

- Light Show Operators/Technicians  
Individuals specially trained to operate, program, service, and adjust light show lasers.

### Bibliography

*The Biographical Encyclopedia of Science and Technology*, Isaac Asimov; Doubleday and Co., Garden City, New York.

*The CRC Handbook of Chemistry and Physics*, 65<sup>th</sup> edition, Robert Weast, Editor; CRC Press, Boca Raton, Florida.

*Hawley's Condensed Chemical Dictionary*, 11<sup>th</sup> edition, Irving Sax & Richard Lewis, Sr., Editors; Van Nostrand Reinhold, New York, New York.

*The History of Physics*, Isaac Asimov; Walker and Co., New York, New York.

*The Merck Index*, 9<sup>th</sup> edition, Martha Windholz, Editor; Merck and Co., Rathway, New Jersey.

### Web Sites

[http://lasereye.net/laser\\_eye\\_surgery\\_hawaii\\_kw.htm#Laser%20Types](http://lasereye.net/laser_eye_surgery_hawaii_kw.htm#Laser%20Types)

[http://www.laserist.org/Laserist/showbasics\\_laser.html](http://www.laserist.org/Laserist/showbasics_laser.html)

## UNIT 2 SELF-QUIZ

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1. False: The term orbital refers to the volume of space an electron occupies near a nucleus.
2. True
3. True
4. True
5. False: The ground state electron configuration for all alkali metals shows that the highest energy electrons are in an *s* sublevel.
6. False: There are thought to be five *d* energy sublevels.
7. True
8. False: Schrödinger became famous by developing wave equation mathematics to describe electrons as wave functions.
9. True
10. True
11. False: VSEPR theory predicts that a central atom with three bonded atoms and one lone pair of electrons should have a pyramidal shape.
12. True
13. True
14. False: VSEPR and Lewis theories are complete enough to explain the structure and shape of the molecules in gaseous silane,  $\text{SiH}_{4(g)}$ , which is used as a doping agent in the manufacture of semiconductors for solid-state devices.
15. True
16. True
17. True
18. False: Ionic bonding involves three-dimensional structures with positive and negative ions attracting each other.
19. True
20. (a)
21. (b)
22. (c)
23. (a)
24. (a)
25. (a)
26. (c)
27. (d)
28. (b)
29. (d)
30. (b)

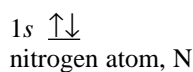
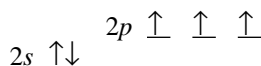
31. (b)
32. (a)
33. (b)
34. (c)
35. (a)
36. (c)
37. (b)
38. (c)
39. (a)
40. (d)

## UNIT 2 REVIEW

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### Understanding Concepts

1. When most alpha particles pass through the thin foil essentially unaffected, it indicates that somehow they are meeting negligible resistance; so most of the structure of the atoms they are hitting seems to be essentially empty space. When a very few alpha particles are very significantly deflected, it indicates that a tiny part of the structure of the target atoms must be relatively massive and positively charged.
2. (a) The electron was discovered as a result of the qualitative studies of cathode rays by Crookes and, in particular, by the quantitative studies of cathode rays by Thomson.  
(b) The proton was discovered as a result of the alpha particle scattering experiments by Rutherford and, in particular, by the studies of positive rays (hydrogen ions) in a cathode ray tube by Rutherford and Thomson.  
(c) The neutron was discovered as a result of radioactive decay studies by Soddy, mass spectrometer work by Aston, and, in particular, by bombarding elements with alpha particles by Chadwick.
3. (a) Atoms of an element may have different numbers of neutrons in their nuclei. These different nuclei therefore differ in mass; and, if a nucleus containing a given number of neutrons is unstable, that nucleus will be radioactive.  
(b) The term applied to such atoms is *isotope*.
4. Max Planck suggested that energy radiated from heat sources was quantized, meaning that it could not be any frequency at all, but must be a multiple of some smallest value. He could not form an equation to correctly predict the frequencies radiated without this supposition, even though it seemed completely illogical at the time.
5. Rutherford knew that a stationary electron would be attracted by, and pulled into, the positive nucleus of an atom. He thought the electrons would be orbiting just like the planets around the Sun.
6. Bohr knew that if electrons were travelling in orbits, they would be accelerating and therefore radiating electromagnetic energy constantly. This would mean that all atoms would collapse and this is not observed.
7. Bohr's First Postulate states (assumes) that electrons do not radiate energy as they orbit the nucleus because each orbit corresponds to a state of constant energy, called a stationary state.
8. Bohr's Second Postulate assumes that electrons may increase or decrease in energy only by undergoing a transition (jump) from one stationary state to another.
9. (a)



(b)

