

Name: _____

This is a practice test for CH 231 Final. There are 22 questions in total and is of similar difficulty of what can be expected on the actual final. Please treat it as a real examination, with no outside help from notes, internet, or peers. Take 80 minutes to complete this practice test and remember to keep in mind significant figures. Once done, let James know for the answer key. Good luck! It was a pleasure helping out Gen Chem I and I hope to see you again next term.

$\lambda = \frac{h}{mv}$	$q = mc\Delta T$	$q = m\Delta H$
$\Delta E = q + w$	$q = c \Delta T$	$c = 3.00 \times 10^8 \text{ m/s}$
$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$	$\nu = \frac{c}{\lambda}$	$E = h\nu$
$\frac{1}{\lambda} = R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$	$R_H = 2.180 \times 10^{-18} \text{ J/photon}$	$R_H = 10973731.6 \text{ m}^{-1}$
$1 \text{ J} = 1 \frac{\text{kg} \cdot \text{m}^2}{\text{s}^2}$	electron mass = $9.10938 \times 10^{-31} \text{ kg}$	$E = mc^2$
$E\Psi = H\Psi$	$\Delta E = q + w$	$W = -P\Delta V$
$\Delta H = \Delta E - P\Delta V$	$P(r) = 4\pi r^2 \Psi^2$	$(\Delta x)(m\Delta v) \geq h/4\pi$
$E_n = -hcR_\infty/n^2$	$E_n = -RZ^2/n^2$	$KE = E_{\text{photon}} - \phi$

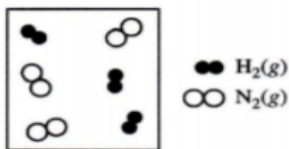
1																	
1A																	
1 H Hydrogen 1.008	2 He Helium 4.003																
3 Li Lithium 6.941	4 Be Beryllium 9.012	5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18										
11 Na Sodium 22.99	12 Mg Magnesium 24.31	13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95	19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.87	23 V Vanadium 50.94	24 Cr Chromium 52.00	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69
37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.96	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.7	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29
55 Cs Cesium 132.91	56 Ba Barium 137.33	57 La Lanthanum 138.91	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.84	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98	84 Po Polonium (208.98)	85 At Astatine (209.99)	86 Rn Radon (222.02)
87 Fr Francium (223.02)	88 Ra Radium (226.03)	89 Ac Actinium (227.03)	104 Rf Rutherfordium (261.11)	105 Db Dubnium (262.11)	106 Sg Seaborgium (266.12)	107 Bh Bohrium (264.12)	108 Hs Hassium (269.13)	109 Mt Meitnerium (268.14)	110 Ds Darmstadtium (271)	111 Rg Roentgenium (272)	112 Cn Copernicium (285)	113	114 Fl Flerovium (289)	115	116 Lv Livermorium (293)	117	118
58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.05	71 Lu Lutetium 174.97				
90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium (237.05)	94 Pu Plutonium (244.06)	95 Am Americium (243.06)	96 Cm Curium (247.07)	97 Bk Berkelium (247.07)	98 Cf Californium (251.08)	99 Es Einsteinium (252.08)	100 Fm Fermium (257.10)	101 Md Mendelevium (258.10)	102 No Nobelium (259.10)	103 Lr Lawrencium (262.11)				

Multiple Choice

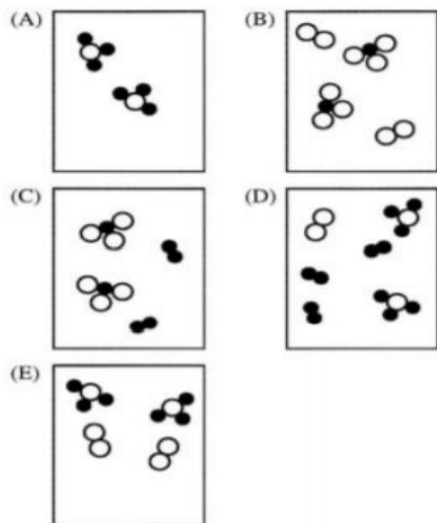
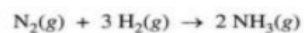
- 1) Jamesonmium (Jh) has two stable isotopes: ^{145}Jh (mass = 144.9362 amu) and ^{148}Jh (mass = 147.9177). Which of the following cannot be an average atomic mass of Jamesonmium?
- a) 145.7731 amu
 - b) 144.9968 amu
 - c) 146.3214 amu
 - d) 147.9882 amu
 - e) Any of these are valid average atomic masses

- 2) How many total electrons are present in 0.1415 g of oxide ions?
- a) 2.23×10^{23}
 - b) 3.20×10^{22}
 - c) 4.26×10^{22}
 - d) 5.33×10^{21}
 - e) None of these

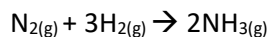
- 3) Look at the diagram shown below:



James shoves $\text{H}_2(\text{g})$ and $\text{N}_2(\text{g})$ into a closed container shown above. Which of the following diagrams would represent the results if the reaction shown before were to proceed to completion?



- 3) Consider the following reaction below:

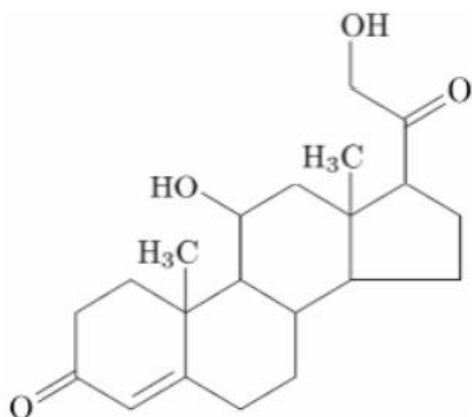


What mass of hydrogen gas must be reacted in excess nitrogen gas to give a theoretical yield of 75.0 grams of NH_3 gas?

- a) 6.60 g
 - b) 13.3 g
 - c) 46.5 g
 - d) 11.3 g
 - e) 5.92 g
- 4) (written) How many mmol are present in 5.45mg of carbon? _____
- 5) If a carbon atom has 3 sigma bonds and 1 pi bond. What is its molecular geometry?
- a) Trigonal planar
 - b) Tetrahedral
 - c) Bent
 - d) Trigonal bipyramidal
 - e) Linear
- 6) Which is the correct order ranking smallest to largest 2nd ionization energy?
- a) He, Be, B, Li
 - b) Be, B, He, Li
 - c) Be, B, Li, He
 - d) Li, Be, B, He
 - e) Li, B, Be, He
- 7) Which of the following compounds are covalently bonded?
- a) BaO
 - b) AsH₅
 - c) MgBr₂
 - d) GaN
 - e) MgSO₄

- 8) Which of the following metals does not exhibit attraction to an external magnetic field in a 2+ oxidation state?
- a) Cu
 - b) Ni
 - c) Zn
 - d) Mn
 - e) They all will exhibit an attraction
- 9) What is the formal charge of sulfur on a sulfate ion?
- a) -4
 - b) -2
 - c) 0
 - d) +2
 - e) +4
- 10) What is the bond order for N_2^{+1} ?
- a) 1
 - b) $3/2$
 - c) 2
 - d) $5/2$
 - e) 3
- 11) Rank the following ions by increasing ionic radii:
- Br^- K^+ Rb^+
- a) $\text{Br}^- < \text{Rb}^+ < \text{K}^+$
 - b) $\text{K}^+ < \text{Rb}^+ < \text{Br}^-$
 - c) $\text{Rb}^+ < \text{Br}^- < \text{K}^+$
 - d) $\text{Br}^- < \text{K}^+ < \text{Rb}^+$
 - e) $\text{Rb}^+ < \text{K}^+ < \text{Br}^-$
- 12) How many electrons can be described by $n=3, l=2$?
- a) 2
 - b) 5
 - c) 6
 - d) 8
 - e) 10

Jamesonnum is shown below:



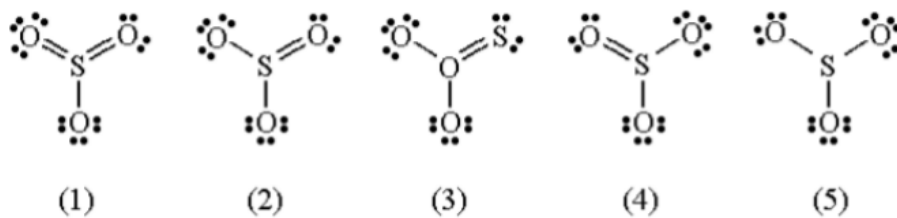
13) Jamesonnum contains: Select all

- An alcohol
- An aldehyde
- A ketone
- An ether
- A methyl
- A carboxylic acid
- An amine
- An ester

14) How many chiral centers does Jamesonnum have? _____

15)

Which of the following are correct resonance structures for SO_3 ?



Short Answer

16) A molecule of nicotine contains 74.01% C, 17.28% N, and balance H by mass.

a) What is the molecular formula of nicotine if it has a molar mass of 162.12 g/mol?

b) If the average person smokes 17 cigarettes a day, and each cigarette contains 13.30 mg of nicotine, how many atoms of Nitrogen will be consumed over a year?

17) Liquid ethanol reacts with diatomic oxygen to form carbon dioxide and water.

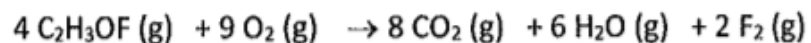
a) Write the balanced equation for the reaction. Include phases

b) How many grams of gas is expected to form if 5.43 grams of ethanol and 4.44 grams of oxygen are produced?

c) If 2.44 grams of gas is formed, what is the percent yield of the gas?

18) A metal plate is struck by a photon with wavelength of 360 nm. The plate has binding energy of 3.88×10^{-20} Joules. If an electron is ejected from the surface, what would its velocity be?

19) Consider the following reaction:



When 5.82 mol of $\text{C}_2\text{H}_3\text{OF}$ and 10.35 mol of O_2 are initially present in the reaction mixture, how much, in grams, of which reactant will remain after the reaction goes to completion?

20) Consider the following aqueous solution: 22.50 g of HI and 100.0 mL of water.

- a) What is the molarity of the solution?
- b) If barium hydroxide has a concentration of 0.800M, then what volume of it is required to fully react with the above solution?

21) Draw the Lewis structure for XeOF_4

- a) What is its molecular geometry?
- b) What is its hybridization?

22) It takes 208.5 kJ of energy to remove 1 mol of electrons from an atom on the surface of rubidium metal. What is the maximum wavelength of light capable of removing a single electron from an atom on the surface of solid Rb?