Chemistry 3A – Fall 2025

Sections 43957-43958

Midterm Examination #1

There are 30 questions. All questions have **five** multiple choice responses. Select the **BEST** response for the question. With questions involving numbers, significant digits and decimal places must be considered.

1. Electrons have a set of quantum numbers that give them an identity or uniqueness in the atom. How many quantum numbers can they have?
   (a) 1 (b) 2 (c) 3 (d) 4 (e) none of the above

2. Which quantum number of an electron best represents the energy of the electron?
   (a) n (b) l (c) m_l (d) m_s (e) **Z**

3. One of the quantum numbers of an electron is represented as a geometric shape in a 3-dimensional coordinate system (x, y, z). Which quantum number is that?
   (a) n (b) l (c) m_l (d) m_s (e) **Z**

4. The quantum number l has values that range from 0 to 3, and are represented as letters in electron configurations of the atoms of the elements of the periodic table. Which letter represents the $l = 2$ value?
   (a) ***s*** (b) ***d*** (c) ***z*** (d) ***f*** (e) ***p***

5. An orbital can hold how many electrons maximally?
   (a) 1 (b) 2 (c) 3 (d) 5 (e) 14

6. How many orbitals of *p*-type electrons are available in an electron configuration?
   (a) 1 (b) 2 (c) 3 (d) 5 (e) 7

7. Which of the following is true about the element bromine?
   (a) It is a member of the *p*-block of elements (b) It is a Group 17 element
   (c) It is a non-metal (d) all of the above (e) none of the above

8. How would the number **0.**001849 be expressed in scientific notation?
   (a) 1.849×10^{3} (b) 1.849×10^{-3} (c) 1.849×10^{6} (d) 1.849×10^{-6} (e) none of choices *a-d*

9. Which number in standard notation properly expresses $\mathbf{3.40700 \times 10^{3}}$?
   (a) 3407 (b) 3407.0 (c) 3407.00 (d) 0.003407 (e) none of choices ***a-d***

10. The velocity of a car is **13.4 m/s** (meters per second). If 1 mile = 1.61 km, which choice below is most close to car's velocity in miles per hour (mi/h, or mph)?
    (a) 15 mi/h (b) 20 mi/h (c) 25 mi/h (d) 30 mi/h (e) 60 mi/h

11. Which of these states that an electron in an atom cannot have an identical set of the quantum numbers n, l, m_l, and m_s?
    (a) Hund's Rule (b) the Bohr model (c) the Aufbau Principle
    (d) the Pauli Exclusion Principle (e) the "plum pudding" model

12. One liter (1 L) is how many microliters (μL)?
(a) 10^3 μL (b) 10^{-3} μL (c) 10^6 μL (d) 10^{-6} μL (e) 10^{-9} μL

13. The density of an object having a mass of 30.72 g is 6.83 g/mL. What is the volume that it should have?
a) 0.222 mL (b) 4.50 mL (c) 210 mL (d) 23.9 mL (e) 37.6 mL

14. The scientific method includes a stage where a tentative explanation is given to account for a set of related observations. What is that stage?
(a) observations (b) hypothesis (c) theory (d) experimentation (e) the Bohr model

15. Which of these subatomic particles is **NOT** found in the nucleus of the atom?
(a) proton (b) neutron (c) electron (d) all of choice (a)-(c) (e) none of choices (a)-(c)

16. Which of these elements is a member of the Alkaline Earth metals?
(a) potassium (K) (b) chlorine (Cl) (c) aluminum (Al)
(d) magnesium (Mg) (e) none of choices (a)-(d)

17. An isotope of cobalt has a mass number of 60. Which of the following is the correct atomic notation for this isotope?
(a) $^{60}_{27}\mathrm{Co}$ (b) $^{27}_{60}\mathrm{Co}$ (c) $^{23}_{27}\mathrm{Co}$ (d) $^{27}_{23}\mathrm{Co}$ (e) none of choices (a)-(d)

18. What is a true statement regarding an element in the Periodic Table?
(a) the number of protons in its nucleus can be used to name the element
(b) the atomic number (**Z** value) indicates the number of protons it has
(c) the mass number (A value) indicates the number of neutrons it has
(d) choices (a) and (b) are true (e) none of choices (a)-(d) are true

19. Which of these formulas would be correct for **iron(III) chloride**?
(a) $FeCl_2$ (b) $FeCl_3$ (c) Fe_2Cl (d) FeCl (e) Fe_2Cl_2

20. The label on the bottle has the formula $Ca(NO_3)_2$. Its name is ___
(a) cobalt fluoride (b) calcium nitroxide (c) calcium nitrate
(d) calcium oxide (e) kryptonite

21. You need to separate two alcohols which have different boiling points. What laboratory setup process would you choose?
(a) condensation (b) chromatography (c) solvent extraction
(d) distillation (e) none of choices (a)-(d) is correct

22. The distance between two points in a wave, such as crest-to-crest distance is termed:
(a) wave speed (b) frequency (c) wavelength (d) amplitude (e) none of choices (a)-(d)

23. What term describes the electron in its natural state, its lowest energy level?
(a) emission (b) excited state (c) absorption (d) ground state (e) nucleated

24. Isotope ^{69}Ga has atomic mass 68.93 amu with relative abundance 60.10% and ^{71}Ga has atomic mass 70.92 amu with relative abundance 39.90%. Which value below represents the average atomic mass ("atomic weight") of element gallium?
(a) 69.93 amu (b) 69.72 amu (c) 139.85 amu (d) 69 amu (e) 71 amu

25. How many significant digits does the number 2.800120×10^5 have?
(a) 2 (b) 5 (c) 6 (d) 7 (e) none of choices (a)-(d)

26. When you complete the operation on the expression 26.009 – 2.4770 – 15.4, how many digits after the decimal point will it have? (this is decimal places question)
(a) 0 (b) 1 (c) 3 (d) 4 (e) none of choices (a)-(d)

27. What is the atomic number (Z) of the element beryllium?
(a) 1 (b) 3 (c) 4 (d) 34 (e) 57

28. Which of these is a polyatomic ion?
(a) Ne (b) H^+ (c) SO_4^{2-} (d) Br^- (e) SiO_4

29. Which of these is the electron configuration for the hydrogen atom?
(a) $1s^1$ (b) $1s^2$ (c) $1s^22s^1$ (d) $1s^22p^1$ (e)

30. Each division mark on a 100 mL graduated cylinder in 1 mL. What is the precision of any reading (measurement) of the graduated cylinder?
(a) 10 mL (b) 1 mL (c) 0.1 mL (d) 0.01 mL (e) not enough information to answer