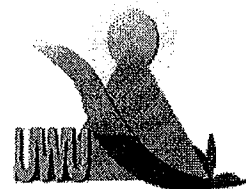
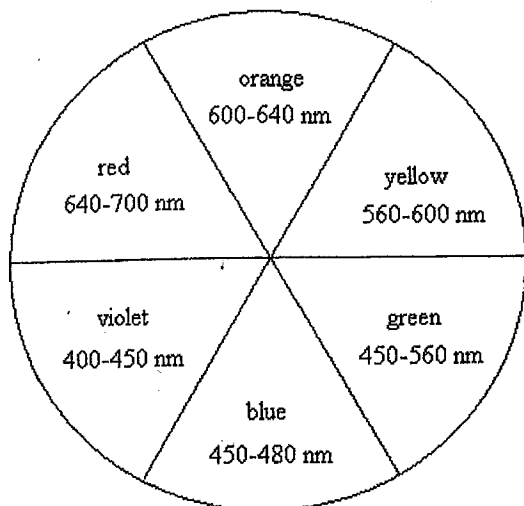


Uva Wellassa University, Sri Lanka
End Semester Examination – March 2011
SCT 231-1 Inorganic Chemistry



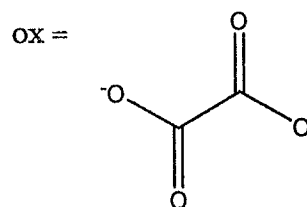
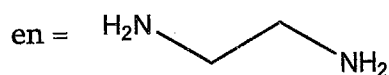
Time: One (01) hour

Total three (03) questions
Answer all questions.



Avogadro constant, $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$
Electron charge (e) = $1.6022 \times 10^{-19} \text{ C}$
Electron mass = $9.1095 \times 10^{-28} \text{ g}$
Universal gas constant, $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$
Boltzmann constant, $k = 1.3807 \times 10^{-23} \text{ J K}^{-1}$
Plank's constant, $h = 6.626 \times 10^{-34} \text{ m}^2 \text{ kg s}^{-1}$
Faraday's constant, $F = 9.6485 \times 10^4 \text{ C mol}^{-1}$
Velocity of light, $c = 2.998 \times 10^8 \text{ m s}^{-1}$
Proton mass = $1.67252 \times 10^{-24} \text{ g}$
Neutron mass = $1.67495 \times 10^{-24} \text{ g}$

The abbreviations given are;



01. a. Write the IUPAC names for the following coordination complexes.
- $\text{Na}_2[\text{Ni}(\text{CN})_4]$
 - $[\text{Mn}(\text{en})_2\text{I}_2]\text{ClO}_4$
 - $[\text{Co}(\text{NO}_2)_3(\text{NH}_3)_3]$
- b. Write the chemical formula for each of the following complexes.
- tetraammineplatinum(II) amminetrichloroplatinate(II)
 - diamminebis(ethylenediamine)cobalt(III) chloride
- c. The d^8 complexes $[\text{Ni}(\text{CN})_4]^{2-}$ and $[\text{NiCl}_4]^{2-}$ are square planar and tetrahedral respectively. Will these complexes be paramagnetic or diamagnetic?

- d. Draw all possible stereoisomers for each of the following complexes. Label the diastereoisomers as *cis* or *trans*. If no stereoisomers are possible, indicate this fact and draw the only structure possible.
- $[\text{Ni}(\text{NH}_3)_2\text{Cl}_2]$ (square planar)
 - $[\text{Fe}(\text{en})_2\text{Br}_2]^+$
- e. The colours observed for the four complexes of metal ion M^{3+} , $[\text{M}(\text{en})_3]^{3+}$, $[\text{M}(\text{ox})_3]^{3-}$, $[\text{MF}_6]^{3-}$, and $[\text{Ml}_6]^{3-}$, are blue, green, violet, and yellow (colours are not in order). Match the colour to the complex.

(40 marks)

02. a. Define the following terms.

- Isotope
- Radioactive decay

b. Write balanced equations for the following *nuclear reactions*:

- Fusion of a beryllium nucleus with an alpha particle (resulting in the formation of a new nucleus and emission of a gamma photon).
- Proton capture by a nitrogen-14 nucleus (resulting in the formation of a new nucleus and emission of a gamma photon).
- Neutron capture by a nitrogen-14 nucleus (resulting in the formation of a new nucleus and emission of a proton).

c. The carbon-14 decay rate of a sample obtained from a young tree is 0.260 disintegration per second per gram of the sample. Another wood sample prepared from an object recovered at an archaeological excavation gives a decay rate of 0.186 disintegration per second per gram of the sample. Half life of ^{14}C is 5730 years. What is the age of the object?

d. Write a short account on one of the following topics.

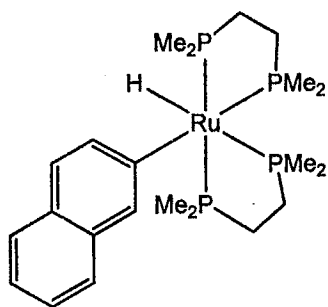
- Nuclear power generation.
- Carbon dating.

(40 marks)

03. a. Write the IUPAC name of the following organometallic complexes.

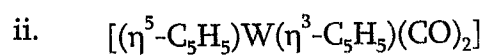
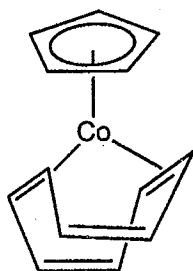


ii.



b. Determine the hapticity of the organic ligands in the following complexes.

i.



c. Write a short account on "Applications of organometallic complexes".

(20 marks)



Periodic Table of the Elements

hydrogen 1 H 1.0079	helium 2 He 4.0026	lithium 3 Li 6.941	beryllium 4 Be 9.0122	boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180	sodium 11 Na 22.990	magnesium 12 Mg 24.305	aluminum 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948	potassium 19 K 39.098	calcium 20 Ca 40.078	scandium 21 Sc 44.956	titanium 22 Ti 47.887	vandium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 76.96	bromine 35 Br 79.904	krrypton 36 Kr 83.80	rubidium 37 Rb 85.468	strontium 38 Sr 87.62	ytrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	silver 46 Ag 107.87	cadmium 47 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29	cesium 55 Cs 132.91	barium 56 Ba 137.33	lanthanum 57 La 138.91	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]	francium 87 Fr [223]	radium 88 Ra [226]	actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa [231]	uranium 92 U 238.03	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04	lutetium 71 Lu 174.97	berkelium 97 Bk [247]	californium 98 Cf [251]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	americium 95 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