KEY

Chemistry 121 | Fall 2008 | Oregon State University
Final Exam | December 9, 2008 | Dr. Richard Nafshun

Instructions: You should have with you several number two pencils, an eraser, your 3" x 5" note card, a calculator, and your University ID Card. If you have notes with you, place them in a sealed backpack and place the backpack OUT OF SIGHT or place the notes directly on the table at the front of the room.

Fill in the front page of the Scantron answer sheet with your test form number (listed above), last name, first name, middle initial, and student identification number. **Leave the class section number and the test form number blank.**

This exam consists of 40 multiple-choice questions. Each question has four points associated with it. Select the best multiple-choice answer by filling in the corresponding circle on the rear page of the answer sheet. If you have any questions before the exam, please ask. If you have any questions during the exam, please ask the proctor. Open and start this exam when instructed. When finished, place your Scantron form and note card in the appropriate stacks. You may keep the exam packet, so please show your work and mark the answers you selected on it.

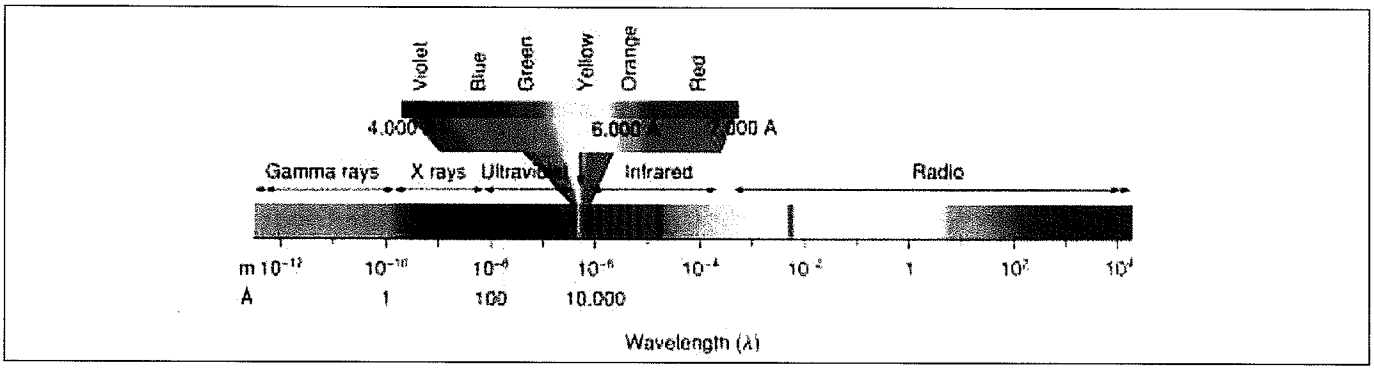
centi (c) = 1/100	milli (m) = 1/000	kilo (k) = 1000
micro (μ) = 10^{-6}	nano (n) = 10^{-9}	1 mole = 6.022 x 10^{23}
1 inch = 2.54 cm (exact)	1 kg = 2.2 pounds	1 foot = 12 inches (exact)
K = 273.15 + °C	1 atm = 760 mm Hg = 760 Torr	
Hydroxide OH^-	Cyanide CN^-	Nitrate NO_3^-
Acetate CH_3COO^-	Carbonate CO_3^{2-}	Phosphate PO_4^{3-}
Hydronium H_3O^+	Ammonium NH_4^+	Sulfate SO_4^{2-}

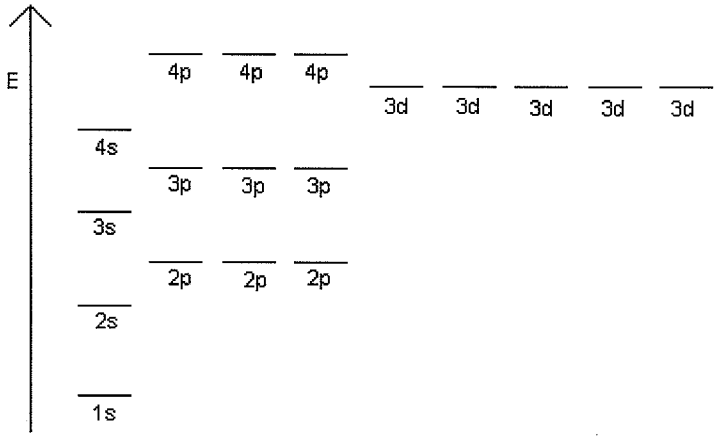
Abbreviated Solubility Rules:
Rule 1: All nitrates, group 1A metal salts and ammonium salts are soluble.
Rule 2: All carbonates, hydroxides, phosphates and sulfides are insoluble.
Rule 3: Rule 1 always takes precedent.

$M_1V_1 = M_2V_2$	$M_{acid}V_{acid} = M_{base}V_{base}$	$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$
$R = 0.0821 \frac{L \bullet atm}{mol \bullet K}$	$\mu_{rms} = \sqrt{\frac{3RT}{Molar\ Mass}}$	$R = 8.314 \frac{kg \bullet m^2}{s^2 \bullet mol \bullet K}$
PV = nRT	q = mcΔT	q = mΔH
E = q + w	$R_H = 2.180 \times 10^{-18}$ J/photon	c = 3.00 x 10^8 m/s
h = 6.626 x 10^{-34} J·s	$\nu = \frac{c}{\lambda}$	E = hν

Substance	FM (g/mol)	MP (°C)	Heat (f) (J/g)	BP (°C)	Heat (v) (J/g)	Specific Heat (J/g°C)* Solid	Liquid	Gas
acetone	58.1	-95.1	96.7	56.1	520	2.26	2.20	1.46
benzene	78.1	5.41	126	80.1	394	1.20	1.90	1.17
ethanol	46.1	-112	100	78.3	852	0.96	2.10	1.71
n-octane	114	-57.0	182	126	339	1.30	2.40	1.30
water	18.0	0.00	334	100	2260	2.09	4.18	1.38

* Values are estimated based on averages over the temperature range





[Periodic Table of the Elements Here]

Unit 1 (Material Assessed on Exam 1)

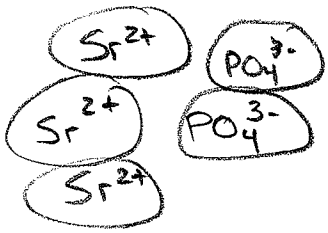
1. A student measures a sample of lithium oxide to be 177.2234 g. Another student measures a sample of lithium oxide to be 74.62 g. Added together, the sum of these samples is (with the proper number of significant figures):

(A) 251.8434 g
(B) 251.843 g
(C) 251.84 g
(D) 251.8 g
(E) 252. g

177.2234 g
\+ 74.62 g
251.84 34 g

2. Which of the following chemical formulae is **incorrect**?

(A) $(NH_4)_2O$
(B) $Ca(NO_3)_2$
(C) LiOH
(D) $Sr_2(PO_4)_3$ → Should be $Sr_3(PO_4)_2$
(E) $MgCO_3$



3. Which of the following pairs of elements will form a molecule?

(A) Sodium and calcium ✗
(B) Carbon and oxygen
(C) Cesium and magnesium ✗
(D) Fluorine and barium ✗
(E) Calcium and iodine ✗

↓ All non-metals

4. $^{243}Am^{2+}$ has:

(A) 95 **protons**, 148 **neutrons**, 93 **electrons**
(B) 95 **protons**, 148 **neutrons**, 97 **electrons**
(C) 95 **protons**, 146 **neutrons**, 95 **electrons**
(D) 243 **protons**, 241 **neutrons**, 241 **electrons**
(E) 243 **protons**, 243 **neutrons**, 241 **electrons**

95 ← 95 p
Am
243 − 95 = 148 n
95 − 2 = 93 e⁻

All non-metals

5. The PCl_5 is:

(A) a metal
(B) a non-metal
(C) an alloy
(D) a molecule
(E) an ionic compound

6. A fictitious element, Beyonceium, has two naturally occurring isotopes. ^{212}By has a mass of 211.976 g/mol and is 10.2338% abundant. ^{213}By has a mass of 212.992 g/mol and is 89.7662% abundant. What is the average atomic mass of Beyonceium?

(A) 212.888 g/mol
(B) 212.080 g/mol
(C) 212.484 g/mol
(D) 212.288 g/mol
(E) 212.028 g/mol

$(211.976\ g/mol)(0.102338) + (212.992\ g/mol)(0.897662) =$

$212.888\ g/mol$

7. The chemical formula of calcium sulfate is:

(A) Ca_2SO_4
(B) $CaSO_4$
(C) CaS
(D) CaS_2
(E) $Ca(SO_4)_2$

Ca^{2+} SO_4^{2-}

$CaSO_4$

→ ionic - no prefixes
→ molecular - prefixes

8. The names of $Mg_3(PO_4)_2$ and SF_6 are:

(A) trimagnesium diphosphide and sulfur hexafluoride
(B) magnesium phosphide and sulfur hexafluoride
(C) trimagnesium phosphate and sulfur fluoride
(D) trimagnesium diphosphate and sulfur hexafluoride
(E) magnesium phosphate and sulfur hexafluoride

Mg^{2+} PO_4^{3-} SF_6

9. A student ( ) requires 0.835 moles of LiF for a reaction. How many grams of LiF should she weigh out?

(A) 0.835 g
(B) 25.94 g
(C) 21.66 g
(D) 0.03219 g
(E) 31.07 g

6.941 g/mol
+ 18.9984 g/mol
25.939 g/mol

$0.835 \text{ mol LiF} \left(\frac{25.939 \text{ g}}{1 \text{ mol}}\right) = 21.66 \text{g}$

10. When the reaction

$C_{11}H_{24}(l) + 17\ O_2(g) \rightarrow 11\ CO_2(g) + 12\ H_2O(g)$ is correctly balanced,

34 oxygen atoms

(A) 11 O_2 are consumed
(B) 17 O_2 are consumed
(C) 18 O_2 are consumed
(D) 34 O_2 are consumed
(E) 36 O_2 are consumed

11. A student () obtains 293.55 grams of platinum. This is:

(A) 1.50 platinum atoms
(B) 9.06×10^{23} platinum atoms
(C) 4.64×10^{21} platinum atoms
(D) 1.77×10^{26} platinum atoms
(E) 3.45×10^{28} platinum atoms

$$293.55\ g\ Pt \left(\frac{1\ mol}{195.09\ g}\right)\left(\frac{6.022 \times 10^{23}\ atoms}{1\ mol}\right) =$$

9.06×10^{23} Pt atoms

12. In an excess amount of oxygen, how many grams of CO_2 (g) are theoretically produced from the combustion of 1711.5 g of sucrose [$C_{12}H_{22}O_{11}$ (s), molar mass of 342.3 g/mol]?

$$C_{12}H_{22}O_{11}\ (s) + \frac{35}{2}\ O_2\ (g) \rightarrow 12\ CO_2\ (g) + 11\ H_2O\ (g)$$

1711.5 g → (1) → 5.000 mol → (2) → 60.000 mol → (3) → 2641 g

(1) $1711.5\ g \left(\frac{1\ mol}{342.3\ g}\right) = 5.000\ mol$

(2) $5.000\ mol\ C_{12}H_{22}O_{11} \left(\frac{12\ mol\ CO_2}{1\ mol\ C_{12}O_{22}O_{11}}\right) = 60.000\ mol\ CO_2$

(3) $60.000\ mol\ CO_2 \left(\frac{44.01\ g}{1\ mol}\right) = 2641\ g\ CO_2$

(A) 220.0 g CO_2 (g) are produced
(B) 2641 g CO_2 (g) are produced
(C) 528.1 g CO_2 (g) are produced
(D) 585,846 g CO_2 (g) are produced
(E) 60.00 g CO_2 (g) are produced

13. The mass percent composition of $CaSO_4$ is:

(A) 16.7% Ca, 16.7% S, 66.7% O
(B) 20.0% Ca, 20.0% S, 60.0% O
(C) 25.1% Ca, 20.5% S, 54.4% O
(D) 29.4% Ca, 23.6% S, 47.0% O
(E) 33.3% Ca, 33.3 % S, 33.3% O

Whole
Ca = 40.08 g/mol
S = 32.06 g/mol
(4) O = (4) 16.00 g/mol
136.14 g/mol

Ca → $\frac{40.08\ g/mol}{136.14\ g/mol} \cdot 100\% = 29.4\%$

S → $\frac{32.06\ g/mol}{136.14\ g/mol} \cdot 100\% = 23.6\%$

O → $\frac{(4)16.00\ g/mol}{136.14\ g/mol} \cdot 100\% = 47.0\%$

14. A student places 46.76 g of NaCl (s) into a 2.000-L volumetric flask and fills to the mark with water. The concentration of the solution is:

(A) 0.0500 M
(B) 0.1000 M
(C) 0.2000 M
(D) 0.4000 M
(E) 0.8000 M

$M = \frac{mol}{L} = \frac{\left(\frac{46.76\ g}{58.45\ g/mol}\right)}{2.000\ L} = 0.4000\ M$

15. There are 1.291×10^{24} methylphenidate molecules in 500.0 g of methylphenidate. What is the molar mass of methylphenidate?

(A) 233.3 g/mol
(B) 2.582 g/mol
(C) 384.6 g/mol
(D) 367.4 g/mol
(E) The answer cannot be calculated without the molecular formula of methylphenidate.

g/mol

$1.291 \times 10^{24}\ molecules \left(\frac{1\ mol}{6.022 \times 10^{23}\ molecules}\right) = 2.144\ mol$

$\frac{500.0\ g}{2.144\ mol} = 233.3\ g/mol$

16. A student places 454.7 g of a gas into a 80.0-L container at 313 K and measures the pressure to be 2.06 atm. This gas is:

(A) O_2 (g)
(B) N_2 (g)
(C) Cl_2 (g)
(D) H_2 (g)
(E) He (g)

$PV = nRT$

$n = \frac{PV}{RT} = \frac{(2.06\ atm)(80.0\ L)}{(0.0821\ \frac{L \cdot atm}{mol \cdot L})(313\ K)} = 6.41\ mol$

$\text{Molar Mass} = g/mol = \frac{454.7\ g}{6.41\ mol} = 70.9\ g/mol\ Cl_2$

17. What is the density (in g/L) of CH_4 (g) at 298 K and 720 mm Hg?

(A) 0.545 g/L
(B) 0.621 g/L
(C) 1.61 g/L
(D) 3.24 g/L
(E) 7.17×10^{-4} g/L

1 mol 16.04 g

$V = \frac{nRT}{P} = \frac{(1\ mol)(0.0821\ \frac{L \cdot atm}{mol \cdot K})(298\ K)}{\left(\frac{720\ mm\ Hg}{760\ mm\ Hg / 1\ atm}\right)} = 25.8\ L$

$d = \frac{g}{L} = \frac{16.04\ g}{25.8\ L} = 0.621\ g/L$

18. A student obtains a gas in a 3.20 liter glass flask at 23.0 °C and 1.02 atm. He cools the gas in the flask to 11.5 °C. The pressure of the gas inside the flask at 11.5 °C is:

(A) 1.63 atm
(B) 1.02 atm
(C) 1.96 atm
(D) 0.980 atm
(E) 0.510 atm

296.2 K → 284.7 K

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$ $\quad \frac{1.02\ atm}{296.2\ K} = \frac{P_2}{284.7\ K}$

$P_2 = 0.980\ atm$

19. Consider the following five gases: CO (g) CO_2 (g) Xe (g) N_2O_4 (g) F_2 (g)

28 g/mol 44 g/mol 131 g/mol 92 g/mol 38 g/mol

Of these, the gas with the **highest** velocity at room temperature is:

↓ Lightest

(A) CO (g)
(B) CO_2 (g)
(C) Xe (g)
(D) N_2O_4 (g)
(E) F_2 (g)

20. A student combusts 88.2 grams of propane gas (C_3H_8) in excess oxygen gas to produce carbon dioxide gas and steam at 1.00 atm and 390 K. How many liters of steam are produced?

C_3H_{18} (g) + 5 O_2 (g) → 3 CO_2 (g) + 4 H_2O (g)

88.2 g → (1) → 2.00 mol → (2) → 8.00 mol → (3) → 256 L

(1) $88.2\text{ g}\left(\frac{1\text{ mol}}{44.1\text{ g}}\right) = 2.00\text{ mol}$

(2) $2.00\text{ mol } C_3H_8\left(\frac{4\text{ mol } H_2O}{1\text{ mol } C_3H_8}\right) = 8.00\text{ mol } H_2O$

(3) $PV = nRT \quad V = \frac{nRT}{P} = \frac{(8.00\text{ mol})\left(0.0821\frac{\text{L·atm}}{\text{mol·K}}\right)(390\text{ K})}{1\text{ atm}} = 256\text{ L}$

(A) 2.00 L of H_2O are produced
(B) 8.00 L of H_2O are produced
(C) 64.0 L of H_2O are produced
(D) 128 L of H_2O are produced
(E) 256 L of H_2O are produced

21. A sample of Cl_2 (g) is observed to effuse through a porous barrier in 0.855 minutes. Under the same conditions, the same number of moles of an unknown gas requires 1.16 minutes to effuse through the same barrier. Which of the following is the unknown gas?

(A) O_2 (g)
(B) N_2 (g)
(C) Cl_2 (g)
(D) H_2 (g)
(E) Xe (g)

$\frac{\text{time}_1}{\text{time}_2} = \frac{\sqrt{\text{Molar Mass}_1}}{\sqrt{\text{Molar Mass}_2}}$

$\frac{0.855\text{ min}}{1.16\text{ min}} = \frac{\sqrt{70.9\text{ g/mol}}}{\sqrt{MM_2}}$

$MM_2 = 131\text{ g/mol}$

22. The root-mean-square speed of Cl_2 (g) at 1.20 atm and 350 K is:

(A) 34.9 m/s.
(B) 123 m/s.
(C) 351 m/s.
(D) 1.23×10^6 m/s.
(E) 11.1 m/s.

$$u_{rms} = \sqrt{\frac{3RT}{\text{Molar Mass}}} = \sqrt{\frac{(3)(8.314\ \frac{kg \cdot m^2}{s^2 \cdot mol \cdot K})(350\ K)}{70.9 \times 10^{-3}\ g/mol}}$$

$$= 351\ \frac{m}{s}$$

23. Use the data in the table below to answer the following question:

	$\Delta H°_f$ (kJ/mol)
CO_2 (g)	- 393.5
C_3H_8 (g)	- 104.0
H_2O (l)	- 285.9

What is $\Delta H°_{reaction}$ for the following reaction?

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

$-104.0\ \frac{kJ}{mol}$ $\quad \emptyset \quad$ $-393.5\ \frac{kJ}{mol}$ $\quad -285.9\ \frac{kJ}{mol}$

(A) -783.4 kJ
(B) -2220.1 kJ
(C) -2428.1 kJ
(D) +2428.1 kJ
(E) + 575.4 kJ

$\Delta H°_{rxtn}$ = products - reactants

$$= \left[(3\ mol\ CO_2)(-393.5\ \tfrac{kJ}{mol}) + (4\ mol\ H_2O)(-285.9\ \tfrac{kJ}{mol})\right] -$$

$$\left[(1\ mol\ C_3H_8)(-104.0\ \tfrac{kJ}{mol}) + (5\ mol\ O_2)(\emptyset\ \tfrac{kJ}{mol})\right]$$

$$= -2220.1\ kJ$$

24. Which of the following equations is exothermic?

(A) $H_2O(l) \rightarrow H_2O(g)$ endo
(B) $CO_2(s) \rightarrow CO_2(g)$ endo
(C) $H_2O(s) \rightarrow H_2O(l)$ endo
(D) $CH_4(g) + 2\ O_2(g) \rightarrow CO_2(g) + 2\ H_2O(g)$

combustion - exothermic

25. How much heat is required to raise the temperature of 150.0 grams of water from 20.6 °C to 90.0°C?

(A) 43.6 kJ
(B) 12.9 kJ
(C) 10.4 kJ
(D) 2.16 kJ
(E) 20.8 kJ

$q = mc\Delta T = (150.0\,g)\left(4.18\frac{J}{g\cdot°C}\right)(90.0°C - 20.6°C)$

$= 43{,}600\,J$ or $43.6\,kJ$

26. The heat of formation ($\Delta H°_f$) of $Mg(OH)_2$ (s) is –925 kJ/mol. The chemical equation associated with this reaction is:

(A) $Mg\,(s) + 2\,O\,(g) + 2\,H\,(g) \rightarrow Mg(OH)_2\,(s)$
(B) $Mg\,(s) + 2\,(OH^-)\,(aq) \rightarrow Mg(OH)_2\,(s)$
(C) $Mg\,(s) + 2\,OH^-\,(aq) \rightarrow Mg(OH)_2\,(s)$
(D) $Mg\,(s) + 2\,O_2\,(g) + 2\,H_2\,(g) \rightarrow Mg(OH)_2\,(s)$
(E) $Mg\,(s) + O_2\,(g) + H_2\,(g) \rightarrow Mg(OH)_2\,(s)$

elements in their standard state → one mole of product

27. 25 kJ of heat will cause a 200.0 gram sample of H_2O (l) to increase from 0.0 °C to:

(A) 5000 °C
(B) 0.125 °C
(C) 125 °C
(D) 29.9 °C
(E) 8.00 °C

$q = mc\Delta T$

$25{,}000\,J = (200.0\,g)\left(4.18\frac{J}{g\cdot°C}\right)(T_f - 0.0°C)$

$T_f = 29.9\,°C$

28. Determine $\Delta H°$ for the reaction $3\ Fe_2O_3\ (s) + CO\ (g) \rightarrow CO_2\ (g) + 2\ Fe_3O_4\ (s)$, using:

3x $Fe_2O_3\ (s) + 3\ CO\ (g) \rightarrow 2\ Fe\ (s) + 3\ CO_2\ (g)$ $\Delta H° = -28.0$ kJ

2x $3\ Fe\ (s) + 4\ CO_2\ (g) \rightarrow 4\ CO\ (g) + Fe_3O_4\ (s)$ $\Delta H° = +12.5$ kJ

$3Fe_2O_3 + CO \rightarrow 6Fe + CO_2$ $\Delta H° = -28$ kJ $\times 3$

$6Fe + 8CO_2 \rightarrow 8CO + 2Fe_3O_4$ $\Delta H° = +12.5$ kJ $\times 2$

$3Fe_2O_3 + CO \rightarrow CO_2 + 2Fe_3O_4$ -59.0 kJ

(A) - 105.5 kJ
(B) - 74.8 kJ
(C) - 1570 kJ
(D) - 211.0 kJ
(E) -59.0 kJ

29. A student mixes two solutions: K_3PO_4 (aq) and $Ca(NO_3)_2$ (aq). The solid precipitate formed is:

(A) KNO_3 (s)
(B) $Ca_3(PO_4)_2$ (s)
(C) KOH (s)
(D) CaO (s)
(E) K_3PO_4 (s)

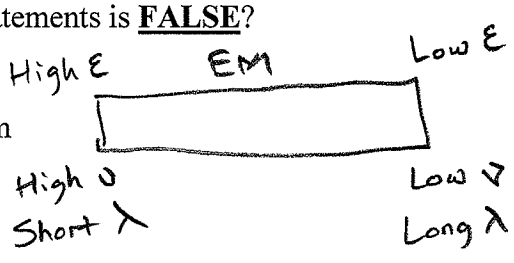
spec ion spec ion

$Ca_3(PO_4)_2(s)$

Unit 3 (Material Discussed after Exam 2)

30. Consider the electromagnetic spectrum. Which of the following statements is **FALSE**?

(A) ✓Blue light is lower in energy than x-rays
(B) ✓Violet light and red light have the same velocity in a vacuum
(C) ✓Yellow light has a lower frequency than x-rays
(D) Green light has a shorter wavelength than x-rays False
(E) ✓X-rays and green light have the same velocity in a vacuum



31. The frequency of red laser photons having a wavelength of 630 nm is:

$= 630 \times 10^{-9}\ m$

(A) $1.60 \times 10^{-9}\ \frac{1}{s}$
(B) $1.60 \times 10^{9}\ \frac{1}{s}$
(C) $4.76 \times 10^{14}\ \frac{1}{s}$
(D) $2.10 \times 10^{14}\ \frac{1}{s}$
(E) $8.91 \times 10^{14}\ \frac{1}{s}$

$$\nu = \frac{c}{\lambda} = \frac{3.00 \times 10^{8}\ \frac{m}{s}}{630 \times 10^{-9}\ m} = 4.76 \times 10^{14}\ \frac{1}{s}$$

32. The energy of **one mole** of blue photons having a wavelength of 480 nm is:

(A) 249 kJ.
(B) 284 kJ.
(C) 302 kJ.
(D) 604 kJ.
(E) 906 kJ.

$$\nu = \frac{c}{\lambda} = \frac{3.00 \times 10^{8}\ \frac{m}{s}}{480 \times 10^{-9}\ m} = 6.25 \times 10^{14}\ \frac{1}{s}$$

$$E = h\nu = \left(6.626 \times 10^{-34}\ \frac{J \cdot s}{photon}\right)\left(6.25 \times 10^{14}\ \frac{1}{s}\right) =$$

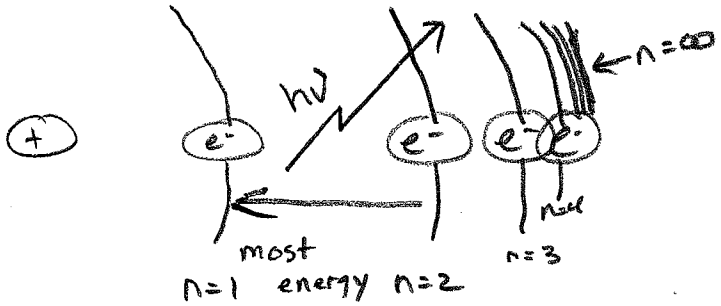
$$E = 4.14 \times 10^{-19}\ \frac{J}{photon}$$

For 1 mole ⇒

$$4.14 \times 10^{-19}\ \frac{J}{photon} * \frac{6.022 \times 10^{23}\ photons}{1\ mol} = 249{,}000\ J \text{ or } 249\ kJ$$

33. Consider the Bohr Model for the Hydrogen Atom. Which of the following electron transitions releases the **most** energy?

(A) n = 7 to n = 6
(B) n = 2 to n = 1
(C) n = 1 to n = 2
(D) n = 5 to n = 4
(E) n = 3 to n = 4



34. Consider the Bohr Model for the Hydrogen Atom. Which of the following electron transitions releases electromagnetic radiation with the **longest** wavelength?

lowest energy

(A) n = 7 to n = 6
(B) n = 2 to n = 1
(C) n = 1 to n = 2
(D) n = 5 to n = 4
(E) n = 3 to n = 4

35. Which of the following sets of quantum numbers is not valid?

(A) $n = 1, l = 0, m_l = 0, m_s = +½$
(B) $n = 3, l = 1, m_l = 0, m_s = +½$
(C) $n = 3, l = 2, m_l = -2, m_s = -½$
(D) $n = 2, l = 1, m_l = 0, m_s = +½$
(E) $n = 1, l = 1, m_l = 1, m_s = +½$

for $n=1$ l must be 0 $\quad l = 0 \ldots n-1$

36. Which set of four quantum numbers describes the orbital pictured below?

← p $\ell = 1$

(A) $n = 1, l = 0, m_l = 0, m_s = +½$ — no such orbital as a 1p
(B) $n = 1, l = 1, m_l = 0, m_s = +½$
(C) $n = 2, l = 1, m_l = 0, m_s = +½$
(D) $n = 2, l = 2, m_l = 0, m_s = +½$
(E) $n = 3, l = 2, m_l = 1, m_s = +½$

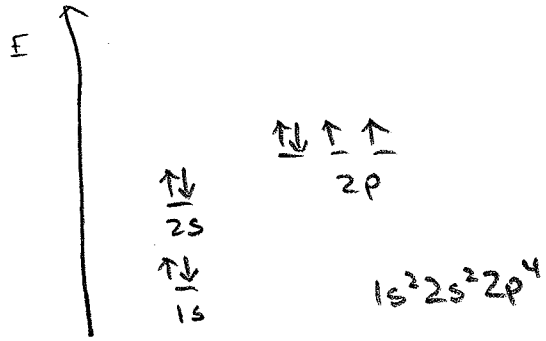
37. deBroglie's proposition regarding the nature of matter was:

(A) All matter exhibits a wavelength: $\lambda = h/mv$.
(B) All photons are in the visible region of the electromagnetic spectrum.
(C) The frequency of electromagnetic radiation is inversely proportional to the energy.
(D) All matter exhibits energy: $E=mc^2$.
(E) Matter that is greater in energy than UV is IR.

38. The ground-state electron configuration of an oxygen **atom** is:

→ 8 e⁻

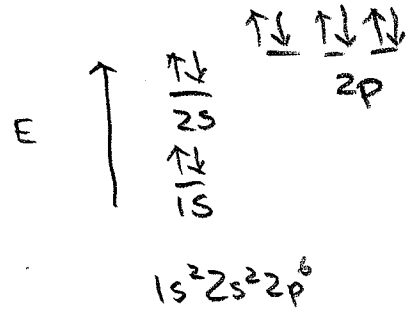
(A) $1s^2 2s^2 3s^2 3p^1$
(B) $1s^2 2s^2 3s^1$
(C) $1s^2 2s^2 2p^4$
(D) $1s^2 2s^2 2p^5$
(E) $1s^2 2s^2 3s^3$



39. The ground-state electron configuration of an oxide **ion** (O^{2-}) is:

(A) $1s^2 2s^2 2p^4$
(B) $1s^2 2s^2 3s^1$
(C) $1s^2 2s^2 2p^6$
(D) $1s^2 2s^2 2p^6 3s^2 3p^2$
(E) $1s^2 2s^2 2p^2$

10 e⁻



$1s^2 2s^2 2p^6$

40. Because of CH 121...

(A) Electrons excite me

(B) I have learned to be charming and get some dates

(C) I have a blister the size of a football on my brain

(D) I have learned to appreciate life; I have stopped to smell the roses, I have seen beauty where I had not seen beauty before, and I am grateful for those around me.

(E) OPPS

(B) I want to grow up and teach chemistry because I want to ~~promote lifelong learning~~ torment young people with OWL

Questions 1 through 40 each have 4 points attached. Any response to Question 40 will receive full credit (4 Points); even no response.

The point total for this exam is 160 points. See the grade sheet or CH 121 web syllabus for grade computation details.

Final exam keys, scores, and course grades will be posted on the CH 121 website as they become available.

Have an excellent and safe Winter Break ☺