You will have 50 minutes to complete the test. Follow the instructions carefully.

The answers to the multiple choice questions must be filled out on the answer sheet provided using a #2 pencil. Write your name on this test AND on the answer sheet. You will lose 1 point for failing to put your name on each item.

You will receive one point for each correct answer, and zero points for incorrect answers or blank answers.

You may use a calculator, but no books, notes or other information may be used.

A periodic table and table of atomic masses is available.

You may write on this test.

Turn in both test and MC sheet.

Below are some useful relationships—not all will be used.

\[ T_K = T_C + 273.15 \quad T_F = T_C \left( \frac{9}{5}^\circ F \right) + 32^\circ F \]

\[ D = \frac{m}{V} \]

\[ R = 8.314 \text{ J/(K-mol)} \]

\[ 1 \text{ amu} = 1.66054 \times 10^{-27} \text{ kg} \]

\[ N_A = 6.022 \times 10^{23} \text{ mol}^{-1} \]

\[ 1 \text{ ft} = 12 \text{ in}^* \]

\[ 1 \text{ in} = 2.54 \text{ cm}^* \]

\[ 1 \text{ yd} = 3 \text{ ft}^* \]

\[ 39.4 \text{ in} = 1 \text{ m} \]

\[ 1 \text{ mile} = 5280 \text{ feet}^* \]

\[ 1 \text{ mL} = 1 \text{ cm}^3^* \]

\[ 1 \text{ lb} = 16 \text{ oz}^* \]

\[ 1 \text{ qt} = 946 \text{ mL} \]

\[ 1 \text{ lb} = 454 \text{ g} \]

\[ 1 \text{ hr} = 60 \text{ min}^* \]

\[ 1 \text{ min} = 60 \text{ sec}^* \]

*these factors are exact

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Total Points: \[ \frac{13}{10} \]

Review Sheet: \[ \frac{13}{15} \]

Grade: \[ \frac{62}{80} \]
MULTIPLE CHOICE QUESTIONS

Mark the correct (best) answer on the score sheet provided.

1. Which of the following is not an underlying assumption of the scientific method?
   A) Creation can be understood by humans.
   B) Humans are fallible.
   C) There is order in creation.
   D) Creation is real, it exists.

2. When natural phenomena are examined, an explanation supported by experiments is termed a(n) ________.
   A) observation.
   B) hypothesis.
   C) experiment.
   D) theory.

3. How many centimeters are there in 57.0 in.?
   A) 22 cm
   B) 145 cm
   C) 140 cm
   D) 22.4 cm

4. Which of the following is the basic unit of volume in the metric system?
   A) liter
   B) kilogram
   C) meter
   D) gram

5. The measurement 0.00000043 m, expressed correctly using scientific notation, is
   A) 4.3 x 10^{-7} m.
   B) 4.3 x 10^{-6} m.
   C) 4.3 x 10^{-5} m.
   D) 0.43 x 10^{-3} m.
   E) 4.3 m.

6. Which of the following numbers is the largest?
   A) 2.05 x 10^3
   B) 2.05 x 10^{-12}
   C) 2.05 x 10^1
   D) 2.05 x 10^3
   E) 2.05 x 10^3

7. Which of the following measurements has three significant figures?
   A) 0.005 m
   B) 510 m
   C) 0.510 m
   D) 0.051 m

8. A salt solution has a concentration of 0.43 g/L. What is the concentration in units of mg/μL?
   A) 4.3 x 10^{-4} mg/μL
   B) 0.43 mg/μL
   C) 430 mg/μL
   D) 4.3 x 10^5 mg/μL

9. How many significant figures are in the number 0.00208?
   A) six
   B) two
   C) three
   D) four

10. Which of the following masses is the smallest?
    A) 8.7 x 10^{-3} mg
    B) 6.9 x 10^{-2} g
    C) 5.5 g
    D) 2.3 x 10^{-3} kg

11. The correct answer for the addition of 7.5 g + 2.26 g + 1.311 g + 0.2 g is
    A) 13.071 g.
    B) 13 g.
    C) 13.0 g.
    D) 10 g.

12. Which of the following measurements are NOT equivalent?
    A) 25 mg = 0.025 g
    B) 150 sec = 0.150 ksec
    C) 84 cm = 8.4 mm
    D) 240 μL = 0.24 mL

13. Which of the answers for the following conversions contains the correct number of significant figures?
    A) 2.543 m x \frac{39.4 \text{ in}}{1 \text{ m}} = 100.1942 \text{ in}
    B) 2 L x \frac{1.06 \text{ qt}}{1 \text{ L}} = 2.12 \text{ qt}
    C) 24.95 min x \frac{1 \text{ hr}}{60 \text{ min}} = 0.4158 \text{ hr}
    D) 12.0 ft x \frac{12 \text{ in}}{1 \text{ ft}} x \frac{2.54 \text{ cm}}{1 \text{ in}} = 3.7 x 10^2 \text{ cm}
14. Which of the following setups would convert centimeters to feet?

A) \(80 \text{ cm} \times \frac{2.54 \text{ in.}}{1 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}\)

B) \(80 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}\)

C) \(80 \text{ cm} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{1 \text{ ft}}{12 \text{ in.}}\)

D) \(80 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}\)

15. Carrots are $0.79 per pound. What is the cost of 1.2 kg of carrots?

A) $2.09
B) $0.43
C) $1.45
D) $0.79

16. A doctor's order is 0.125 g of ampicillin. The liquid suspension on hand contains 250 mg/5.0 mL. How many milliliters of the suspension are required?

A) 3.0 mL
B) 2.5 mL
C) 6.3 mL
D) 0.0063 mL

17. What is the mass of 53 mL of ethanol, which has a density of 0.79 g/mL?

A) 67.1 g
B) 42 g
C) 67 g
D) 53 g

18. What is the density of the solid object that is weighed and submerged in water?

A) 0.56 g/mL
B) 0.45 g/mL
C) 1.8 g/mL
D) 0.36 g/mL

19. The temperature of liquid nitrogen is \(-196^\circ\text{C}\). What is the corresponding reading on the Kelvin scale?

A) 77 K
B) 127 K
C) 91 K
D) 321 K

20. Absolute zero is

A) the freezing point of water using the Celsius scale.
B) the boiling point of liquid nitrogen.
C) the temperature on the Kelvin scale corresponding to 32°F.
D) the coldest temperature possible, \(-273^\circ\text{C}\).

21. Which of the following is a characteristic of the modern periodic table?

A) A group is a horizontal row on the periodic table.
B) A period is a column on the periodic table.
C) The elements in each group have similar chemical properties.
D) Metals are found on the right side of the table.

22. Which of the following elements is a noble gas?

A) oxygen
B) chlorine
C) argon
D) nitrogen

23. The smallest particle of an element that retains the characteristics of the element is a(n)

A) electron.
B) proton.
C) atom.
D) nucleus.

24. According to the Atomic Theory,

A) all atoms are different.
B) atoms are neither created nor destroyed during a chemical reaction.
C) atoms of the same element combine to form compounds.
D) a compound can contain different numbers of atoms as long as it has the same kinds of atoms.
25. What is the mass number of an atom of potassium that has 20 neutrons?
   A) 15  
   B) 19  
   C) 35  
   D) 89

26. Which of the following gives the correct numbers of protons, neutrons, and electrons in a neutral atom of $^{118}_{50}$Sn?
   A) 118 protons, 50 neutrons, 118 electrons  
   B) 118 protons, 118 neutrons, 50 electrons  
   C) 50 protons, 68 neutrons, 50 electrons  
   D) 68 protons, 50 neutrons, 68 electrons

27. The correct symbol for the isotope of sulfur with 18 neutrons is:
   A) $^{18}_{16}$S  
   B) $^{16}_{18}$S  
   C) $^{34}_{18}$S  
   D) $^{34}_{16}$S

28. Which of the following is a pair of isotopes?
   A) $^{36}_{18}$Ar and $^{40}_{18}$Ar  
   B) $^{23}_{11}$Na and $^{23}_{11}$Na$^+$  
   C) $^1$H and $^4$He  
   D) $^{14}_{6}$C and $^{14}_{7}$N

29. The atomic mass of Cs is
   A) 140.1 amu  
   B) 12.01 amu  
   C) 132.9 amu  
   D) 12.01 + 32.07 = 44.08 amu

30. Energy can enter or leave an atom in the form of:
   A) photons of electromagnetic radiation  
   B) radio waves  
   C) ionized electrons  
   D) kinetic energy

31. Electrons in an atom are found in regions of space called:
   A) energy levels  
   B) the nucleus  
   C) chemical bonds  
   D) atomic orbitals

32. The number of valence electrons in a neutral atom of boron (atomic number 5) is
   A) 2.  
   B) 3.  
   C) 5.  
   D) 8.

33. What is the electron configuration for aluminum?
   A) $1s^22s^22p^63s^23p^3$  
   B) $1s^22s^2(2p)^63p^3$  
   C) $1s^22s^22p^63s^23p^3$  
   D) $1s^22s^22p^63s^33p^3$

34. What is the element with the abbreviated electron configuration [Kr]5s$^2$4d$^8$?
   A) Ni  
   B) Pd  
   C) Pt  
   D) Kr

35. Which of the following is the lowest energy valence electron state for Si?
   A)  
   B)  
   C)  
   D)  

36. Which of the following is an acceptable electron-dot structure for carbon?
   A)  
   B)  
   C)  
   D) all of the above

37. Valence electrons are electrons located
   A) in the outermost energy level of an atom.  
   B) in the nucleus of an atom.  
   C) in the innermost energy level of an atom.  
   D) throughout the atom.
38. In an electron-dot structure of an element, the dots are used to represent
   A) all of the electrons in the atom.
   B) the valence electrons.
   C) only the electrons that will participate in bond formation.
   D) the electrons that the element will gain when it forms a compound.

39. Which of the following processes illustrates ionization energy?
   A) H₂(g) → 2H(g)
   B) Na⁺ + e⁻ → Na
   C) Na⁺ + Cl⁻ → NaCl
   D) Ar(g) → Ar⁺(g) + e⁻

40. In ionic compounds, _________ lose their valence electrons to form positively charged _________.
   A) metals; anions
   B) nonmetals; cations
   C) nonmetals; anions
   D) metals; cations

41. Sulfur is most likely to form which of the following ions?
   A) S⁻¹
   B) S⁻²
   C) S⁺²
   D) S⁺⁶

42. Which of the following ions is not possible?
   A) Na⁺
   B) Cu⁺²
   C) N⁻³
   D) I⁻

43. The correct formula for an ionic compound made from Li and O is:
   A) Li₂O
   B) Li₂O
   C) Li₂O₂
   D) Li₂O₂

44. Which one of the following compounds contains an ion with a 3+ charge?
   A) KCl
   B) Na₃O
   C) FeCl₃
   D) CuO

45. What is the correct formula for cobalt (III) sulfide?
   A) Co₂S₂
   B) Co₂S
   C) CoS₂
   D) Co₂S₃

46. What is the correct name for SnCl₂?
   A) tin chloride
   B) tin(I) chloride
   C) tin(II) chloride
   D) tin dichloride

47. The name of Al₂(SO₄)₃ is
   A) aluminum(III) sulfate.
   B) dialuminum sulfate.
   C) dialuminum trisulfide.
   D) aluminum sulfate.

48. Sodium cyanide has the formula:
   A) Na₂CO₃
   B) NaNO₃
   C) NaCN
   D) NaClO₂

49. Which of the following formulas for lead compounds is incorrect?
   A) PbO₂
   B) Pb(NO₃)₂
   C) PbCl₄
   D) PbPO₄

50. NH₄NO₃ is called:
   A) tetrahydrornitrogen nitrate
   B) ammonium nitrate
   C) hydrogen nitride oxide
   D) ammonia nitrite