

*** ALWAYS ANSWER IN FULL SENTENCES!

*** Use your time wisely. Do not get stuck on one question.

*** Answer each question carefully, with thought and with confidence! Do not stop to check over your work until you have worked through the entire exam.

PAGE	TOTAL SCORE POSSIBLE	YOUR SCORE
1	16	
2	35	
3	17	
4	25	
5	7	
TOTAL	100	
Bonus p.5	1	
Bonus Definitions	5	

Adjusted total to Exam IV =

Current Course Total =

1. (2 pts)



a) Draw a wave that has a lower energy than the one shown above.

2. (3 pts) Put the following in order of increasing energy: microwave, X-ray, visible, UV, IR
lowest E \longrightarrow highest E

Multiple Choice (1 pts each) Circle your answer.

3. Which is higher in energy?
A. E from the transition $n = 5 \rightarrow n = 4$ B. E from the transition $n = 3 \rightarrow n = 2$
4. Which is higher in energy?
A. E from the transition $n = 5 \rightarrow n = 3$ B. E from the transition $n = 5 \rightarrow n = 2$
5. A photon is a positive electron
A. True B. False
6. Bohr did not believe E levels of the atom are quantized.
A. True B. False
7. Which has the higher energy?
A. $n = 5$ B. $n = 1$ C. neither
8. Each line in the emission spectrum of hydrogen represents...
A. each energy level of the hydrogen atom
B. $n = 1, n = 2, n = 3$ etc.
C. an electron.
D. a transition of an electron.
9. If Bohr's model predicted the observed wavelengths so well, why did we ultimately have to revise it drastically?
A. His measurements were recorded incorrectly.
B. It only worked for one element.
C. He didn't realize that the electron behaves as a wave.
10. Which has the higher ionization energy?
A. K B. Rb
11. Which has more metallic character?
A. K B. Ca
12. Which has a higher affinity for electrons?
A. S B. N
13. Which is larger?
A. Cl B. P

14. (2 pts) Describe one difference between Bohr's and Schroedinger's models of the atom. Use full sentences.

Question 15 thru 24 (2 pts each)

15. Give an example of a one-electron system, other than H. Ans. _____
16. What is the Greek symbol used for wavelength? Ans. _____
17. Give the symbol of the element that tends to form +2 ion and is in the 5th period. Ans. _____
18. Give the symbol of the element that has 3 valence electrons and its outershell is $n = 3$. Ans. _____
19. Give the symbol of the element that has the ground state electron configuration of $[\text{Kr}] 5s^2 4d^3$. Ans. _____
20. What is the preferred number of covalent bonds for P? Ans. _____
21. How many electrons does S^{2-} have? Ans. _____
- How many valence electrons does S^{2-} have? Ans. _____
22. Give the symbol of an anion that is isoelectronic with Mg^{2+} . As. _____
23. Which are the innershells of Ca? Ans. _____
24. Give the electron configuration of Ca^{2+} .

25. (6 pts) Give the definition of the following by completing the sentence:
An orbital is....

Ground state of an atom is...

The ionization energy of an atom is...

26. (3 pts) State the Octet Rule (as given in lecture):

27. (4 pts) Sketch the shapes of the orbitals:

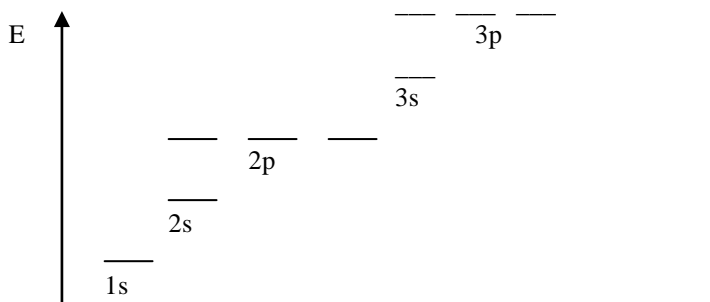
s orbital

p_x orbital

two different shapes of the d-orbitals

28. (11 pts)

a) Fill in the electrons for phosphorus in the E diagram below.



b) Give the full electron configuration for P.

c) Circle the valence electrons in BOTH the E diagram and the electron configuration for P above.

d) Give the electron configuration of JUST the valence electrons P.

e) Give the electron configuration of JUST the valence electrons of phosphide:

f) Give the Lewis structure of P.

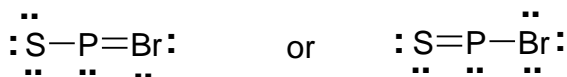
g) Give the Lewis structure of phosphide:

29. (1 pts) Give the electron configuration for As using the CORE METHOD.

30. (1 pts) Give the symbol of a cation that is isoelectronic to the chloride ion: _____

31. (2 pts) Give the electron dot symbol for sodium sulfide. Circle your final answer.

32. (2 pts) Examine the structures below. Which is more stable? Circle one.



33. (8 pts) The following questions involve PO_3^{3-} .

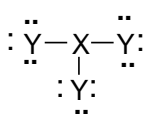
- Give its Lewis structure
- Draw a 3-dimensional sketch to show its molecular geometry →
- Name the molecular geometry: _____
- In your 3-D sketch above, draw in the bond dipoles (if any).
- Is the molecule polar or nonpolar? Circle one.

34. (8 pts) The following questions involve the N_2H_2 .

- Give its Lewis structure
- Draw a 3-dimensional sketch to show its molecular geometry →
- Name the molecular geometry at each N: _____
- In your 3-D sketch above, draw in the bond dipoles (if any).
- Is the molecule polar or nonpolar? Circle one.

35. (9 pts) Give the names and bond angles of the molecular geometry of the following.

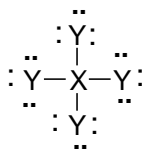
a)



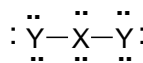
molecular geometry:

bond angle:

b)



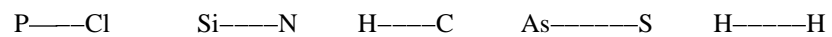
c)



X and Y have different electronegativities. State whether each molecule shown above is polar or nonpolar:

36. (2 pts) Why is PBr_5 expected to violate the Octet Rule?

37. (5 pts) Draw in the arrow, δ^+ and δ^- for each bond. If the bond is nonpolar say so.



BONUS POINT:

(1 pt) Make sure your full name is on every page, front and back.