

9/9. HW #2.

1. $\lambda = 0.333 \text{ nm}$ $r = 0.154$

$$n\lambda = 2\pi r$$

$$0.333n = 2\pi(0.154)$$

$$n = \frac{2\pi(0.154)}{0.333}$$

$$\underline{n = 3.00}$$

2. $L = \frac{n\lambda}{2}$ $L = 6$
 $n = 4$

$$2L = n\lambda$$

$$\lambda = \frac{2L}{n}$$

$$\lambda = \frac{2(6)}{4}$$

$$\underline{\lambda = 3 \text{ m.}}$$

3. $L = \frac{n\lambda}{2}$ $L = 1 \text{ m}$
 $n = 12$

$$2L = n\lambda$$

$$\lambda = \frac{2L}{n}$$

$$\lambda = \frac{2(1)}{12}$$

$$\underline{\lambda = \frac{1}{6} \text{ m.}}$$

4. \textcircled{B} 3s.

$l=0$ s orbital.



5. \textcircled{D} $n=3, l=0, m=0, s=-1/2$.



Dictates shape.

6. \textcircled{C} $n=5, l=1, m=-1, s=-1/2$.



P orbital / Dumbbell shape.

7. \textcircled{A} $n=4, l=-2, m=2, s=-1/2$.



Can't happen.

$l = 0, 1, 2, 3$ only.

8. (D) $n=2, l=2, m=-1, s=1/2$.

↓
If $l=2$, m should be 2 or -2.

9. $z=3, r=100, a_0=52.9$

$$\psi_{300} = \frac{1}{\sqrt{32\pi}} \left(\frac{3}{52.9} \right)^{3/2} \left(2 - \frac{3(100)}{52.9} \right) e^{-\frac{3(100)}{52.9}}$$

$$= -2.9 e^{-4}$$

$$R = 4\pi r^2 \psi^2$$

$$= 4\pi (100)^2 (-2.9 e^{-4})^2$$

$$= \underline{0.0105 \text{ } \mu\text{m}^{-1}}$$

10. $\psi_{100} = \frac{1}{\sqrt{\pi}} \left(\frac{1}{52.9} \right)^{3/2} e^{-100/52.9} = 2.21 e^{-4}$

$$R_1 = 4\pi (100)^2 (2.21 e^{-4})^2 = 0.006$$

$$\psi_{100} = \frac{1}{\sqrt{\pi}} \left(\frac{1}{52.9} \right)^{3/2} e^{-200/52.9} = 1.299 e^{-5}$$

$$R_2 = 4\pi (200)^2 (1.299 e^{-5})^2 = 1.32 e^{-4}$$

$$r_2 = 200 \text{ } \mu\text{m}$$

11.

A. C (4)
 B. Ta (2)
 C. As (5)
 D. Fe (2)
 E. Co (7)

(C) As.

12.

Mn atom.

(A) 2 unpaired

13.

Ground state Be atom.

(D) $n=2, l=1, m=0, s=1/2$

↓

p-orbital as there are 2 electrons.

14.

2 electrons.

15.

(A) B³⁺

16.

Should form 3 covalent bonds as it has 3 electrons species to form.



17. A. $Mn^{2+} \rightarrow 23. \times$

B. $V^{5+} \rightarrow 18 \checkmark$

C. $Co^{2+} \rightarrow 25 \times$

D. $Cd^{2+} \rightarrow 46 \times$

E. $Os^{4+} \rightarrow 72 \times$

18. Selenium.

$n=4, l=1, m=1, s=1/2.$

e^- .