

1. Which of the following samples contains the greatest mass?

- A) 1.5 mol of C B) 3×10^{23} V atoms C) 1 mol of P D) 3 mol of Li E) 6×10^{23} F atoms

2. Which of the following samples contains the least number of atoms?

- A) 1.5 mol of Li B) 28 g of N C) 80 g of Br D) 27 g of Be E) 0.5 mol of Kr

3. When two like charges interact, which of the following gives the highest energy?

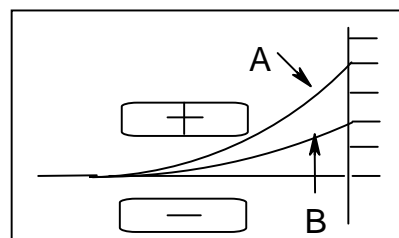
- A) large charges close together
B) large charges far apart
C) small charges close together
D) small charges far apart

4. Which subatomic particles are in the nucleus?

- A) protons and electrons B) protons and neutrons C) electrons and neutrons
D) protons only E) electrons only

5. The paths of particle A and particle B as they move through an electric field are shown at the right. Which of the following statements could be true about A and B?

- A) if of equal charges, the mass of A is twice the mass of B
B) if of equal masses, the charge of A is twice the charge of B
C) both of these statements could be true
D) neither of these statements could be true



6. The Thomson cathode ray experiment:

- A) measured the mass of the electron
B) measured the charge of the electron
C) showed the existence of quantized energy levels
D) showed the presence of a nucleus in an atom
E) none of the above

7. What is the symbol of the isotope that contains 22 protons, 26 neutrons and 20 electrons?

- A) $^{48}\text{Ti}^{2-}$ B) $^{48}\text{Cd}^{2+}$ C) $^{22}\text{Ti}^{2+}$ D) $^{22}\text{Cd}^{2-}$ E) None of these

8. (6 each) Consider the following transitions in the Bohr model of the atom:

- A) $n = 4 \rightarrow n = 6$ B) $n = 6 \rightarrow n = 3$ C) $n = 3 \rightarrow n = 5$ D) $n = 2 \rightarrow n = 1$

Which corresponds to the absorption process of greatest energy?

9. Blue light has a greater frequency than red light. It also has:

- A) a greater energy and a greater wavelength
B) a greater energy and a smaller wavelength
C) a smaller energy and a smaller wavelength
D) a smaller energy and a greater wavelength

10. What is the highest occupied orbital in a Ta atom?

- A) 3d B) 4d C) 5d D) 6s E) 6p

11. How many unpaired electrons are present in a Se atom?

- A) 1 B) 2 C) 3 D) 4 E) 0

12. Which statement below best describes what is meant by the phrase “atomic energy levels are quantized”?
- A) They have non-zero values
 - B) They occur only at certain discrete energies rather than being continuous
 - C) The energy levels should be thought of as photons
 - D) They are evenly spaced
 - E) The energies have a unit (most commonly Joules)
13. Which of the following statements about levels and sublevels is correct?
- A) The $n=3$ level contains two sublevels
 - B) The $2s$ sublevel contains two orbitals
 - C) The $4p$ sublevel can contain up to six electrons
 - D) The $3d$ sublevel contains ten orbitals
 - E) The $n=3$ level contains six orbitals
14. Which of the following atoms has the greatest ionization energy?
- A) Al B) As C) Mg D) S E) Sr
15. Quantum Theory differs from the Bohr model in that:
- A) Only quantum theory explains the emission spectrum of the hydrogen atom
 - B) Only quantum theory treats electrons as waves
 - C) Only quantum theory has different energy levels for different modes of motion
 - D) Only quantum theory models the atom as a hard sphere
 - E) Only quantum theory treats the motion of protons

PLACE YOUR ANSWERS FOR #16-20 DIRECTLY ON THIS PAPER

16. (4 points each) Provide names for the following compounds:

a) SrS _____

b) Cr_2O_3 _____

17. (4 points each) Provide chemical formulas for the following compounds:

a) potassium nitride _____ b) tin(IV) bromide _____

18. (4 points each) In each pair, circle the lower energy orbital

3s on Mg OR 3s on S 5s on Sr OR 4d on Sr 4s on Ca OR 4p on Br

19. (5 points each) Write the valence electron configurations of

a Ge atom _____ an Fe atom _____

20. (12 points) SET UP the following calculations, showing the conversion factor(s) you would use. You do NOT need to calculate an answer. You will be graded on your set-up.
How many individual atoms are in 12.8 g of Si?