

PLEASE READ THESE DIRECTIONS CAREFULLY BEFORE STARTING THE EXAMINATION!

It is *extremely* important that you fill in the answer sheet EXACTLY as indicated, otherwise your answer sheet may not be processed; ALL entries are to be made on SIDE 1 of the answer sheet. Use a #2 pencil (or softer); fill in the circles completely and firmly. Erasures must be complete. Use only the following categories:

|                 |  |            |         |           |                  |
|-----------------|--|------------|---------|-----------|------------------|
| NAME:           | Print your name starting at the first space, LAST NAME first, then a space, followed by your FIRST NAME, then another space, followed by your MIDDLE INITIAL. Fill in the <u>correct</u> circles below your printed name corresponding to the letters of your name; for the spaces, fill in the top blank circle.  |            |         |           |                  |
| STUDENT NUMBER: | This is <b>VERY IMPORTANT!</b> Under IDENTIFICATION NUMBER, put in your <b>8 DIGIT STUDENT ID NUMBER (do not use the 9 at the beginning of your number)</b> beginning in column A and continuing through column H, column I will be blank, (do NOT use column J at this time); be sure to fill in the correct circles (a common error to be avoided is mistaking "0" for "1"). |            |         |           |                  |
| TEST FORM:      | Fill in the "2" blank in the J column under IDENTIFICATION NUMBER (to indicate Hour Examination II).   |            |         |           |                  |
| SPECIAL CODES:  | Use for course and section number; in positions K-P write in one of the following:<br><br><div style="text-align: center;"> <table> <tr> <td>Dr. Ladipo</td> <td>105-001</td> </tr> <tr> <td>Dr. Yates</td> <td>105-002, 105-401</td> </tr> </table> </div>  | Dr. Ladipo | 105-001 | Dr. Yates | 105-002, 105-401 |
| Dr. Ladipo      | 105-001  |            |         |           |                  |
| Dr. Yates       | 105-002, 105-401   |            |         |           |                  |
| SIGNATURE:      | You <b>MUST</b> sign the examination answer sheet (bubble sheet) on the line directly above your printed name. Use your legal signature.   |            |         |           |                  |

Answering Questions:

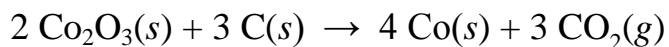
Starting with answer "1" on SIDE 1, fill in the circle indicating the one best answer for each of the **30 questions** in this examination. Your score is the sum of the appropriate credit for each response. On the day following the examination, an answer key will be posted on Blackboard.

Grading and Reporting:

The examination scores will be posted in Blackboard as soon as possible after the examination. If an error has occurred in scoring your answers, inform your instructor within 48 hours of the posting of your score.

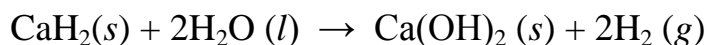
**BE SURE THAT YOUR TEST HAS 30 QUESTIONS, A PERIODIC TABLE, AND ONE SHEET OF SCRATCH PAPER.** You may NOT use your own scratch paper during this examination. Cell phones, computers, and pagers are to be turned off and out of sight during the exam.

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1. According to the following balanced chemical equation, how many moles of carbon dioxide will be formed from 5.44 moles of  $\text{Co}_2\text{O}_3$  and an excess of carbon?



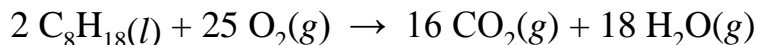
- A. 3.63 mol  $\text{CO}_2$                       C. 8.16 mol  $\text{CO}_2$   
B. 5.44 mol  $\text{CO}_2$                       D. 10.9 mol  $\text{CO}_2$

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2. Find the limiting reactant for the reaction between 4.50 g  $\text{CaH}_2$  and 3.80 g  $\text{H}_2\text{O}$  according to the following balanced chemical equation:



- A.  $\text{CaH}_2$                                       C.  $\text{Ca}(\text{OH})_2$   
B.  $\text{H}_2\text{O}$                                       D.  $\text{H}_2$

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3. From the balanced reaction below, what is the percent yield when 28.16 g of  $\text{CO}_2$  (molar mass = 44.010 g/mol) are formed from the reaction of 4.00 moles of  $\text{C}_8\text{H}_{18}$  with 8.00 moles of  $\text{O}_2$ ?



- A. 12.5%                                      C. 35.0%  
B. 20.0%                                      D. 50.0%

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4. How many grams of  $\text{BaCl}_2$  are required to make 2.05 L of a 0.227 M  $\text{BaCl}_2$  solution?

- A. 96.9 g                                      C. 114 g  
B. 33.2 g                                      D.  $1.88 \times 10^3$  g

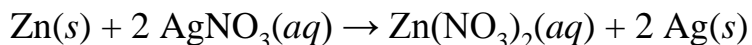
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5. What volume of 0.0887 M  $\text{MgF}_2$  solution is needed to make 275.0 mL of 0.0224 M  $\text{MgF}_2$  solution by dilution?

- A. 69.4 mL                                      C. 72.3 mL  
B. 91.8 mL                                      D. 14.4 mL
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11. Which element (if any) is undergoing reduction in the following reaction?



- A. nitrogen  
B. zinc  
C. silver  
D. None, this is not a redox reaction.

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12. The atmospheric pressure at 3400-foot elevation was determined to be 0.430 atm. What is this pressure in torrs?

- A. 327 torr  
B. 433 torr  
C. 32.7 torr  
D. 43.3 torr

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13. If 0.300 moles of nitrogen gas occupies 0.600 L under certain conditions, what number of moles occupies 1.500 L under the same conditions?

- A. 0.330 moles  
B. 0.750 moles  
C. 1.50 moles  
D. 0.950 moles

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14. A 75.0 g sample of Argon is confined to a 3.10 L flask. What is the pressure (in atm) at 115°C?

- A. 60.0 atm  
B. 19.3 atm  
C. 23.4 atm  
D. 35.9 atm

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15. What volume will 3.12 grams of helium occupy at STP?

- A. 15.6 L  
B. 43.7 L  
C. 70.2 L  
D. 17.5 L
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16. What is the molar mass of a gas at 1.20 atm and 65.0 °C if 5.97 g of the gas occupies 2.06 L?

A. 37.3 g/mol

C. 70.2 g/mol

B. 12.6 g/mol

D. 57.4 g/mol

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17. A gas mixture consists of N<sub>2</sub>, O<sub>2</sub>, and Ne, where the mole fraction of N<sub>2</sub> is 0.55 and the mole fraction of Ne is 0.25. If the mixture is at STP in a 5.0 L container, how many O<sub>2</sub> molecules are present?

A.  $2.7 \times 10^{22}$  O<sub>2</sub> molecules

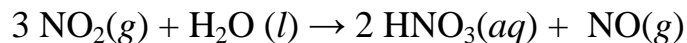
C.  $4.5 \times 10^{22}$  O<sub>2</sub> molecules

B.  $3.7 \times 10^{23}$  O<sub>2</sub> molecules

D.  $9.3 \times 10^{24}$  O<sub>2</sub> molecules

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18. The industrial preparation of nitric acid involves reaction of NO<sub>2</sub>(g) with H<sub>2</sub>O(l):



How many moles of nitric acid can be prepared using 550 L of NO<sub>2</sub> at a pressure of 5.00 atm and a temperature of 295 K?

A. 75.7 mol

C. 67.4 mol

B. 112 mol

D. 96.7 mol

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19. Which of the following is used for determining the properties of a gas under non-ideal, *i.e.*, real, conditions?

A. The Van der Waals equation

C. Cole's Law

B. Dalton's Law

D.  $PV = (a + b/c)RT$

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20. What is work?

- A. The result of a force acting through a distance
- B. The flow of energy caused by a temperature difference
- C. The transfer of energy between a system and its surroundings
- D. The change in relative positions of electrons in atoms

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21. Work is done by a system (on its surroundings) while heat is being lost to the surroundings. For the system, we can conclude that:

- A.  $q$  is negative and  $w$  is positive.
- B.  $\Delta E_{\text{system}}$  must be negative.
- C. both  $q$  and  $w$  are positive.
- D. more information is needed to provide a correct answer.

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22. A system absorbs 366 kJ of heat and the surroundings do 122 kJ of work on the system. What is the change in internal energy of the system?

- A. -488 kJ
- B. 488 kJ
- C. -244 kJ
- D. 244 kJ

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23. Which of the following substances (with its mass and specific heat capacity,  $C_s$ , provided) would experience the smallest temperature change upon absorbing 200.0 J of heat?

- A. 25.0 g granite,  $C_{\text{granite}} = 0.79 \text{ J/g}\cdot^\circ\text{C}$
- B. 25.0 g Au,  $C_{\text{Au}} = 0.128 \text{ J/g}\cdot^\circ\text{C}$
- C. 50.0 g Cu,  $C_{\text{Cu}} = 0.385 \text{ J/g}\cdot^\circ\text{C}$
- D. 50.0 g Al,  $C_{\text{Al}} = 0.903 \text{ J/g}\cdot^\circ\text{C}$

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24. A 12.3 g lead ball initially at  $169^\circ\text{C}$  is submerged into 22.1 g of water at  $27.8^\circ\text{C}$  in an isolated container. What is the final temperature of both substances at thermal equilibrium? ( $C_{\text{Pb}} = 0.128 \text{ J/g}\cdot^\circ\text{C}$  and  $C_{\text{water}} = 4.18 \text{ J/g}\cdot^\circ\text{C}$ )

- A.  $30.2^\circ\text{C}$
  - C.  $37.6^\circ\text{C}$
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B. 51.1 °C

D. 42.4 °C

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25. If a balloon is inflated from 0.100 L to 0.500 L against an external pressure of 2.00 atm, how much work is done? (101.3 J = 1 L·atm)

A. 0.810 J

C. -15.6 J

B. -81.0 J

D. 8.10 J

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26. All of the following processes are exothermic EXCEPT

A. Butane gas burning on a stove

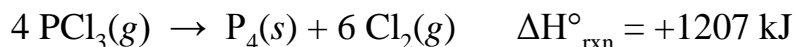
C. Ice freezing

B. Dry ice evaporating

D. Ethanol condensing from the gaseous state

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27. How much energy is required to decompose 765 g of  $\text{PCl}_3$  (molar mass = 137.32 g/mol) according to the balanced thermochemical equation below?



A.  $2.31 \times 10^3$  kJ

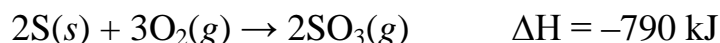
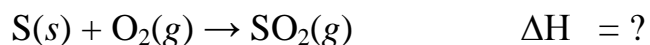
C.  $6.72 \times 10^3$  kJ

B.  $4.33 \times 10^3$  kJ

D.  $1.68 \times 10^3$  kJ

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28. From the thermochemical data provided below, what is  $\Delta H_{\text{rxn}}$  for the reaction:



A. 594 kJ

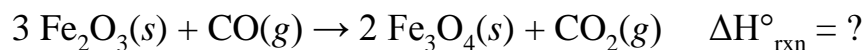
C. -986 kJ

B. -594 kJ

D. -297 kJ

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29. From the thermochemical data provided below, what is the standard enthalpy change for the reaction shown?



|                            | $\Delta H^\circ_f$ |
|----------------------------|--------------------|
| $\text{Fe}_2\text{O}_3(s)$ | -824 kJ/mol        |
| $\text{Fe}_3\text{O}_4(s)$ | -1118 kJ/mol       |
| $\text{CO}(g)$             | -111 kJ/mol        |
| $\text{CO}_2(g)$           | -394 kJ/mol        |

- A. +277 kJ  
B. +144 kJ  
C. -47 kJ  
D. -111 kJ
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30. The burning of fossil fuels is believed to significantly contribute to the concentration of the which greenhouse gas in the atmosphere?

- A.  $\text{O}_2(g)$   
B.  $\text{CO}_2(g)$   
C.  $\text{NO}(g)$   
D.  $\text{Ar}(g)$
-



