , l , m_l , and m_s)

- A) 2, 2, -1, -1/2
- B) 1, 0, 0, 1/2**
- C) 3, 3, 3, 1/2
- D) 5, 4, -5, 1/2
- E) 3, 3, 3, -1/2

18. The complete electron configuration of gallium, element 31, is _____.

- A) $1s^2 2s^2 2p^{10} 3s^2 3p^{10} 4s^2 3d^3$
- B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$**
- C) $1s^4 2s^4 2p^6 3s^4 3p^6 4s^4 3d^3$
- D) $1s^4 2s^4 2p^{10} 3s^4 3p^9$
- E) $1s^4 2s^4 2p^8 3s^4 3p^8 4s^3$

19. In general, as you go across a period in the periodic table from left to right:

- (1) the atom radius _____;
- (2) the electron affinity becomes _____ negative; and
- (3) the first ionization energy _____.

- A) decreases, decreasingly, increases
- B) increases, increasingly, decreases
- C) increases, increasingly, increases
- D) decreases, increasingly, increases**
- E) decreases, increasingly, decreases

20. The substance, _____ is always produced when an active metal reacts with water.

- A) NaOH
- B) H_2O
- C) CO_2
- D) H_2**
- E) O_2

21. Which one of the following elements has the largest atomic radius?

- A) O
- B) F
- C) Al**
- D) P
- E) B

22. Of the following elements, which has the largest first ionization energy?

- A) K
- B) Rb
- C) Sr
- D) Ca
- E) Ba

23. Which of the following has the largest second ionization energy?

- A) Si
- B) Mg
- C) Al
- D) Na
- E) P

24. Which equation correctly represents the electron affinity of calcium?

- A) $\text{Ca (g)} + e^- \rightarrow \text{Ca}^- \text{ (g)}$
- B) $\text{Ca (g)} \rightarrow \text{Ca}^+ \text{ (g)} + e^-$
- C) $\text{Ca (g)} \rightarrow \text{Ca}^- \text{ (g)} + e^-$
- D) $\text{Ca}^- \text{ (g)} \rightarrow \text{Ca (g)} + e^-$
- E) $\text{Ca}^+ \text{ (g)} + e^- \rightarrow \text{Ca (g)}$

25. Of the following, _____ radiation has the shortest wavelength.

- A) X-ray
- B) radio
- C) microwave
- D) ultraviolet
- E) infrared

THE PERIODIC TABLE OF THE CHEMICAL ELEMENTS

GUIDE:
 45 → Atomic Number
 Rh → Element symbol
 102.91 → Relative atomic weight
 (mass)

IA	1	2											18	0																					
1	H 1.008	IIA	2											2	He 4.00																				
2	3 Li 6.94	4	4 Be 9.01											5	B 10.81	6	6 C 12.01	7	7 N 14.01	8	8 O 16.00	9	9 F 19.00	10	10 Ne 20.18										
3	11 Na 22.99	12	12 Mg 24.31	III B	3	IV B	4	VB	5	VIB	6	VII B	7	VIII	8	VIII	9	VIII	10	IB	11	II B	12	13 Al 26.98	14	14 Si 28.09	15	15 P 30.97	16	16 S 32.07	17	17 Cl 35.45	18	18 Ar 39.95	
4	19 K 39.10	20	20 Ca 40.08	21	21 Sc 44.96	22	22 Ti 47.88	23	23 V 50.94	24	24 Cr 52.00	25	25 Mn 54.94	26	26 Fe 55.85	27	27 Co 58.93	28	28 Ni 58.69	29	29 Cu 63.55	30	30 Zn 65.39	31	31 Ga 69.72	32	32 Ge 72.61	33	33 As 74.92	34	34 Se 78.96	35	35 Br 79.90	36	36 Kr 83.80
5	37 Rb 85.47	38	38 Sr 87.62	39	39 Y 88.91	40	40 Zr 91.22	41	41 Nb 92.91	42	42 Mo 95.94	43	43 Tc 98.91	44	44 Ru 101.07	45	45 Rh 102.91	46	46 Pd 106.42	47	47 Ag 107.87	48	48 Cd 112.41	49	49 In 114.82	50	50 Sn 118.71	51	51 Sb 121.75	52	52 Te 127.60	53	53 I 126.90	54	54 Xe 131.29
6	55 Cs 132.91	56	56 Ba 137.33	57-71 La-Lu Lanthanides	72	72 Hf 178.49	73	73 Ta 180.95	74	74 W 183.85	75	75 Re 186.21	76	76 Os 190.2	77	77 Ir 192.22	78	78 Pt 195.08	79	79 Au 196.97	80	80 Hg 200.59	81	81 Tl 204.38	82	82 Pb 207.2	83	83 Bi 208.98	84	84 Po 208.98	85	85 At 209.99	86	86 Rn 222.02	
7	87 Fr 223.02	88	88 Ra 226.03	89-103 Ac-Lr Actinides	104	104 Rf 261.11	105	105 Db 262.11	106	106 Sg 263.12	107	107 Bh 262.12	108	108 Hs 262.12	109	109 Mt 262.12	110	110 Uun	111	111 Uuu	112	112 Uub	113	113 Uut	114	114 Uuq	115	115 Uup	116	116 Uuq	117	117 Uup	118	118 Uuo	

Lanthanides		57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
La		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
138.91		140.12	140.91	142.24	146.92	150.36	151.97	157.25	158.93	162.50	164.93	167.26	168.93	173.04	174.97	
Actinides		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
Ac		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
227.03		232.04	231.04	238.03	238.04	244.06	243.06	247.07	251.08	252.08	257.10	258.10	259.10	260.11		