

CHEM1902 - CHEMISTRY 1B (ADVANCED)

and

CHEM1904 - CHEMISTRY 1B (SPECIAL STUDIES PROGRAM)SECOND SEMESTER EXAMINATION**CONFIDENTIAL****NOVEMBER 2000****TIME ALLOWED: THREE HOURS**

GIVE THE FOLLOWING INFORMATION IN BLOCK LETTERS

SURNAME		OTHER NAMES	
SID NUMBER		FACULTY	TABLE NUMBER

INSTRUCTIONS TO CANDIDATES

- All questions are to be attempted. There are 13 pages of examinable material.
- Complete the written section of the examination paper in **INK**.
- Read each question carefully. Report the appropriate answer and show all relevant working in the space provided.
- The total score for this paper is 100. The possible score per page is shown in the adjacent tables.
- Each new question of the short answer section begins with a •.
- Electronic calculators, including programmable calculators, may be used. Students are warned, however, that credit may not be given, even for a correct answer, where there is insufficient evidence of the working required to obtain the solution. Logarithms may also be used.
- A Periodic Table and numerical values required for any question may be found on a separate data sheet.
- Pages 10 & 16 are for rough working only.

OFFICIAL USE ONLY**Multiple choice sections**

Page	Marks	
	Max	Gained
2-8	50	

Short answer section

Page	Marks		Marker
	Max	Gained	
9	8		
11	8		
12	4		
13	12		
14	9		
15	9		
Total	50		
Check Total			

		Marks
<ul style="list-style-type: none">Consider the compound with formula $[\text{PtBr}(\text{NH}_3)_3]\text{Cl}$.		3
Name the compound.		
Write the formula of the complex ion.		
Write the symbols of the ligand donor atoms.		
What is the d electron configuration of the metal ion in this complex?		
<ul style="list-style-type: none">Write balanced equations for each of the following reactions. If there is no reaction then write "no reaction".		5
Excess CN^- solution is added to a solution containing $[\text{Ag}(\text{NH}_3)_2]^+$.		
Excess dilute nitric acid is added to tin metal.		
H_2S is bubbled through a solution containing 4 M HCl and Cd^{2+} .		
Fluorine gas is bubbled through a dilute solution of NaBr.		
Excess Cu^{2+} is added to a 0.1 M solution of NH_3 .		

- Nickel hydroxide, Ni(OH)_2 , has a solubility product constant, K_{so} , of $6.5 \times 10^{-18} \text{ M}^3$ at 25°C . Calculate the molar solubility of Ni(OH)_2 at 25°C .

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ANSWER:

What is the pH of a saturated solution of Ni(OH)_2 at 25°C .

Calculate the molar solubility of Ni(OH)_2 in a solution buffered to a pH of 12.00.

ANSWER:

- A current of 2.00 A applied for 2.80 minutes is just sufficient to plate out all of the Cr^{3+} from 0.500 L of a solution. What was the original concentration of Cr^{3+} in that solution?

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ANSWER:

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY

- Draw the structures of the more stable and of the less stable intermediate formed when 1-butene is treated with HBr in an inert solvent.

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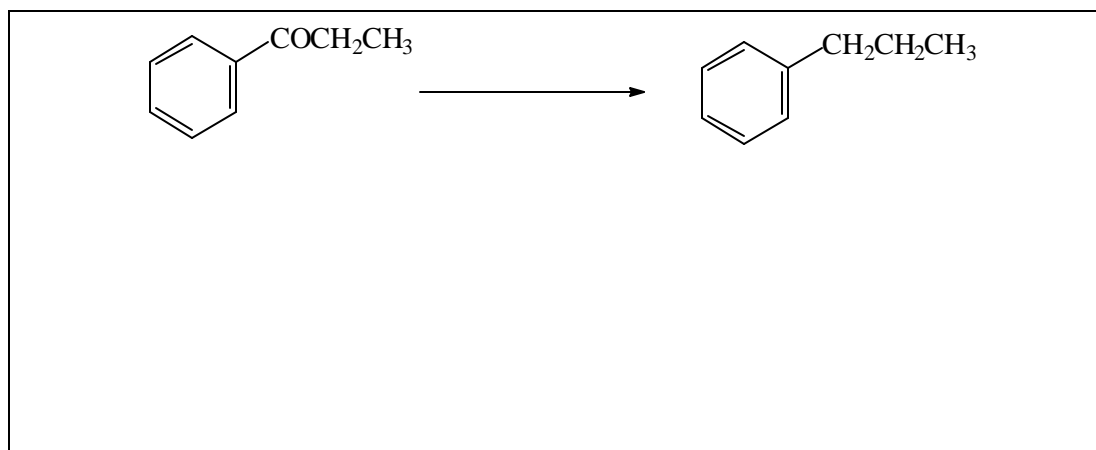
MORE STABLE	LESS STABLE
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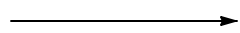
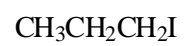
In Box **A** below, draw the structure of the product formed in the above reaction, and in Box **B** draw the structure of the additional product formed when 1-butene is treated with HBr in water.

A	B
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- With the aid of structure diagrams, show how you would effect the following conversions.

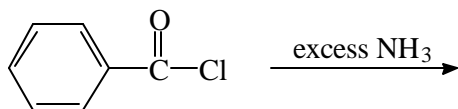
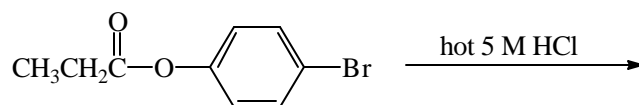
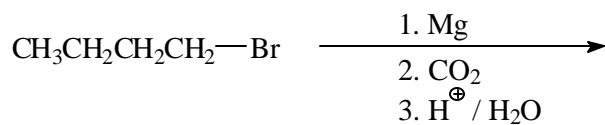
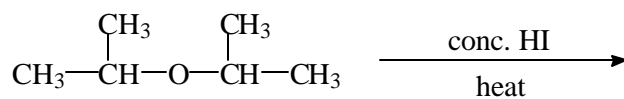
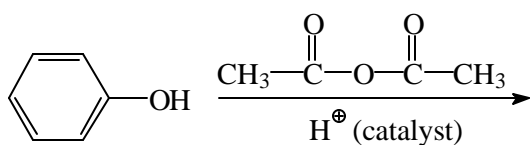
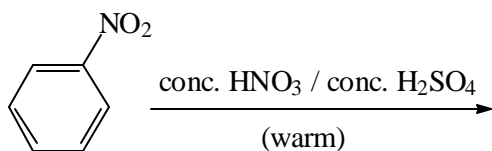
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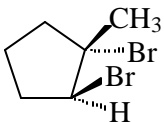
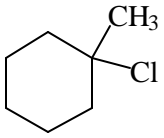
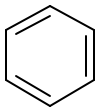
- Give the constitutional formulas of the major organic product(s) formed in the following reactions.

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- Complete the following table.

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STARTING MATERIAL	REAGENT/CONDITIONS	CONSTITUTIONAL FORMULAS OF MAJOR ORGANIC PRODUCT(S)
$\text{CH}_2=\text{CHCl}$	HCl gas	
	Br_2 in CCl_4	 (racemic)
$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{C}-\text{O}^\ominus \text{K}^\oplus \\ \\ \text{CH}_3 \end{array}$	$\text{CH}_3\text{CH}_2\text{I}$	
$\text{CH}_3-\text{C}\equiv\text{C}-\text{H}$	1. NaNH_2 / liquid NH_3 2. CH_3COCH_3 3. $\text{H}^+/\text{H}_2\text{O}$	
	warm 5 M NaOH	
	1. $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCl}/\text{AlCl}_3$ 2. $\text{H}^+/\text{H}_2\text{O}$	

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22/10(b)

The University of Sydney

CHEM1902/1904

SECOND SEMESTER EXAMINATION

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Numerical Data

Physical constants

Faraday constant = $F = 96485$ coulomb mole⁻¹

Electrode potentials

$F_2(g)$	+	$2e^-$	\rightleftharpoons	$2F^-(aq)$	$E^\circ = 2.89$ V		
$Cl_2(g)$	+	$2e^-$	\rightleftharpoons	$2Cl^-(aq)$	$E^\circ = 1.36$ V		
$O_2(g)$	+	$4H^+(aq)$	+	$4e^-$	\rightleftharpoons	$2H_2O(l)$	$E^\circ = 1.23$ V
$Pt^{2+}(aq)$	+	$2e^-$	\rightleftharpoons	$Pt(s)$	$E^\circ = 1.20$ V		
$Br_2(aq)$	+	$2e^-$	\rightleftharpoons	$2Br^-(aq)$	$E^\circ = 1.10$ V		
$Ag^+(aq)$	+	e^-	\rightleftharpoons	$Ag(s)$	$E^\circ = 0.80$ V		
$Fe^{3+}(aq)$	+	e^-	\rightleftharpoons	$Fe^{2+}(aq)$	$E^\circ = 0.77$ V		
$Cu^{2+}(aq)$	+	$2e^-$	\rightleftharpoons	$Cu(s)$	$E^\circ = 0.34$ V		
$2H^+(aq)$	+	$2e^-$	\rightleftharpoons	$H_2(g)$	$E^\circ = 0.00$ V		
$Ni^{2+}(aq)$	+	$2e^-$	\rightleftharpoons	$Ni(s)$	$E^\circ = -0.24$ V		
$Co^{2+}(aq)$	+	$2e^-$	\rightleftharpoons	$Co(s)$	$E^\circ = -0.28$ V		
$Zn^{2+}(aq)$	+	$2e^-$	\rightleftharpoons	$Zn(s)$	$E^\circ = -0.76$ V		
$2H_2O(l)$	+	$2e^-$	\rightleftharpoons	$H_2(g)$	+	$2OH^-(aq)$	$E^\circ = -0.83$ V
$Mn^{2+}(aq)$	+	$2e^-$	\rightleftharpoons	$Mn(s)$	$E^\circ = -1.18$ V		

**A periodic table is printed on the other side of this data sheet.
Atomic weights are included in the periodic table.**

PERIODIC TABLE OF THE ELEMENTS

November 2000

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 HYDROGEN H 1.008																	2 HELIUM He 4.003
3 LITHIUM Li 6.941	4 BERYLLIUM Be 9.012											5 BORON B 10.81	6 CARBON C 12.01	7 NITROGEN N 14.01	8 OXYGEN O 16.00	9 FLUORINE F 19.00	10 NEON Ne 20.18
11 SODIUM Na 22.99	12 MAGNESIUM Mg 24.31											13 ALUMINIUM Al 26.98	14 SILICON Si 28.09	15 PHOSPHORUS P 30.97	16 SULFUR S 32.07	17 CHLORINE Cl 35.45	18 ARGON Ar 39.95
19 POTASSIUM K 39.10	20 CALCIUM Ca 40.08	21 SCANDIUM Sc 44.96	22 TITANIUM Ti 47.88	23 VANADIUM V 50.94	24 CHROMIUM Cr 52.00	25 MANGANESE Mn 54.94	26 IRON Fe 55.85	27 COBALT Co 58.93	28 NICKEL Ni 58.69	29 COPPER Cu 63.55	30 ZINC Zn 65.39	31 GALLIUM Ga 69.72	32 GERMANIUM Ge 72.59	33 ARSENIC As 74.92	34 SELENIUM Se 78.96	35 BROMINE Br 79.90	36 KRYPTON Kr 83.80
37 RUBIDIUM Rb 85.47	38 STRONTIUM Sr 87.62	39 YTTRIUM Y 88.91	40 ZIRCONIUM Zr 91.22	41 NIObIUM Nb 92.91	42 MOLYBDENUM Mo 95.94	43 TECHNETIUM Tc [98.91]	44 RUTHENIUM Ru 101.07	45 RHODIUM Rh 102.91	46 PALLADIUM Pd 106.4	47 SILVER Ag 107.87	48 CADMIUM Cd 112.40	49 INDIUM In 114.82	50 TIN Sn 118.69	51 ANTIMONY Sb 121.75	52 TELLURIUM Te 127.60	53 IODINE I 126.90	54 XENON Xe 131.30
55 CAESIUM Cs 132.91	56 BARIUM Ba 137.34	57-71	72 HAFNIUM Hf 178.49	73 TANTALUM Ta 180.95	74 TUNGSTEN W 183.85	75 RHENIUM Re 186.2	76 OSMIUM Os 190.2	77 IRIDIUM Ir 192.22	78 PLATINUM Pt 195.09	79 GOLD Au 196.97	80 MERCURY Hg 200.59	81 THALLIUM Tl 204.37	82 LEAD Pb 207.2	83 BISMUTH Bi 208.98	84 POLONIUM Po [210.0]	85 ASTATINE At [210.0]	86 RADON Rn [222.0]
87 FRANCIUM Fr [223.0]	88 RADIUM Ra [226.0]	89-103	104 RUTHERFORDIUM Rf [261]	105 DUBNIUM Db [262]	106 SEABORGIUM Sg [266]	107 BOHRIUM Bh [262]	108 HASSIUM Hs [265]	109 MEITNERIUM Mt [266]									

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57 LANTHANUM La 138.91	58 CERIUM Ce 140.12	59 PRASEODYMIUM Pr 140.91	60 NEODYMIUM Nd 144.24	61 PROMETHIUM Pm [144.9]	62 SAMARIUM Sm 150.4	63 EUROPIUM Eu 151.96	64 GADOLINIUM Gd 157.25	65 TERBIUM Tb 158.93	66 DYSPROSIUM Dy 162.50	67 HOLMIUM Ho 164.93	68 ERBIUM Er 167.26	69 THULIUM Tm 168.93	70 YTERBIUM Yb 173.04	71 LUTETIUM Lu 174.97
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ACTINIDES

89 ACTINIUM Ac [227.0]	90 THORIUM Th 232.04	91 PROTACTINIUM Pa [231.0]	92 URANIUM U 238.03	93 NEPTUNIUM Np [237.0]	94 PLUTONIUM Pu [239.1]	95 AMERICIUM Am [243.1]	96 CURIUM Cm [247.1]	97 BERKELIUM Bk [247.1]	98 CALIFORNIUM Cf [252.1]	99 EINSTEINIUM Es [252.1]	100 FERMIUM Fm [257.1]	101 MENDELEVIUM Md [256.1]	102 NOBELIUM No [259.1]	103 LAWRENCIUM Lr [260.1]
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