

1. What is the net static electric charge on a metal sphere having an excess of +3 elementary charges?

- A.  $4.7 \times 10$
- B.  $8.4 \times 10$
- C.  $4.8 \times 10$
- D.  $8.7 \times 10^{19} \text{ C}$

2. A hydrogen atom could have an electron energy level transition from  $n=2$  to  $n=3$  by absorbing a photon having an energy of?

- A. 1.89 eV
- B. 2.04 eV
- C. 2.25 eV
- D. 2.87 eV

3. Two solid metal blocks are placed in an insulated container. If there is a net flow of heat between the blocks, they must have different?

- A. Initial temperatures
- B. Specific Heat values
- C. Melting points
- D. Heats of fusion

4. A (P type) semiconductor is formed by adding impurities, which provide extra \_\_\_\_\_.

- A. Electrons
- B. Neutrons
- C. Photons
- D. Holes

5. A student measures a current of .05 ampere through a P type semiconductor. If the battery connections are reversed, the current through the semiconductor will be?

- A. Less than .05 ampere
- B. Greater than .05 ampere
- C. The same

6. What is the approximate bind energy of a helium nucleus that has a mass defect of  $5.2 \times 10^{-29}$  kilogram?

- A.  $4.6 \times 10$
- B.  $4.6 \times 10$
- C.  $4.7 \times 10$
- D.  $4.7 \times 10^{-18}$

7. Which particle cannot be accelerated by a cyclotron?

- A. Proton
- B. Neutron
- C. Electron

D. Alpha particle

8. A 96 gram sample of a radioactive nuclide is placed in a container. After 12 minutes only 6 grams of the sample has not yet decayed. What is the half life of the nuclide?

A. 3 minutes

B. 4 minutes

C. 5 minutes

D. 6 minutes

9. The principal reason for using neutrons to bombard a nucleus is that neutrons?

A. Have a relatively low atomic mass

B. Can be easily accelerated

C. Have a very high kinetic energy

D. Are not repelled by the nucleus

10. What is the magnitude of the gravitational force between an electron and a proton separated by a distance of  $1.0 \times 10^{-10}$  meter?

A.  $1.0 \times 10$

B.  $1.0 \times 10$

C.  $2.0 \times 10$

D.  $3.05 \times 10^{-47}$  N

11. A sphere has a net excess charge of  $-4.8 \times 10^{-19}$  coulomb. The sphere must have an excess of \_\_\_\_\_.

- A. 1 Electron
- B. 1 Proton
- C. 3 Electrons
- D. 3 Protons

12. An excited hydrogen atom returns to its ground state. A possible energy change for the atom is?

- A. Loss of 10.20 eV
- B. Gain of 10.20 eV
- C. Loss of 11.70 eV
- D. Gain of 11.70 eV

13. During a collision between a proton and an electron there is conservation of \_\_\_\_\_.

- A. Energy, only
- B. Momentum, only
- C. Energy and Momentum
- D. Neither Energy or Momentum

14. As the temperature of a surface increases, how does the rate of thermionic emission change?

- A. Electrons are emitted at a lower rate.
- B. Electrons are emitted at a higher rate.
- C. Protons are emitted at a lower rate.

D. Protons are emitted at a higher rate.

Answer Key

1. C

2. A

3. A

4. D

5. B

6. C

7. B

8. A

9. D

10. B

11. C

12. A

13. C

14. B