Exam consists of 13 questions (26 points total)
Answer all questions
Time allowed is one hour only
Answer Form

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Total Score /26

**Good Luck**
1. A term that relates to how well a particular measurement is able to be repeated by a measuring device is:
   a) qualitative
   b) precision
   c) phase
   d) accuracy
   e) quantitative

2. Do the following calculations \[155.3 + 2.53 \times 4.8\] and give the proper significant figures:
   a) 167
   b) 167.4
   c) 167.44
   d) 167.444
   e) 167.0

3. Which of the following atoms is the smallest?
   a) As
   b) Ge
   c) P
   d) Se
   e) S

4. The formula for aluminum nitride is:
   a) \(\text{Al}_3\text{N}_4\)
   b) \(\text{Al}_4\text{N}_3\)
   c) \(\text{Al}_2\text{N}_3\)
   d) \(\text{AlN}\)
   e) \(\text{Al}_3\text{N}_2\)

5. A compound is composed of 68.4\% Cr (At. Mass = 52.0) and 31.6\% O (atomic mass = 16.0). What is the empirical formula of the compound?
   a) \(\text{Cr}_2\text{O}_3\)
   b) \(\text{CrO}_2\)
   c) \(\text{Cr}_2\text{O}_5\)
   d) \(\text{Cr}_3\text{O}_2\)
   e) \(\text{Cr}_3\text{O}_4\)

6. The electronic configuration for \(\text{Cu}^+\) ion (Cu; atomic number 29) is:
   a) \(\text{[Ar]}3d^94s^1\)
   b) \(\text{[Ar]}3d^84s^2\)
   c) \(\text{[Ar]}3d^{10}4s^0\)
   d) \(1s^22s^22p^63s^23p^64s^13d^9\)
   e) \(1s^22s^22p^63s^23p^64s^23d^8\)
7. The wavelength (in nm) associated with a photon energy of $4.36 \times 10^{-18}$ Joules is:

a) 362 nm  

b) 1.83 nm  

c) 127 nm  

d) 45.6 nm  

e) 21.6 nm

8. For the electron transition from the $n = 2$ to the $n = 4$ quantum state in Bohr's model of the hydrogen atom, what is the wavelength (in nm) of the associated photon?

a) 409  

b) 617  

c) 486  

d) 325  

e) 233

9. Which of the following is not an allowed set of quantum numbers for an electron in an atom?

a) $n = 3, l = 3, m_l = -2, m_s = \frac{1}{2}$  

b) $n = 4, l = 3, m_l = -3, m_s = \frac{1}{2}$  

c) $n = 2, l = 0, m_l = 0, m_s = -\frac{1}{2}$  

d) $n = 3, l = 2, m_l = -1, m_s = \frac{1}{2}$  

e) $n = 3, l = 0, m_l = 0, m_s = \frac{1}{2}$

10. Calculate the percentage yield of CH$_3$OH when 68.5 kg CO is reacted with 8.60 kg H$_2$ to yield 3.57 x $10^4$ g of CH$_3$OH, in the reaction $2H_2(g) + CO(g) \rightarrow CH_3OH(l)$?

a) 34.2%  

b) 55.1%  

c) 52.0%  

d) 32.7%  

e) 66.0%

11. The number of protons, neutrons, and electrons in $^{23}X^+$ (atomic number = 11) is?

a) 11, 12, and 10  

b) 11, 12, and 11  

c) 10, 12, and 11  

d) 11, 10, and 12  

e) 12, 10, and 11

12. What is the percentage of nitrogen by mass in ammonium nitrate (NH$_4$NO$_3$)? (Atomic masses: H = 1.10; N = 14.01; O = 16)

a) 43.8%  

b) 35.4%  

c) 17.5%  

d) 42.9%  

e) 35.0%
13. What is the designation for the electron subshell with principle quantum number = 4 and azimuthal quantum number = 3; the number of orbitals in this subshell; and the total electrons it can hold:

a) 3d; 5 orbitals; 10 electrons
b) 3s; 1 orbital; 2 electrons
c) 3p; 3 orbitals; 6 electrons
d) 4f; 7 orbitals; 14 electrons
e) 4p; 3 orbitals; 6 electrons

Constants, etc.
c (speed of light) = 3 × 10^8 m/s
h (Planck's constant) = 6.63 × 10^-34 Js
R_H (Rydberg constant) = 2.18 × 10^-18 J
(Note: this is also known as 'A' or Bohr's constant relating electron energies in the Hydrogen atom)
Mass of electron: 9.11 × 10^-31 kg
1 Joule = 1 kg m^2 s^-2