

Exam 3a

Chem 1141

Fall 2008

Name: _____

MULTIPLE CHOICE. [3 pts ea.]

Q1. The SI unit of pressure is the pascal (Pa). It is defined as being equal to:

- a) 1 Pa = 1 N b) 1 Pa = 1 N/s c) 1 Pa = 1 N/m²
d) 1 Pa = 1 m²/N e) 1 Pa = 1 m/s

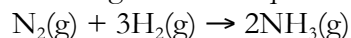
Q2. Which of the following elements is *not* found as a diatomic gas under regular conditions on earth:

- a) nitrogen b) helium c) hydrogen d) oxygen e) fluorine

Q3. The volume of a gas is directly proportion to its absolute temperature. This is commonly known as:

- a) Avogadro's law b) Boyle's law c) Charles' law
d) Gay-Lussac's law e) van der Waal's law

Q4. Given the following chemical equation:



What volume of hydrogen gas is required to fully react with 3.0 L of nitrogen gas at STP?

- a) 1.0 L b) 3.0 L c) 4.5 L d) 6.0 L e) 9.0 L

Q5. Which pressure is the largest:

- a) 1 atm b) 1 mmHg c) 1 torr d) 1 Pa

Q6. A 4.50 g sample of metal absorbs 76.0 J of heat, and changes in temperature from 24.0 °C to 155.1 °C. What is the specific heat capacity of the metal?

- a) 0.129 J/g °C b) 0.341 J/g °C c) 1.45 J/g °C
d) 14.2 J/g °C e) 89 J/g °C

Q7. Which chemical equation corresponds to the standard enthalpy of formation of C₈H₁₅Cl(l)?

- a) C₈H₁₅Cl(l) + 11½ O₂(g) → 8 CO₂(g) + 7 H₂O(l) + HCl(aq)
b) 2 C₈H₁₅Cl(l) + 23½ O₂(g) → 16 CO₂(g) + 15 H₂O(l) + Cl₂(g)
c) C₈H₁₅Cl(l) → 8C(s, graphite) + 15H(g) + ½ Cl₂(g)
d) C₈H₁₅Cl(l) → 8C(s, graphite) + 7½ H₂(g) + ½ Cl₂(g)
e) 8C(s, graphite) + 7½ H₂(g) + ½ Cl₂(g) → C₈H₁₅Cl(l)

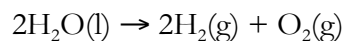
Q8. A chemical reaction that absorbs heat is said to be:

- a) Exoergic b) Endoergic c) Exothermic d) Endothermic

Q9. Which of the following standard enthalpy of formation values is not zero at 25 °C?

- a) Na(s) b) Ne(g) c) CH₄(g) d) Hg(l) e) H₂(g)

Q10. Calculate ΔH° for the reaction:



given that ΔH_f° for $\text{H}_2\text{O}(\text{l})$ is -285.8 kJ/mol .

- a) -285.8 kJ/mol b) $+285.8 \text{ kJ/mol}$ c) $+142.9 \text{ kJ/mol}$
d) -142.9 kJ/mol e) $+571.6 \text{ kJ/mol}$

Q11. A particle of light is called a(n):

- a) Proton b) Electron c) Quantum d) Positron e) Photon

Q12. Which form of electromagnetic (EM) radiation has the *longest* wavelength?

- a) Radio b) Ultraviolet c) Visible d) X-Ray e) Infrared

Q13. Which set of quantum numbers for an electron in an atom is *not* allowed:

- a) $n = 3, l = 2, m_l = -1, m_s = +1/2$ b) $n = 1, l = 0, m_l = 0, m_s = -1/2$
c) $n = 4, l = 1, m_l = 0, m_s = +1/2$ d) $n = 1, l = 1, m_l = 0, m_s = -1/2$
e) $n = 8, l = 6, m_l = -3, m_s = +1/2$

Q14. Atoms of neon are paramagnetic.

- a) TRUE b) FALSE

Q15. Atoms of oxygen are paramagnetic.

- a) TRUE b) FALSE

Q16. [8 pts.] Write the *full* electron configuration for

i) oxygen.

ii) copper

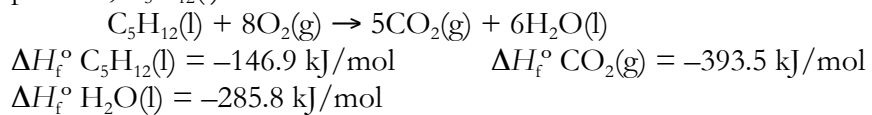
iii) chlorine

Q17. [6 pts.] Draw an orbital diagram for an atom of phosphorus.

Q18. [8 pts.] Calculate the frequency of light emitted from a hydrogen atom undergoing an electron transition from $n = 5$ to $n = 2$.

Q19. [5 pts.] A sample of an ideal gas whose volume is 45.6 mL at a temperature of 127 °C is cooled down to -87 °C. What will its new volume be?

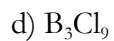
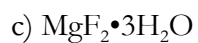
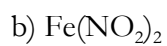
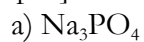
Q20. [8 pts.] How much heat will be absorbed/released from the complete combustion of 34.0 g of pentane, C₅H₁₂(l).



Q21. [5 pts.] 34.5 mL of 12.0 M HCl(aq) is added to 128 mL of H₂O. Calculate the final concentration of HCl. State any assumptions that you are making.

Q22. [10 pts.] What volume of $\text{CO}_2(\text{g})$ will be formed by the reaction of 34.0 mL of 1.45 M $\text{HCl}(\text{aq})$ with 67.8 mL of 5.60 M $\text{LiHCO}_3(\text{aq})$? The reaction is carried out at a temperature of 35 °C, and a pressure of 0.987 atm. Be sure to start by writing out the *balanced* chemical equation!

Q23. [5 pts.] Name the following compounds:



Soluble Compounds	Exceptions
Halides (Cl^- , Br^- , I^-)	Halides of Ag^+ , Hg_2^{2+} , and Pb^{2+}
Sulfates (SO_4^{2-})	Sulfates of Ag^+ , Ca^{2+} , Sr^{2+} , Ba^{2+} , Hg_2^{2+} , and Pb^{2+}
Insoluble Compounds	Exceptions
Carbonates (CO_3^{2-}), phosphates (PO_4^{3-}), chromates (CrO_4^{2-}), and sulfides (S^{2-})	Compounds containing alkali metal ions and the ammonium ion
Hydroxides (OH^-)	Compounds containing alkali metal ions and the Ba^{2+} ion