Chemistry M11/M12/M1A Diagnostic Test

Directions: Select the correct answer choice for each of the questions below. You will need a calculator for certain questions. Then check your exam with the answers provided as a separate link on the department website.

1. Evaluate the following: –4 – (–3)

   A. –1
   B. 1
   C. 7
   D. –7
   E. 12

2. Evaluate the following: $\frac{-4-2}{4-1}$

   A. –2
   B. 2
   C. 1
   D. –10
   E. 5

3. Solve for x in the following equation: 3x – 5 = 7

   A. –2
   B. 3
   C. –4
   D. 4
   E. 6

4. Solve for x in the following equation: 2x – (4 + 5x) = 14

   A. 4
   B. –6
   C. 1
   D. –1
   E. –3

5. Evaluate the following: $4^3 + 3^2$

   A. 18
   B. 73
   C. 21
   D. 108
   E. 70

6. Evaluate the following: $(4.1 \times 10^5)(2.0 \times 10^{-4})$

   A. 0.82
   B. 8.2
   C. 8.2×10^{-20}
   D. 82
   E. -8.2

7. Convert 1.24×10^4 mm into km

A. 12.4 km
B. 1.24×10^2 km
C. 1.24×10^{-2} km
D. 1.24×10^6 km
E. 1.24×10^{-6} km

8. Express the following in decimal form: 4.2×10^{-3} g

A. 4200 g
B. 42 g
C. 0.42 g
D. 0.042 g
E. 0.0042 g

9. Express the following in proper scientific notation: 3600 s

A. 3.6×10^4 s
B. 3.6×10^3 s
C. 0.36×10^{-4} s
D. 3.6×10^{-3} s
E. 3600×10^3 s

10. Convert 880 cm^3 to in^3 (1 in = 2.54 cm)

A. 346 in^3
B. 1.44×10^4 in^3
C. 73.3 in^3
D. 53.7 in^3
E. 115 in^3

11. Convert 72.0 km/hr to m/s

A. 20.0 m/s
B. 1200 m/s
C. 200 m/s
D. 260 m/s
E. 43.2 m/s

12. If $f(x) = x^2 - 2x + 3$, then f (2) is equal to what?

A. –2
B. 4
C. 3
D. –3
E. 2

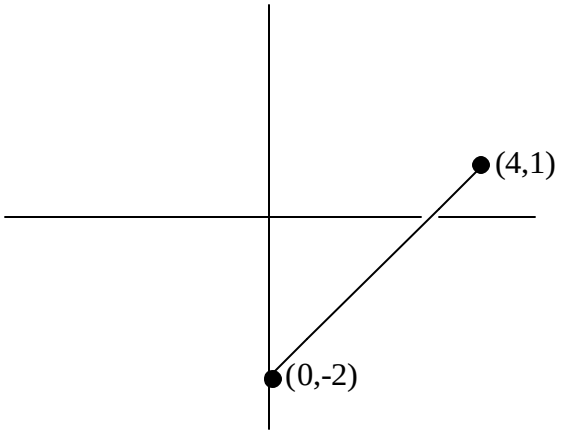
13. Evaluate the following: $\dfrac{4.0x10^{-5}}{2.0x10^{-3}}$

A. 2.0×10^2
B. 2.0×10^{-2}
C. 2.0×10^{-6}
D. 2.0×10^{-8}
E. 2.0×10^{-3}

14. Evaluate $10^{-2.2}$

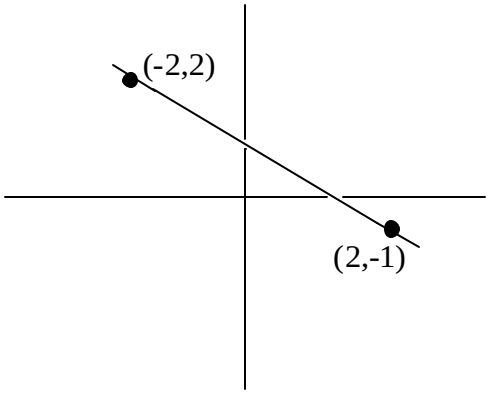
A. 0.0063
B. -2.2
C. 0.022
D. 0.342
E. 158

15. Consider the graph below. Determine the slope of the line.



A. 4
B. 3
C. 3/4
D. 4/3
E. –3/4

16. Consider the graph below. Determine the y-value at x = 0.



A. 3/4
B. 1
C. 0.6
D. 0.5
E. 0.7

17. The quadratic formula for the roots or solutions of a quadratic equation in the form $ax^2 + bx + c = 0$ is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. What are the solutions to $2x^2 - 3x + 1 = 0$?

A. 1 and ½
B. ½ and ¼
C. 1 and -½
D. -1 and -½
E. ½ and -¼

18. When 20.0 g NaCl are dissolved in 180. g of water, what is the percent by mass of NaCl in the solution?

A. 0.100%
B. 0.110%
C. 10.0%
D. 11.1%
E. 90.0%

19. Perform the indicated operations below and determine your final answer in centimeters with the proper number of significant figures:

12.64 cm – 48 mm + 0.246 m = ?

A. 32.44 cm
B. 60.886 cm
C. 42.0 cm
D. 32.4 cm
E. 42 cm

20. Convert 184 ºF to Kelvin. (ºF = 1.8 ºC + 32; K = ºC + 273)

A. 84
B. 184
C. 189
D. 273
E. 357

21. What is the name of $FeCl_3$?

A. ferrate chloride
B. iron chloride
C. iron chloride(III)
D. iron(III) chloride
E. iron(III) chlorine

22. What is the name of SO_2?

A. sulfite
B. sulfate
C. sulfur oxide
D. sulfur dioxide
E. monosulfur dioxide

For Questions 23 – 25, consider the following ion: $^{56}_{26}Fe^{+2}$

23. What are the total number of protons?

A 24
B. 26
C. 28
D. 30
E. 56

24. What are the total number of neutrons?

A. 24
B. 26
C. 28
D. 30
E. 56

25. What are the total number of electrons?

A. 24
B. 26
C. 28
D. 30
E. 56

26. Consider the combustion of C_2H_4 according to the following unbalanced chemical equation: $C_2H_4 + O_2 \rightarrow CO_2 + H_2O$. Determine the coefficient for O_2 when the equation is balanced using the smallest whole numbers.

A. 1
B. 2
C. 3
D. 7
E. 8

27. A certain glucose solution weighing 115 g has a density of 1.23 g/cm^3. Determine the volume of this solution in cm^3.

A. 0.0107 cm^3
B. 114 cm^3
C. 116 cm^3
D. 93.5 cm^3
E. 141 cm^3

28. Calculate the number of CCl_4 moles in 14.5 g CCl_4.
Note: atomic wt of carbon = 12.011 g/mol; atomic wt of chlorine = 35.453 g/mol

A. 154 mol
B. 0.0943 mol
C. 10.6 mol
D. 0.305 mol
E. 2230 mol

29. Calculate the percent by mass of chlorine in PCl_3.
Note: atomic wt of phosphorus = 30.974 g/mol;
atomic wt of chlorine = 35.45 g/mol

A. 22.5
B. 50.0
C. 53.4
D. 25.0
E. 77.4

30. A 0.125 L tank is filled with oxygen until the pressure is 75.0 atm at 298 K. Calculate the moles of oxygen in the tank.
Note: PV = nRT; R = 0.0821 L atm/K mol.

A. 383
B. 4.57
C. 0.505
D. 0.383
E. 0.00378

END OF DIAGNOSTIC TEST