

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 VERY IMPORTANT! Under IDENTIFICATION NUMBER, put in your 8 DIGIT STUDENT ID NUMBER (do not use the 9 at the beginning of your number) 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 "5" blank in the J column under IDENTIFICATION NUMBER (to indicate Examination V).
SPECIAL CODES:	Use for course and section number; in positions K-P write in the following: Dr. Owen 105-020
SIGNATURE:	You MUST 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 **25 questions** in this examination. Your score is the sum of the appropriate credit for each response. On the day following the examination, an examination 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 25 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.

5. How much work is done when a gas expands 3.5 L against a pressure of 748 torr?

A. 0.86 L·atm

C. 1.7 L·atm

B. -2.8 L·atm

D. -3.4 L·atm

6. A 100-watt light bulb radiates energy at a rate of 100 J/s. If the wavelength (λ) of the emitted light is 525 nm, how many photons are emitted after 4 seconds?

A. 1.58×10^{20} photons

C. 1.06×10^{21} photons

B. 5.45×10^{20} photons

D. 3.60×10^{21} photons

7. If an electron has a principle quantum number $n = 5$, how many possible m_l values of +2 are possible?

A. 1

C. 2

B. 3

D. 4

8. Which of the following statements is **false** concerning the photoelectric effect?

A. The photoelectric effect demonstrated that light has a particle nature in addition to a wave nature.

B. Many metals emit electrons when light of high enough energy is shone on them.

C. Electrons are emitted from many metals after exposure to light with a threshold frequency.

D. Electrons are emitted from many metals after exposure to light with threshold amplitude.

9. What is the frequency of the light emitted from a hydrogen atom with a wavelength of 486.1 nm?

A. 6.172×10^{14} Hz

C. 2.438×10^{14} Hz

B. 4.444×10^{15} Hz

D. 1.189×10^{15} Hz

10. Which of the following atoms contains the most **unpaired** electrons?

A. Cr

C. O

B. Ar

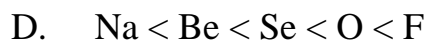
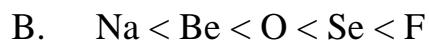
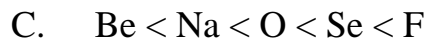
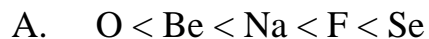
D. N

11. What is the electronic configuration of gold?

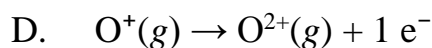
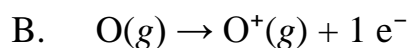
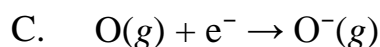
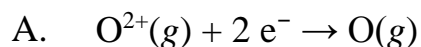


12. Arrange the following elements in order of **increasing** first ionization energy:

Be, Se, F, Na, O



13. Which reaction below represents the first electron affinity of oxygen?



Questions 14-26 (Chapters 9 and 10)

14. What is the chemical formula for the compound formed between strontium and phosphorus?

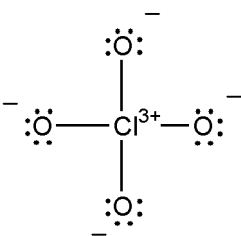
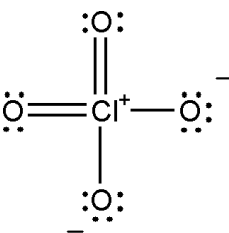
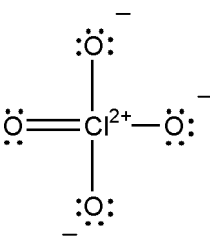
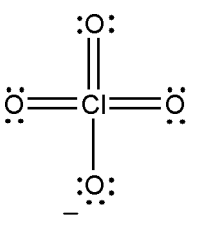
- A. SrP
B. Si₃P
C. Sr₃P₂
D. Sr₂P₃
-

15. Arrange the following compounds in order of **increasing** lattice energy:



- A. Al₂O₃ < Al₂S₃ < CaO < NaF < RbBr
B. NaF < RbBr < CaO < Al₂S₃ < Al₂O₃
C. CaO < RbBr < NaF < Al₂S₃ < Al₂O₃
D. RbBr < NaF < CaO < Al₂S₃ < Al₂O₃
-

16. What is the **best** Lewis structure for ClO₄⁻?

- A. 
- B. 
- C. 
- D. 
-

17. What is the formal charge of carbon in CH₃⁺?

- A. +1
B. +2
C. 0
D. +3
-

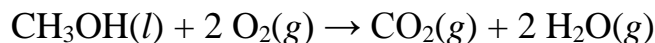
18. How many valence electrons are in caffeine ($C_8H_{10}N_4O_2$)?

- A. 24
B. 74
C. 194
D. 98

19. Which compound contains the strongest bond?

- A. CO
B. CH_3CH_2OH
C. CH_2O
D. CO_2

20. Use the bond energies provided to estimate the ΔH_{rxn} for



Bond	Bond Energy (kJ/mol)
C-H	414
C-O	360
C=O	799
O=O	498
O-H	464

- A. -98.0 kJ
B. -157 kJ
C. -294 kJ
D. -392 kJ

21. What is the electron geometry (eg) and the molecular geometry (mg) of XeF_4 ?

- A. eg = octahedral, mg = square planar
B. eg = octahedral, mg = octahedral
C. eg = tetrahedral, mg = tetrahedral
D. eg = trigonal bipyramid, mg = seesaw

22. Which molecule is polar?

- A. $BrCl_3$
B. SiF_4
C. CS_2
D. SO_3
-

23. What is the hybridization on the oxygen atom in H_3O^+ ?

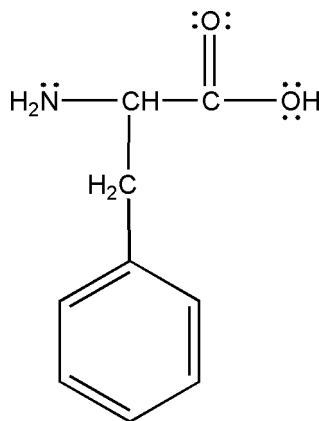
A. sp

C. sp^2

B. sp^3

D. sp^3d

24. How many pi (π) electrons are in the following molecule?



A. 2

C. 4

B. 6

D. 8

25. Which of the following statements is **true** concerning molecular orbital theory?

A. Molecular orbital theory states that bonding orbitals are localized to specific atoms.

B. Molecular orbital theory states that bonding orbitals include the whole molecule.

C. Molecular orbital theory cannot predict the magnetic properties of molecules.

D. Molecular orbital theory cannot predict the stability of molecules.

26. What is the bond order for a molecule of C_2 ?

A. 1

C. 2

B. 3

D. 4

Answer Key:

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