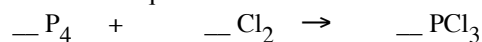


Sample Questions – Mid-Session Test CHEM1011

(Note your test will consist of only 20 questions similar to these examples).

1. A 1.00 L gas sample at 705 Torr and 47 °C has a mass of 0.988 g. The gas is most likely:
(A) CO (molar mass 28 g mol⁻¹)
(B) CF₄ (molar mass 88 g mol⁻¹)
(C) CH₄ (molar mass 16 g mol⁻¹)
(D) CO₂ (molar mass 44 g mol⁻¹)
(E) Cl₂ (molar mass 71 g mol⁻¹)
2. The name of the compound BaCl₂·2H₂O is
(A) barium dichloride
(B) barium dichlorohydrate
(C) barium chloride dihydrate
(D) barium chloride
(E) barium dichloride dihydrate
3. A binary compound of lead and oxygen was found to contain 90.66% Pb. What is the empirical formula for the compound?
(A) PbO
(B) Pb₃O₄
(C) PbO₉
(D) Pb₉O
(E) PbO₂
4. The nucleus of the species F⁻ is made up of
(A) 9 protons, 19 neutrons and 0 electrons
(B) 9 protons, 10 neutrons and 0 electrons
(C) 10 protons, 9 neutrons and 0 electrons
(D) 10 protons, 9 neutrons and 10 electrons
(E) 9 protons, 10 neutrons and 9 electrons
5. What amount of iron is contained in 125 g of it?
(The atomic mass of iron is 55.85 g mol⁻¹).
(A) 1.12 mol
(B) 0.447 mol
(C) 3.49 mol
(D) 6.98 mol
(E) 2.24 mol
6. The charge on a halide ion is
(A) always -2
(B) may be -1, +1, +3, +5, or +7
(C) always +1
(D) always -1
(E) -1 or +7

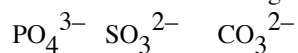
7. Given the unbalanced equation:



The balanced equation shows that for every mole of Cl_2 used that the number of mole of PCl_3 formed is

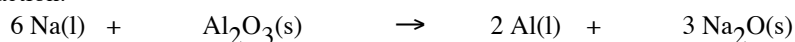
- (A) 3
 - (B) 2
 - (C) $3/2$
 - (D) $2/3$
 - (E) 6
8. A gas mixture contains four times as many CH_4 molecules as C_2H_4 molecules. The partial pressure of CH_4 is 100 mmHg. What is the partial pressure of C_2H_4 in the mixture?
- (A) 400 mmHg
 - (B) 25 mmHg
 - (C) 20 mmHg
 - (D) 500 mmHg
 - (E) 100 mmHg
9. The molar mass of dinitrogen oxide (laughing gas) is $44.02 \text{ g}\cdot\text{mol}^{-1}$. A sample contains 4.00×10^{24} dinitrogen oxide molecules. What is the mass of the sample in grams?
- (A) $2.92 \times 10^2 \text{ g}$
 - (B) 29.2 g
 - (C) $1.51 \times 10^2 \text{ g}$
 - (D) $3.42 \times 10^2 \text{ g}$
 - (E) $1.51 \times 10^{-2} \text{ g}$
10. What volume of 0.202 M NaCl(aq) should be used to prepare 125 mL of $3.20 \times 10^{-3} \text{ M}$ NaCl(aq) ?
- (A) 25.3 mL
 - (B) 0.0808 mL
 - (C) 1.98 mL
 - (D) 7.89 mL
 - (E) 0.400 mL
11. Calculate the number of moles of $\text{Ca(OH)}_2\text{(aq)}$ needed to react completely with 125 mL of 6.00 M HCl(aq) .
- (A) 0.0416 mol
 - (B) 0.750 mol
 - (C) 3.00 mol
 - (D) 0.375 mol
 - (E) 1.50 mol

12. The names of the following three anions are respectively,



- (A) phosphide ion, sulfite ion, carbonate ion
- (B) phosphate ion, sulfate ion, carbonate ion
- (C) phosphite ion, sulfite ion, carbonite ion
- (D) phosphite ion, sulfate ion, carbonate ion
- (E) phosphate ion, sulfite ion, carbonate ion

13. For the reaction:



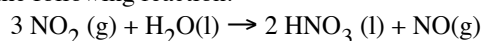
When 5.52 grams of Na (molar mass $23.0 \text{ g}\cdot\text{mol}^{-1}$) is reacted with excess $\text{Al}_2\text{O}_3\text{(s)}$ (molar mass $102 \text{ g}\cdot\text{mol}^{-1}$), 1.00 g of Al(l) (molar mass $27.0 \text{ g}\cdot\text{mol}^{-1}$) is produced. The percent yield of Al is:

- (A) 46.3%
- (B) 18.1%
- (C) 11.1%
- (D) 39.1%
- (E) 15.4%

14. The formula for sulfurous acid is

- (A) HSO_3
- (B) H_2SO_3
- (C) H_2S
- (D) HSO_4
- (E) H_2SO_4

15. Consider the following reaction:



How many mole of the excess reactant remain after the reaction is complete if 2.00 moles of $\text{H}_2\text{O(l)}$ and 5.00 moles of $\text{NO}_2\text{(g)}$ are used?

- (A) 0.33 mol $\text{H}_2\text{O(l)}$
- (B) 4.00 mol $\text{NO}_2\text{(g)}$
- (C) 1.67 mol $\text{H}_2\text{O(l)}$
- (D) 3.00 mol $\text{NO}_2\text{(g)}$
- (E) 1.00 mol $\text{NO}_2\text{(g)}$

16. The dye, Bismark brown, has a molar mass of $228.3 \text{ g}\cdot\text{mol}^{-1}$. Analysis shows that it is 30.68% N. How many nitrogen atoms are in each Bismark brown molecule?

- (A) 5
- (B) 0.5
- (C) 1
- (D) 4
- (E) 3

17. What energy is required to excite a hydrogen atom in its $n = 2$ state to the $n = 3$ state ?
- (A) $1.303 \times 10^{-25} \text{ J}$
 - (B) $8.235 \times 10^6 \text{ J}$
 - (C) $1.818 \times 10^{-19} \text{ J}$
 - (D) $3.635 \times 10^{-19} \text{ J}$
 - (E) $3.029 \times 10^{-19} \text{ J}$
18. Electromagnetic radiation with a frequency of 10.4 MHz has a wavelength of:
- (A) $6.89 \times 10^{-27} \text{ m}$
 - (B) $9.61 \times 10^{-8} \text{ m}$
 - (C) 0.035 m
 - (D) 2.88 m
 - (E) 28.8 m
19. The energy per photon for visible light with a wavelength of 700 nm is:
- (A) $3.31 \times 10^{-31} \text{ J}$
 - (B) $2.84 \times 10^{-19} \text{ J}$
 - (C) $3.71 \times 10^{-19} \text{ J}$
 - (D) $3.97 \times 10^{-16} \text{ J}$
 - (E) $9.96 \times 10^{-10} \text{ J}$
20. An atom undergoes a transition from a higher to a lower state where the energy difference is $3.03 \times 10^{-19} \text{ J}$. The frequency of the photon emitted is:
- (A) $4.57 \times 10^{-14} \text{ Hz}$
 - (B) $4.57 \times 10^{14} \text{ Hz}$
 - (C) $2.99 \times 10^{13} \text{ Hz}$
 - (D) $9.08 \times 10^{11} \text{ Hz}$
 - (E) $4.57 \times 10^8 \text{ Hz}$
21. Which one of the following statements is true?
- (A) A $2p$ orbital has two nodal planes
 - (B) A $2p$ orbital has no nodal planes
 - (C) There are exactly three d orbitals in the $4d$ sublevel
 - (D) A $2s$ orbital has the quantum number m_l equal to 1
 - (E) There are exactly three p orbitals in the $4p$ sublevel
22. An unknown gas effuses at 1.05 times the rate of Cl_2 molecules, measured using the same apparatus under the same conditions of temperature and pressure. What is the probable identity of the unknown gas ?
- (A) NH_3 (molar mass = 17.0 g mol^{-1})
 - (B) H_2 (molar mass = 2.0 g mol^{-1})
 - (C) Xe (molar mass = 131.3 g mol^{-1})
 - (D) SO_2 (molar mass = 64.1 g mol^{-1})
 - (E) I_2 (molar mass = 253.8 g mol^{-1})

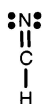
23. Which of the following groups of elements are arranged in order of decreasing atomic radius (that is, from largest to smallest)?
- (A) Na, K, Rb
(B) Ne, Na, Mg
(C) Cl, Ar, K
(D) Be, C, O
(E) Ar, Kr, Ne
24. For which of the following atoms or ions is the electronic configuration given NOT the ground state configuration for that atom or ion?
- (A) N $1s^2 2s^2 2p^3$
(B) S $1s^2 2s^2 2p^6 3s^2 3p^4$
(C) Cr $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4$
(D) Cl^- $1s^2 2s^2 2p^6 3s^2 3p^6$
(E) Ca^{2+} $1s^2 2s^2 2p^6 3s^2 3p^6$
25. Which one of the following statements is TRUE?
- (A) Silicon has 12 core electrons and 2 valence electrons
(B) Isolated atoms of zinc are diamagnetic
(C) Cl^+ is isoelectronic with Ar
(D) The ionic radius of Fe^{3+} is larger than the ionic radius of Fe^{2+}
(E) Isolated atoms of silicon are diamagnetic
26. The first five successive ionisation energies of an element are 0.807, 2.433, 3.666, 25.033, 32.834 MJ mol^{-1} . Which one element from those listed below could this element be?
- (A) B
(B) C
(C) N
(D) O
(E) F
27. In which one of the following species is the central atom (the first atom in the formula) unlikely to have an octet of valence electrons?
- (A) BF_4^-
(B) XeO_3
(C) SiCl_4
(D) NH_3
(E) CH_2Cl_2
28. How many lone pairs of electrons are there in **TOTAL** in the Lewis structure of XeF_4 ?
- (A) 14
(B) 6
(C) 4
(D) 12
(E) 2

29. Which of the following formulae has, pictured below it, the least realistic Lewis diagram?

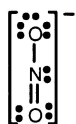
(A) NO



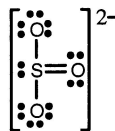
(B) HCN



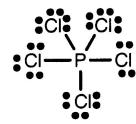
(C) NO_2^-



(D) SO_3^{2-}



(E) PCl_5



30. Which of the following elements has the lowest first ionisation energy?

(A) Cl

(B) K

(C) Br

(D) F

(E) Mg

31. The correct ground state electronic configuration for the isolated iron(III) ion is:

(A)	1s ↑↓	2s ↑↓	2p ↑↓ ↑↓ ↑↓	3s ↑↓	3p ↑↓ ↑↓ ↑↓	3d ↑ ↑ ↑ ↑ ↑	4s ↑
(B)	1s ↑↓	2s ↑↓	2p ↑↓ ↑↓ ↑↓	3s ↑↓	3p ↑↓ ↑↓ ↑↓	3d ↑↓ ↑↓ ↑	4s ↑
(C)	1s ↑↓	2s ↑↓	2p ↑↓ ↑↓ ↑↓	3s ↑↓	3p ↑↓ ↑↓ ↑↓	3d ↑↓ ↑	4s ↑
(D)	1s ↑↓	2s ↑↓	2p ↑↓ ↑↓ ↑↓	3s ↑↓	3p ↑↓ ↑↓ ↑↓	3d ↑ ↑ ↑	4s ↑↓
(E)	1s ↑↓	2s ↑↓	2p ↑↓ ↑↓ ↑↓	3s ↑↓	3p ↑↓ ↑↓ ↑↓	3d ↑↓ ↑	4s ↑↓