Chemistry 123 | Spring 2005 | Oregon State University
Final Exam | June 8, 2005 | Dr. Richard Nafshun

DO NOT OPEN THIS EXAM UNTIL INSTRUCTED. CALCULATORS ARE NOT TO BE SHARED.

Test Form 3

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 blank.**

This exam consists of 36 multiple-choice questions. Each question has four points associated with it; except Question 36 which has five 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 in the appropriate stack. You may keep the exam packet, so please show your work and mark the answers you selected on it.

$K_a[HCOOH\ (aq)] = 1.80 \times 10^{-4}$
$K_a[CH_2ClCOOH\ (aq)] = 1.40 \times 10^{-3}$
$K_a[CH_3COOH\ (aq)] = 1.80 \times 10^{-5}$
$K_a[C_9H_8O_4\ (aq)] = 3.0 \times 10^{-4}$
$K_a[NH_4^+\ (aq)] = 5.6 \times 10^{-10}$
1 Amp = 1 Coulomb/second

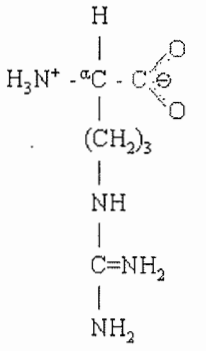
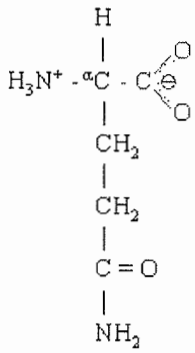
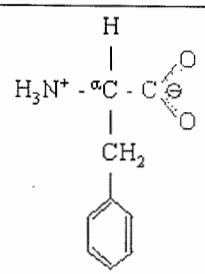
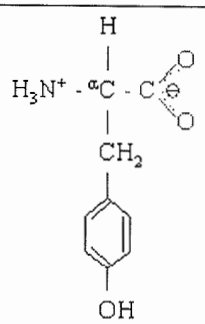
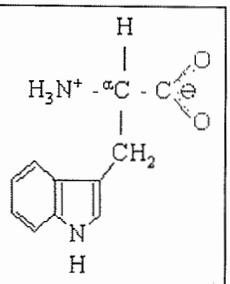
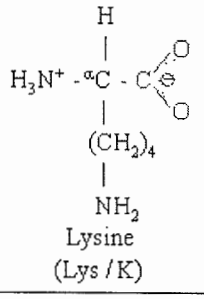
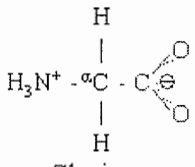
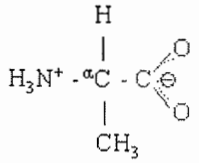
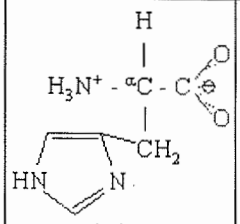
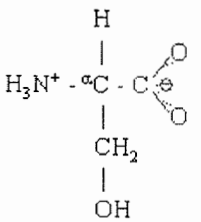
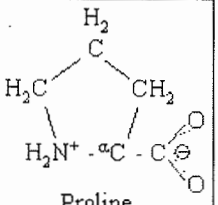
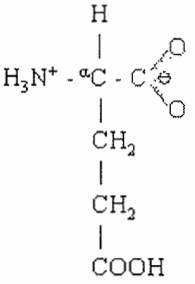
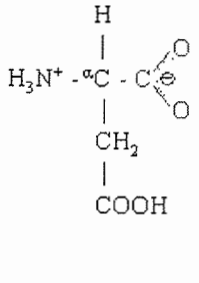
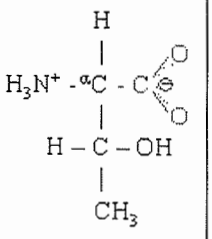
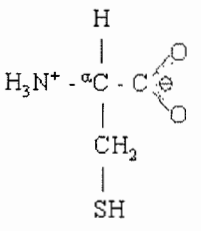
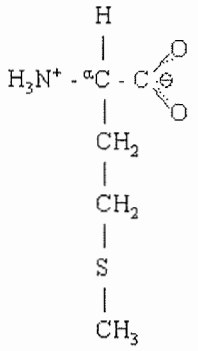
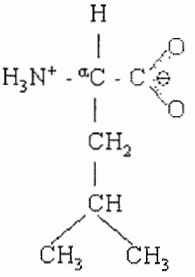
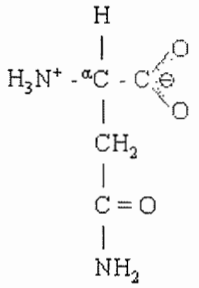
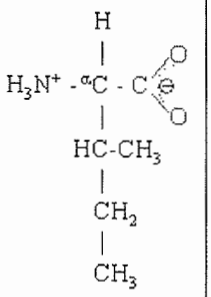
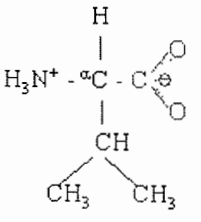
$K_a[C_6H_5COOH\ (aq)] = 6.30 \times 10^{-5}$
$K_b[NH_3\ (aq)] = 1.80 \times 10^{-5}$
$K_a[C_6H_8O_6\ (aq)] = 8.00 \times 10^{-5}$
$R = 8.314$ J/mol·K
F = 96,485 Coulombs/mole e^-
$N_A = 6.02 \times 10^{23}$

1 H Hydrogen 1.0079																2 He Helium 4.0026
3 Li Lithium 6.941	4 Be Beryllium 9.01218											5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.9984	10 Ne Neon 20.179
11 Na Sodium 22.98977	12 Mg Magnesium 24.305											13 Al Aluminum 26.9815	14 Si Silicon 28.0855	15 P Phosphorus 30.97376	16 S Sulfur 32.06	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.0983	20 Ca Calcium 40.08	21 Sc Scandium 44.9559	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.996	25 Mn Manganese 54.9380	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.70	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.72	32 Ge Germanium 72.59	33 As Arsenic 74.9216	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.9059	40 Zr Zirconium 91.22	41 Nb Niobium 92.9064	42 Mo Molybdenum 95.94	43 Tc Technetium 98.906	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.4	47 Ag Silver 107.868	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.69	51 Sb Antimony 121.75	52 Te Tellurium 127.60	53 I Iodine 126.9045	54 Xe Xenon 131.30
55 Cs Cesium 132.9054	56 Ba Barium 137.33	57–71 *Rare earths	72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.2	77 Ir Iridium 192.22	78 Pt Platinum 195.09	79 Au Gold 196.9665	80 Hg Mercury 200.59	81 Tl Thallium 204.37	82 Pb Lead 207.2	83 Bi Bismuth 208.9804	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium 226.0254	89–103 †Actinides	104 Rf Rutherfordium (261)	105 Ha Hahnium (262)	106 Sg Seaborgium (263)	107 Ns Neilsbohrium (262)	108 Hs Hassium (265)	109 Mt Meitnerium (266)	110 ‡ (269)	111 ‡			114				

→ Stable region?

57 La Lanthanium 138.9055	58 Ce Cerium 140.12	59 Pr Praseodymium 140.9077	60 Nd Neodymium 144.24	61 Pm Promethium 145	62 Sm Samarium 150.4	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.9254	66 Dy Dysprosium 162.50	67 Ho Holmium 164.9304	68 Er Erbium 167.26	69 Tm Thulium 168.9342	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967
89 Ac Actinium 227.0278	90 Th Thorium 232.0381	91 Pa Protactinium 231.0359	92 U Uranium 238.029	93 Np Neptunium 237.0482	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (254)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium 259	103 Lr Lawrencium 262

Reduction Half-Reaction	$E°$, volt
Acidic Solution	
$F_2\ (g) + 2\ e^- \rightarrow 2F^-\ (aq)$	+2.866
$O_3(g) + 2\ H^+(aq) + 2\ e^- \rightarrow O_2\ (g) + H_2O(l)$	+2.075
$S_2O_8^{2-}\ (aq) + 2\ e^- \rightarrow 2\ SO_4^{2-}\ (aq)$	+2.01
$H_2O_2\ (aq) + 2H^+\ (aq) + 2\ e^- \rightarrow 2\ H_2O(l)$	+1.763
$MnO_4^-(aq) + 8H^+\ (aq) + 5\ e^- \rightarrow Mn^{2+}(aq) + 4\ H_2O(l)$	+1.51
$PbO_2\ (s) + 4H^+\ (aq) + 2\ e^- \rightarrow Pb^{2+}(aq) + 2\ H_2O(l)$	+1.455
$Cl_2\ (g) + 2\ e^- \rightarrow 2\ Cl^-\ (aq)$	+1.358
$Cr_2O_7^{2-}\ (aq) + 14\ H^+\ (aq) + 6\ e^- \rightarrow 2\ Cr^{3+}(aq) + 7\ H_2O(l)$	+1.33
$MnO_2(s) + 4H^+\ (aq) + 2\ e^- \rightarrow Mn^{2+}(aq) + 2\ H_2O(l)$	+1.23
$O_2(g) + 4H^+\ (aq) + 4\ e^- \rightarrow 2\ H_2O(l)$	+1.229
$2\ IO_3^-\ (aq) + 12H^+\ (aq) + 10\ e^- \rightarrow I_2(s) + 6\ H_2O(l)$	+1.20
$Br_2(l) + 2\ e^- \rightarrow 2\ Br^-\ (aq)$	+1.065
$NO_3^-\ (aq) + 4H^+\ (aq) + 3\ e^- \rightarrow NO(g) + 2\ H_2O(l)$	+0.956
$Ag^+\ (aq) + e^- \rightarrow Ag(s)$	+0.800
$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$	+0.771
$O_2(g) + 2H^+\ (aq) + 2\ e^- \rightarrow H_2O_2(aq)$	+0.695
$I_2(s) + 2\ e^- \rightarrow 2\ I^-\ (aq)$	+0.535
$Cu^{2+}(aq) + 2\ e^- \rightarrow Cu(s)$	+0.340
$SO_4^{2-}\ (aq) + 4H^+\ (aq) + 2\ e^- \rightarrow 2\ H_2O(l) + SO_2(g)$	+0.17
$Sn^{4+}\ (aq) + 2\ e^- \rightarrow Sn^{2+}\ (aq)$	+0.154
$S(s) + 2H^+\ (aq) + 2\ e^- \rightarrow H_2S(g)$	+0.14
$2H^+(aq) + 2\ e^- \rightarrow H_2(g)$	0
$Pb^{2+}(aq) + 2\ e^- \rightarrow Pb(s)$	-0.125
$Sn^{2+}(aq) + 2\ e^- \rightarrow Sn(s)$	-0.137
$Co^{2+}(aq) + 2\ e^- \rightarrow Co(s)$	-0.277
$Fe^{2+}(aq) + 2\ e^- \rightarrow Fe(s)$	-0.440
$Zn^{2+}(aq) + 2\ e^- \rightarrow Zn(s)$	-0.763
$Al^{3+}(aq) + 3\ e^- \rightarrow Al(s)$	-1.676
$Mg^{2+}(aq) + 2\ e^- \rightarrow Mg(s)$	-2.356
$Na^+(aq) + e^- \rightarrow Na\ (s)$	-2.713
$Ca^{2+}(aq) + 2\ e^- \rightarrow Ca(s)$	-2.84
$K^+(aq) + e^- \rightarrow K(s)$	-2.924
$Li^+(aq) + e^- \rightarrow Li(s)$	-3.040
Basic Solution	
$O_3(g) + H_2O(l) + 2\ e^- \rightarrow O_2(g) + 2\ OH^-(aq)$	+1.246
$OCl^-(g) + H_2O(l) + 2\ e^- \rightarrow Cl^-(aq) + 2\ OH^-(aq)$	+0.890
$O_2(g) + 2\ H_2O(l) + 4\ e^- \rightarrow 4\ OH^-(aq)$	+0.401
$2\ H_2O(l) + 2\ e^- \rightarrow H_2(g) + 2\ OH^-(aq)$	-0.828

 Arginine (Arg / R)	 Glutamine (Gln / Q)	 Phenylalanine (Phe / F)	 Tyrosine (Tyr / Y)	 Tryptophan (Trp, W)
 Lysine (Lys / K)	 Glycine (Gly / G)	 Alanine (Ala / A)	 Histidine (His / H)	 Serine (Ser / S)
 Proline (Pro / P)	 Glutamic Acid (Glu / E)	 Aspartic Acid (Asp / D)	 Threonine (Thr / T)	 Cysteine (Cys / C)
 Methionine (Met / M)	 Leucine (Leu / L)	 Asparagine (Asn / N)	 Isoleucine (Ile / I)	 Valine (Val / V)

1. The pH of 0.540 M formic acid, HCOOH (aq), is:

(A) 0.0986.
(B) 2.01.
(C) 9.86×10^{-3}.
(D) 3.24×10^{-5}.
(E) 3.42.

	$HCOOH \rightleftarrows$	$HCOO^-$	$+ H^+$
I	0.540	0	0
C	$-x$	$+x$	$+x$
E	$0.540-x$	x	x

$$K_a = 1.80 \times 10^{-4} = \frac{x^2}{0.540 - x}$$

$x = [H^+] = 0.0099\ M$

$pH = -\log[H^+] = -\log(0.0099) = 2.01$

2. The pOH of 0.250 M hydrochloric acid, HCl (aq), is:

(A) 0.250.
(B) 1.250.
(C) 0.899.
(D) 13.75.
(E) 13.40.

$HCl \xrightarrow[100\%]{} H^+ + Cl^-$

0.250

$pH = -\log[H^+] = -\log(0.250) = 0.602$

$pH + pOH = 14$

$pOH = 14 - pH = 14 - 0.602 = 13.40$

3. A student titrates 0.5222 grams of KHP (potassium hydrogen phthalate; MW=204.2 g/mol) to the equivalence point with 24.08 mL of NaOH (aq). The concentration of the NaOH solution is:

(A) 0.09722 M.
(B) 0.1722 M.
(C) 0.1062 M.
(D) 1.722×10^{-4} M.
(E) 9.416 M.

$$M_{NaOH} V_{NaOH} = \frac{g_{KHP}}{MWT_{KHP}}$$

$$(M_{NaOH})(0.02408\ L) = \frac{0.5222\ g}{204.2\ g/mol}$$

$M_{NaOH} = 0.1062\ M$

4. The pH of a buffer system which is 2.50 M C_6H_5COOH (aq) and 2.80 M C_6H_5COONa (aq) is:

(A) 4.15.
(B) 3.36
(C) 5.05.
(D) 4.20
(E) 4.25

$C_6H_5COOH \rightleftarrows C_6H_5COO^- + H^+$

$$K_a = 6.30 \times 10^{-5} = \frac{[C_6H_5COO^-][H^+]}{[C_6H_5COOH]} = \frac{(2.80\ M)[H^+]}{(2.50\ M)}$$

$[H^+] = 5.625 \times 10^{-5}\ M$

$pH = -\log[H^+] = -\log(5.625 \times 10^{-5}) = 4.25$

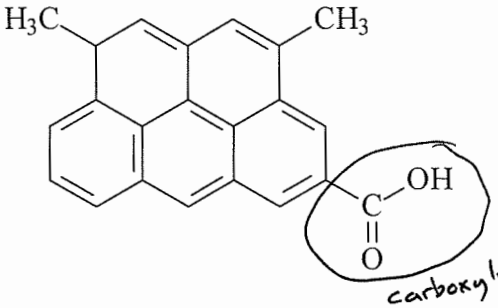
5. The pH of 1.00 M ammonium nitrate, NH_4NO_3 (aq), is:

(A) Greater than 7.00.
(B) Less than 7.00.
(C) 7.00.

Weak Acid ← NH_4^+ is a weak acid: $NH_4^+ \rightleftharpoons NH_3 + H^+$

NO_3^- is a spectator ion

6. The following molecule is:



carboxylic acid (weak acid)

(A) a strong acid
(B) a strong base
(C) a weak acid
(D) a weak base
(E) an amino acid — No amine group is present in our structure

7. A solution is made that is 3.5×10^{-5} M in $[Mg^{2+}]$ and 3.5×10^{-5} M in $[CO_3^{2-}]$. The K_{sp} of magnesium carbonate is 3.5×10^{-8}.

(A) a precipitate will form from the resulting solution.
(B) the resulting solution will be saturated
(C) the resulting solution is unsaturated and a precipitate will not form.

Q < K

$K_{sp} \rightarrow MgCO_3(s) \rightleftharpoons Mg^{2+}(aq) + CO_3^{2-}(aq)$

3.5×10^{-5} M $\quad 3.5\times10^{-5}$ M

$Q = \frac{prod}{react} = [Mg^{2+}][CO_3^{2-}]$ (solid)

$Q = (3.5\times10^{-5})(3.5\times10^{-5}) = 1.225\times10^{-9}$ $\quad Q < K$

8. Consider the "cold pack" reaction. Which of the following statements is correct?

$\Delta S = (+)$ more disorder $\Delta H = (+)$

NH_4NO_3 (s) → NH_4NO_3 (aq) $\quad \Delta H = +50.6$ kJ

endothermic

(A) The process is endothermic; entropy increases; and the process is spontaneous at high temperatures.
(B) The process is endothermic; entropy increases; and the process is spontaneous at low temperatures.
(C) The process is endothermic; entropy decreases; and the process is spontaneous at high temperatures.
(D) The process is exothermic; entropy decreases; and the process is spontaneous at low temperatures.
(E) The process is exothermic; entropy increases; and the process is spontaneous at all temperatures.

$\Delta G = \Delta H - T\Delta S$

$(+) \quad (+)$

higher T would make $\Delta G = (-)$

9. Which of the following processes exhibits an increase in entropy of the system?

(A) $NH_4NO_3\ (aq) \rightarrow NH_4NO_3\ (s)$
(B) $H_2O\ (l) \rightarrow H_2O\ (s)$
(C) $H_2O\ (s) \rightarrow H_2O\ (g)$ ← only process shown which goes to more disorde
(D) $2\ NO_2\ (g) \rightarrow N_2O_4\ (g)$
(E) $CH_3CH_2OH\ (g) \rightarrow CH_3CH_2OH\ (l)$

10. $\Delta H = +50.6$ kJ and $\Delta S = +105$ J/K for a process. Determine the temperature in which the system is at equilibrium?

(A) + 482 K.
(B) - 54.4 K.
(C) + 54.4 K.
(D) + 2.08 K.
(E) + 5.06 K.

$\Delta G = \Delta H - T\Delta S$

$0 = (+50.6\ kJ) - (T)\left(+0.105\ \frac{kJ}{K}\right)$

$T = 482\ K$

11. The oxidation number of each chromium in $Na_2Cr_2O_7$ is:

(A) +2.
(B) +3.
(C) +4.
(D) +5.
(E) +6.

+2 +12 -14

+12 for both chromium ions

Each is +6

12. Consider the reaction $3\ Ag^+\ (aq) + Al\ (s) \rightarrow Al^{3+}\ (aq) + 3\ Ag\ (s)$. The species being reduced is:

(A) $Ag^+\ (aq)$.
(B) Al (s).
(C) $Al^{3+}\ (aq)$.
(D) Ag (s).

$Ag^+ \rightarrow Ag^0$ reduced; gained an e^-

13. The calculated cell potential (voltage) for: $3\ Ag^{+}\ (aq) + Al\ (s) \rightarrow Al^{3+}\ (aq) + 3\ Ag\ (s)$ is:

(A) + 4.076 V.
(B) + 0.724 V.
(C) + 0.876 V.
(D) - 0.876 V.
(E) + 2.476 V.

difference is 2.476 V

$Ag^{+} + e^{-} \rightarrow Ag^{0}$ $+0.800$ V

$Al^{3+} + 3e^{-} \rightarrow Al^{0}$ -1.676 V

14. Consider fuel cells. Which of the following is **false**?

(A) A hydrogen fuel cell produces energy.
(B) The hydrogen fuel cell demonstrated in class produced water.
(C) The hydrogen fuel cell demonstrated in class contains platinum to facilitate the process.
(D) The fuel cell consists of tiny chambers that allow hydrogen gas to explode.
(E) The hydrogen fuel cell demonstrated in class input hydrogen and oxygen gases.

15. A student provides a current of 6.50 amps through a solution of $Cu(NO_3)_2$ (aq) for 5.00 hours. The voltage is such that copper metal is deposited at the cathode. The mass of copper deposited is:

$$5.00\,h\left(\frac{3600\,s}{1\,h}\right)\left(\frac{6.50\,C}{s}\right)\left(\frac{1\ mol\ e^-}{96{,}485\,C}\right)\left(\frac{1\ mol\ Cu}{2\ mol\ e^-}\right)\left(\frac{63.55\,g}{1\ mol\ Cu}\right) = 38.5\,g\ Cu$$

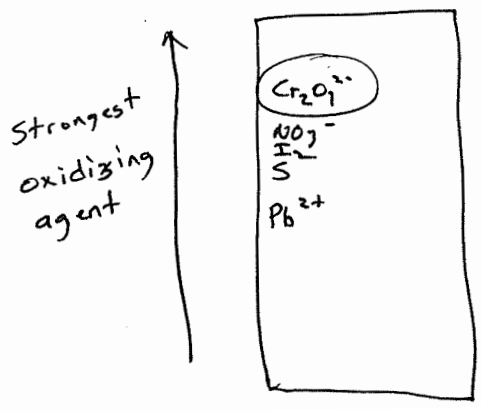
Amps

$Cu^{2+} + 2e^{-} \rightarrow Cu^{0}$

(A) 154 g.
(B) 616 g.
(C) 1.33 g.
(D) 21.3 g.
(E) 38.5 g.

16. Consider $Cr_2O_7^{2-}$ (aq), Pb^{2+} (aq), S (s), NO_3^{-} (aq), and I_2 (s). The strongest oxidizing agent is:

(A) $Cr_2O_7^{2-}$ (aq).
(B) Pb^{2+} (aq).
(C) S (s).
(D) NO_3^{-} (aq).
(E) I_2 (s).



17. When the reaction Cr (s) + $B_2O_5^{2-}$ (aq) → B^{2+} (aq) + Cr^{3+} (aq) is correctly balanced in acid,

(A) 3 protons (H^+) are consumed.
(B) 10 protons (H^+) are consumed.
(C) 20 protons (H^+) are consumed.
(D) 30 protons (H^+) are consumed.
(E) 42 protons (H^+) are consumed.

$4 \times \{ Cr^0 \rightarrow Cr^{3+} + 3e^- \}$

$3 \times \{ 4e^- + \underbrace{10H^+ + B_2O_5^{2-}}_{8+} \rightarrow \underbrace{2\,B^{2+} + 5\,H_2O}_{4+} \}$

$4Cr^0 + 12e^- + 30H^+ + 3B_2O_5^{2-} \rightarrow 4Cr^{3+} + 12e^- + 6\,B^{2+} + 15\,H_2O$

18. Gd-150 decays to produce an alpha particle and _____.

(A) Gd-146.
(B) Tb-150.
(C) Tb-146.
(D) Sm-150.
(E) Sm-146.

$^{150}_{64}Gd \rightarrow {}^{4}_{2}\alpha + {}^{146}_{62}Sm$

19. U-235 decays to produce a beta particle and _____.

(A) Pa-235.
(B) Th-235.
(C) Th-231.
(D) U-238.
(E) Np-235.

$^{235}_{92}U \rightarrow {}^{0}_{-1}\beta + {}^{235}_{93}Np$

20. A student obtains a sample of C-11 ($t_{1/2}$ = 20.39 minutes) containing 1.000 g. How long will it take for the sample to decay to 0.723 g of C-11?

(A) 8.54 minutes.
(B) 9.04 minutes.
(C) 9.54 minutes.
(D) 10.04 minutes.
(E) 10.54 minutes.

① Calc k $\quad \ln\left(\frac{1}{2}\right) = -k t_{1/2}$

$-0.6931 = -k(20.39\ min)$

$k = 0.0340\ min^{-1}$

② Calc t

$\ln\left(\frac{0.723\ g}{1.000\ g}\right) = -(0.0340\ min^{-1})(t)$

$t = 9.54\ min$

21. A radioactive decay series that begins with ^{232}Th ends with formation of the stable nuclide ^{208}Pb. How many alpha particle emissions and how many beta particle emissions are involved in the sequence of radioactive decays?

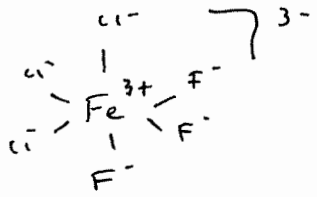
24 = 6α

$^{232}_{90}Th \rightarrow 6\ ^{4}_{2}\alpha + 4\ ^{0}_{-1}\beta + {}^{208}_{82}Pb$

(A) 7 alpha and 6 beta decays.
(B) 7 alpha and 4 beta decays.
(C) 7 alpha and 2 beta decays.
(D) 6 alpha and 2 beta decays.
(E) 6 alpha and 4 beta decays.

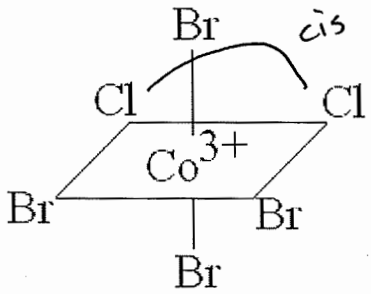
22. Consider coordination chemistry. Which of the following is not a Lewis base?
(A) H_2O.
(B) F^-.
(C) $C_2O_4^{2-}$ (ox; the oxalate ion).
(D) $NH_2CH_2CH_2NH_2$ (en; ethylenediamine).
(E) Cu^{2+}. ← Lewis acid (accepts pairs of e⁻)

23. The coordination number for Fe^{3+} in $[FeCl_3F_3]^{3-}$ is:



(A) 0.
(B) 1.
(C) 2.
(D) 3.
(E) 6.

24. The complex:



(A) is the cis- isomer and it is polar.
(B) is the trans- isomer and it is polar.
(C) is the mer- isomer and it is polar.
(D) is the fac- isomer and it is polar.
(E) is the fac- isomer and it is non-polar.

25. How many **unpaired** electrons are present in $[Fe(NO_2)_6]^{4-}$?
[Fe is the Fe^{2+} ion; (NO_2) is the NO_2^- ion; and the Fe^{2+} is **high spin**].

(A) 0.
(B) 1.
(C) 2.
(D) 3.
(E) 4.

Fe^{2+} → d electrons = 8 − 2 = 6

↑ ↑
— —
↑↓ ↑ ↑
— — —

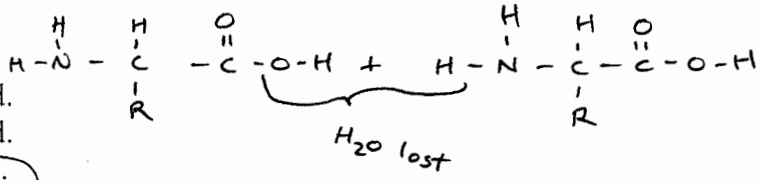
26. A compound having the chemical formula $C_{250}H_{502}$ is:

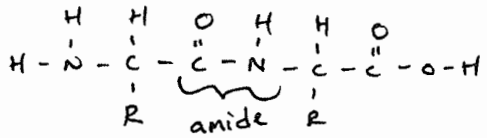
alkane C_nH_{2n+2}

(A) an alkane.
(B) a cyclic alkane.
(C) an alkene.
(D) a cyclic alkene.
(E) a cyclic alkyne.

27. When an amine and a carboxylic acid react in a condensation reaction (such as two amino acids reacting):

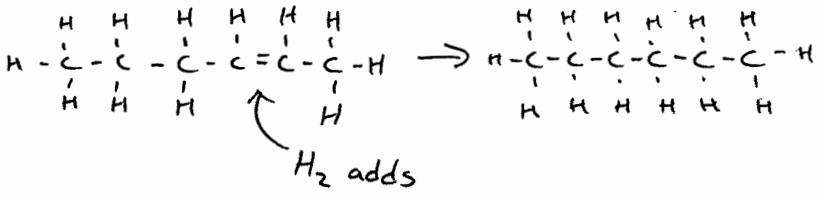
(A) an ester is formed.
(B) an alkane is formed.
(C) an alkene is formed.
(D) an amide is formed.
(E) an alcohol is formed.





28. What is the product produced from the addition of H_2 to 3-hexene?

(A) 2-hexene
(B) 4-hexane
(C) heptane
(D) 3-methylpentane
(E) hexane

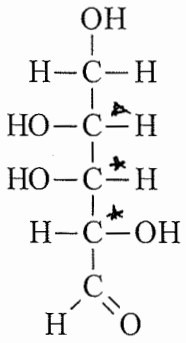


29. Pro and Cys:

(A) are isomers.
(B) are fission products.
(C) are amino acids.
(D) produce green crystals.
(E) are transition metals.

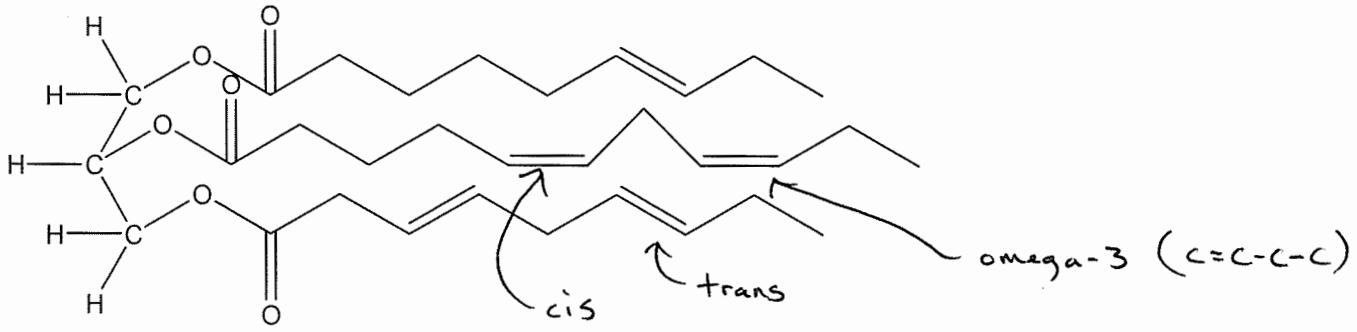
30. Identify the number of chiral carbons in the molecule below.

① 4 single bonds
② 4 different groups



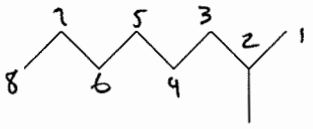
(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

31. Consider the fat molecule below. Which of the following is **false**?



(A) It is an omega-3 fat
(B) it is saturated → it is not saturated, it has C=C
(C) it contains cis bonds
(D) it contains trans bonds
(E) could undergo hydrogenation yes, it contains C=C

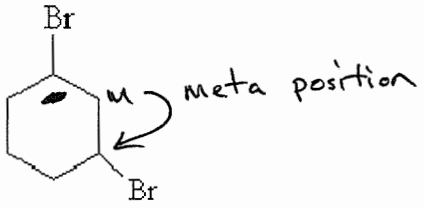
32. The name of:



2-methyloctane

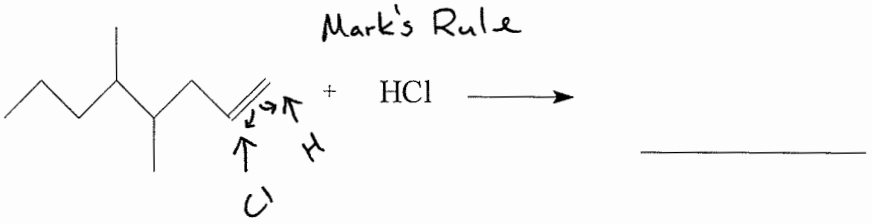
(A) is 7-methyloctane.
(B) is 6-ethyloctane.
(C) is 2-methyloctane.
(D) is 7-ethyloctane.
(E) is ethyloctane.

33. The name of:

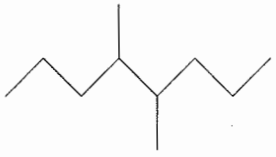


(A) is 1,2-dibromocyclohexane.
(B) is o-dibromocyclohexane.
(C) is m-dibromocyclohexane.
(D) is p-dibromocyclohexane.
(E) is o-dibromobenzene.

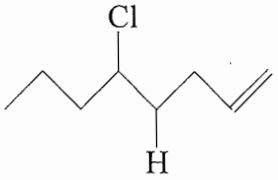
34. Complete the following addition reaction:



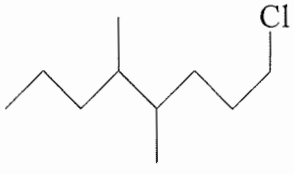
(A)



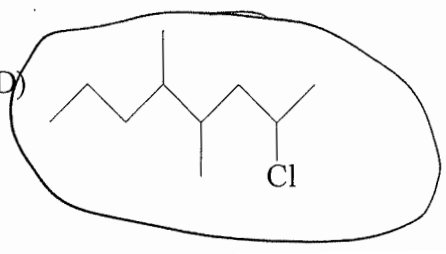
(B)



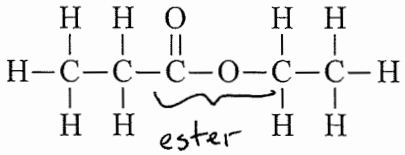
(C)



(D)



35. The molecule below:



(A) is an ester.
(B) is an amine.
(C) is an amide.
(D) is an aldehyde.
(E) is a ketone.

36. Well, well, well... my general chemistry courses are over. Now it's time to:

(A) Write my memoirs.
(B) Get a head start on that organic chemistry reading.
(C) Summer Break road trip to Fort Lauderdale. Not much time. Better take the Batmobile.
(D) Build a cyber being that will do all my laundry.
(E) Sleep for a really long time.

[Any response will receive full credit; even no response.]

Questions 1 through 35 have four points attached (140 total). Any response to Question 36 will receive full credit (5 Points); even no response. The point total for this exam is 145 points. See the grade sheet or CH 123 web syllabus for grade computation details. Final exam keys, scores, and course grades will be posted on the CH 123 website as they become available. Have a great life. Go out there and do some really cool stuff :)