Key!

Final Exam Test Questions Review

1. Which type of matter can be separated into its parts using physical methods like filtration or settling?
   a. Elements
   b. Compounds
   c. Heterogenous mixture
   d. Homogenous mixture
   e. Solutions

2. Which of the following are chemical processes?
   a. Compression of oxygen gas
   b. Freezing of water
   c. Melting of butter
   d. Rusting of a nail - oxidation

3. In which one of the following are all the zeroes significant?
   a. 0.15632
   b. 0.1000
   c. 00.0030020 → 0 → significant
   d. 0.083624
   e. 100.090090 (sandwiched)

4. There are _____ electrons _____ protons, and _____ neutrons in an atom of $^{132}_{54}Xe$

   * Neutral compand

   132 — atomic mass
   Xe — element symbol
   54

   12
   132
   − 54
   78

   # $e^{(-)}$ = # Protons = atomic number

5. Element Z has two naturally occurring isotopes:
   Z-63 with a mass of 62.93 amu and a natural abundance of 69.17%
   Z-65 with a mass of 64.93 amu and a natural abundance of 30.83%
   Calculate the average atomic mass of element

   Empiral rules
   % → dec.
   69.17 % → 0.6917
   30.83 % → 0.3083

   Avg. mass = $(m_1 \times \%) + (m_2 \times \%) + \ldots$
   $= (62.93 \times 0.6917) + (64.93 \times 0.3083)$
   $=$ ____ + ____
   $=$ 63.56 amu

SO_3^{2-} SO_4^{2-}

Sulfite Sulfate

NO_2^- NO_3^-

nitrite nitrate

6. Which formula/name pair is incorrect?
   a. $Mn(NO_2)_2$ manganese (II) nitrite
   b. $Mg(NO_3)_2$ magnesium nitrate
   c. $Mn(NO_3)_2$ ~~magnesium nitrate~~ → manganese (II) nitrate
   d. Mg_3N_2 magnesium permanganate wrong

Ionic ↑ metal NM

metal -ide

↑ Magnesium nitride

7. The combustion of propane (C3H8) in the presence of excess oxygen fields CO2 and H2O:

   $C_3H_8(g) + 5\ O_2 \rightarrow 3\ CO_2(g) + 4\ H_2O(g)$

   When 2.5 mol of O2 are consumed in their reaction, _____ mol of CO2 are produced?

$$\frac{2.5 \text{ mol } O_2 \mid 3 \text{ mol } CO_2}{5 \text{ mol } O_2} = 1.5 \text{ mol } CO_2$$

8. An aqueous ethanol solution (400 ml) was diluted to 4.00 L, giving a concentration of 0.0400 M. The concentration of the original solution was _____ M.
   a. 0.400 M
   b. 0.200 M
   c. 2.00 M
   d. 4.00 M

$$M_1V_1 = M_2V_2$$

$$\frac{M_1(.4)}{.4} = \frac{(0.0400)(4.00L)}{.4}$$

$$M_1 = 0.4\ M$$

0.400 M sig figs!

9. A chemical reaction that absorbs heat from the surroundings is said to be _____ and has a _____ ΔH at constant temperature.
   a. Exothermic, neutral
   b. Exothermic, positive
   c. Endothermic, negative
   d. Endothermic, positive

10. True or false: The ground state electron of Cu is [Ar] $4s^1 3d^{10}$

4 configuration

★ Cu: [Ar] $4s^2 3d^9$ → [Ar] $4s^1 3d^{10}$

11. The value of ΔH for the reaction below is –790 KJ. The enthalpy change accompanying the reaction of 0.95 g of S is _____ KJ.

$2\,S(s) + 3\,O_2(g) \rightarrow 2\,SO_3(g)$

a. 23 KJ
b. -23 KJ
c. 12 KJ
d. -12 KJ

$$\frac{0.95\ g\ S}{32\ g\ S} \left| \frac{1\ mol\ S}{2\ mol\ S} \right| \frac{-790\ kJ}{} = \frac{-11.72}{} \rightarrow -12\ kJ$$

12. The wavelegth of light has a frequency of $1.66 \times 10^9\ s^{-1}$ is _____ m.

a. 6.63 m
b. 0.182 m
c. 2.00×10^{-9} m
d. 5.53×10^{8} m

$$\lambda = \frac{c}{\nu} = \frac{3.00 \times 10^8\ m/s}{1.66 \times 10^9\ s^{-1}} = 0.180722\ m$$

(λ: wavelength; c: speed of light constant; ν: frequency)

13. In general, as you go across a period in the periodic table from left to right:
   I. The atomic radius decreases
   II. The electron affinity becomes increasingly negative
   III. The first ionization energy increases

14. Which of the following would have to lose two electrons in order to achieve a noble gas electron configuration?

O	Sr	Na	Se	Br
+2	-2 → Kr	-1	+2	

15. Arrange the following gases in order of increasing average molecular speed at 25°C – standard

All gases

He	O_2	CO_2	N_2
4.0 g	32 g	44 g	28 g

slowest → fastest

$CO_2 < O_2 < N_2 < He$

16. A sample of a gas originally at 29°C and 1.25 atm pressure in a 3.0 L container is allowed to contract until the volume is 2.2 L and the temperature is 11°C. The final pressure of the gas is _____ atm.

$P_1 = 1.25$
$V_1 = 3.0\ L$
$T_1 = 29°C \rightarrow 302.15$
$V_2 = 2.2\ L$
$T_2 = 11°C \rightarrow 284.15$
$P_2 = ?$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \qquad P_2 = \frac{P_1 V_1 T_2}{T_1 V_2} = \frac{(1.25\ atm)(3.0\ L)(284.15\ K)}{(302.15\ K)(2.2\ L)}$$

$= 1.6$ atm

17. The strongest interparticle attractions (IMFs) exist between particles of a solid, and the weakest interparticle attractions exist between particles of a gas.

18. True or false: All molecules experience London Dispersion forces.

19. Of the following substances, _____ has the highest boiling point.

a. O_2
b. Cl_2
c. N_2
d. Br_2

All non-polar diatomic molecules

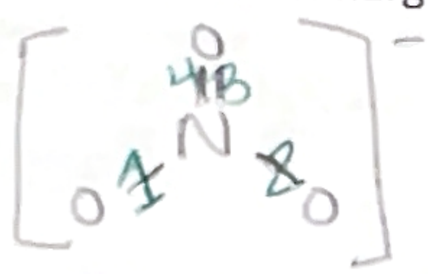
All have London dispersion forces

• Look for increase in molecular size or molar mass

largest molar mass

strongest L.D forces = Highest B.P

20. What is the formal charge of nitrogen in NO_3^-? Draw the Lewis structure



there's a charge ↓ so Brackets!

F.C. = Valence e⁻ − (# of bonds + lone pairs)

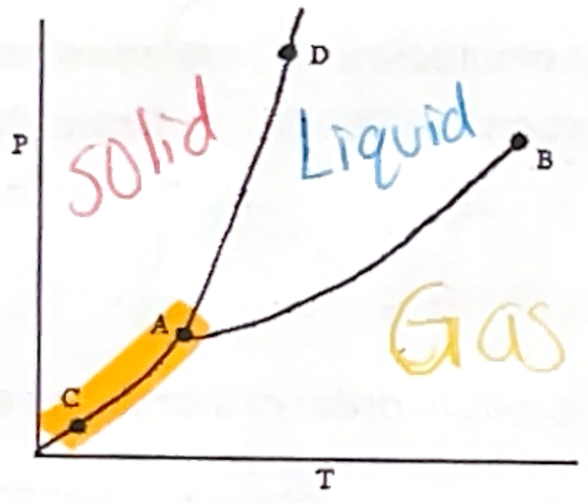
$N = 5 - (4 + 0)$

$= +1$

21. True or false: A volatile liquid is one that is highly viscous.

volatile liquid is one that readily evaporates.

22. On the phase diagram shown below, segment _____ corresponds to the conditions of temperature and pressure under which the solid and the gas of the substance are in equilibrium



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