Full Name: February 22, 2023

0.1 Indicate the number of orbitals that can have the following designations: (a) 1d (b) $n = 1$ (c) 3d (d) 4f

0.2 Indicate the number of orbitals that can have the following designations: (a) 2s (b) 3p (c) 0p (d) $n = 4$

0.3 What is the element with the electron configuration (a) $1s^2 2s^2 2p^6 3s^2$ (b) $1s^2 2s^2 2p^6 3s^2 3p^4$ (c) $[Kr]5s^2 4d^8$

0.4 What is the element with the electron configuration (a) $1s^2 2s^2 2p^6 3s^1$ (b) $[Ar]3d^5 4s^1$ (c) $1s^2 2s^2 2p^6 3s^1$ (d) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$

0.5 Among the elements, indicate the element with the smallest atomic radius (a) C (b) N (c) O (d) S (e) Se

0.6 Among the elements, indicate the element with the largest atomic radius (a) B (b) C (c) F (d) Li (e) Na

0.7 Among the elements, indicate the element with the largest electronegativity (a) Si (b) P (c) S (d) Se

0.8 Among the elements, indicate the element with the largest electronegativity (a) B (b) C (c) F (d) Li

0.9 Among the elements, indicate the element with the largest ionization energy (a) Al (b) Si (c) P (d) As (e) Sb

0.14 Indicate if the following combination of quantum numbers are allowed:

n	ℓ	m_ℓ	m_s	**Allowed?**
4	4	1	$+^1/_2$	
2	1	4	$+^1/_2$	
4	2	-2	$-^1/_2$	

0.15 Use the Bohr equation to: (a) find the energy of the photon emitted when an H atom undergoes a transition from $n = 1$ to $n = 4$. (b) find the wavelength (in nm) of the photon emitted when an H atom undergoes a transition from $n = 2$ to $n = 4$.

0.16 Which of these electron transitions correspond to absorption of energy and which to emission?

(a) $\Delta E_{1\to2}$

(b) $\Delta E_{2\to1}$

(c) $\Delta E_{3\to1}$

(d) $\Delta E_{3\to5}$

(e) $\Delta E_{5\to3}$

(f) $\Delta E_{1\to3}$

0.10 Among the elements, indicate the element with the smallest ionization energy (a) B (b) C (c) F (d) Li (e) Na

0.11 Among the elements, indicate the element with the largest metallic character (a) K (b) Rb (c) Cs (d) Ca

0.12 Among the elements, indicate the element with the largest metallic character (a) B (b) C (c) F (d) Li (e) Na

0.13 For each of the following sublevels, give the values of the n and ℓ quantum numbers and indicate the number of orbitals in the sublevel: (a) 6s (b) 4d (c) 2p

0.17 An electron in the lowest energy level of H atom absorbs a photon of wavelength 96.97 nm. Indicate the final energy level of the electron moved.

0.18 Use the Bohr equation to find the frequency (in Hz) of the photon emitted when an H atom undergoes a transition from $n = 1$ to $n = 5$.

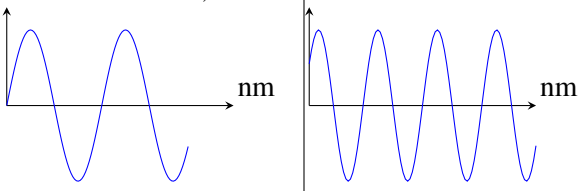
0.19 Calculate the following properties: (a) The wavelength of a radiation with energy 5.34×10^{-16}J? (b) The wavelength of a radiation with frequency of 3.4×10^{14} Hz?

0.20 Calculate the following properties: (a) The energy in joules of a radiation with frequency 2.0×10^{18} Hz? (b) The frequency of a radiation with energy 5.6×10^{-20} J? (c) The energy in joules of a radiation with wavelength 653 nm?

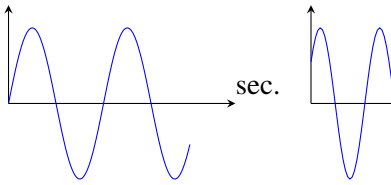
0.21 Classify the nature of a radiation (a) A radiation with γ= 3.4×10^{8}Hz (b) A radiation with λ= 1×10^{-4}nm

0.22 Calculate the following properties: (a) The color of a radiation with λ= 510nm. (b) Indicate the color of a radiation with λ= 580nm.

0.23 Sections of two electromagnetic waves A and B are represented below. Rank them in order of (a) increasing wavelength; (b) increasing energy; (c) If wave B represents visible radiation, is wave A more likely to be IR or UV radiation?



0.24 Sections of two electromagnetic waves A and B are represented below. Rank them in order of (a) increasing frequency; (b) increasing energy; (c) If wave B represents visible radiation, is wave A more likely to be IR or UV radiation?



Answers v. 60 **0.1** (a) 0 orbital (b) 1 orbitals (c) 5 orbital (d) 7 orbital **0.2** (a) 1 orbital (b) 3 orbitals (c) 0 orbital (d) 16 orbitals **0.3** (a) Cl (b) S (c) Pd **0.4** (a) Na (b) Cr (c) Na (d) Ti **0.5** O **0.6** Na **0.7** S **0.8** F **0.9** P **0.10** Na **0.11** Cs **0.12** Li **0.13** (a) 6s ($n = 6; \ell = 0$) (b) 4d ($n = 4; \ell = 2$) (c) 2p ($n = 2; \ell = 1$) **0.14** (a) n=4 ; ℓ=4 ; m_ℓ=1 ; m_s=$+^1/_2$; Allowed=no (b) n=2 ; ℓ=1 ; m_ℓ=4 ; m_s=$+^1/_2$; Allowed=no (c) n=4 ; ℓ=2 ; m_ℓ=-2 ; m_s=$-^1/_2$;Allowed=yes **0.15** (a) 2.04×10^{-18} J (b) 485 nm **0.16** (a) Absorption (b) Emission (c) Emission (d) Absorption (e) Emission (f) Absorption **0.17** $n = 5$ **0.18** 3.16×10^{15} Hz **0.19** (a) 0.37 nm (b) 882 nm **0.20** (a) 1.32×10^{-15}J (b) 8.5×10^{13}Hz (c) 3.03×10^{-19}J **0.21** (a) Microwaves (b) Gamma **0.22** (a) Green (b) Yellow **0.23** (a) λ_B<λ_A (b) E_A<E_B (c) UV **0.24** (a) γ_A<γ_B (b) E_A<E_B (c) IR