



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences
Department of Environmental Health Science
BACHELOR OF SCIENCE IN ENVIRONMENTAL HEALTH

RESIT EXAMINATION PAPER 2017

TITLE OF PAPER : CHEMISTRY FOR HEALTH SCIENCES

COURSE CODE : EHS 111

DURATION : 2 HOURS

MARKS : 100

INSTRUCTIONS :

- : READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
- : ANSWER **ANY FOUR** QUESTIONS
- : EACH QUESTION **CARRIES 25** MARKS.
- : WRITE NEATLY & CLEARLY
- : NO PAPER SHOULD BE BROUGHT INTO OR OUT OF THE EXAMINATION ROOM.
- : BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

QUESTION ONE

- a. With reference to enthalpy changes, what does the term “standard conditions” mean? **[6 Marks]**
- b. Discuss why the dissolution of water in butene (C_4H_8) is inhibited? **[5 Marks]**
- c. The element X has three naturally occurring isotopes. The isotopic masses (amu) and % abundances of the isotopes are given in the table below. The average atomic mass of the element is _____ amu.(fill in the blank space)

Isotope	Abundance	Mass
^{159}X	30.60	159.37
^{163}X	15.79	162.79
^{164}X	53.61	163.92

[8 Marks]

- d. The reaction of $A \rightarrow B$ is first order in $[A]$. Consider the following data.

time (s)	$[A]$ (M)
0.0	1.60
10.0	0.40
20.0	0.10

- (i) What is the rate constant for this reaction? **[3 Marks]**
- (ii) What is the half-life of this reaction? **[3 Marks]**

QUESTION TWO

- a. Balance the redox reaction equation of potassium permanganate and a solution of a bromide salt in both acidic and basic media. Identify the reducing and oxidizing agents in this reaction. **[18 Marks]**
- b. In an experiment, 40.0 cm³ of 0.119 M barium hydroxide were mixed with 20.0 cm³ of 0.330 M aluminium sulphate. What is the total mass of the precipitate that forms?

[7 Marks]**QUESTION THREE**

- a. Use the electronegativity table to determine whether the following compounds are ionic or covalent (pure or polar) compounds. Provide a reason for each answer.
- (i) CO₂
 - (ii) HBr
 - (iii) CuCl
 - (iv) VO₂ **[3 × 4 Marks]**
- b. What is a process used for the synthesis of ammonia? **[3 Marks]**
- c. Give a correct expression for equilibrium-constant for the reaction below?
- $$2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$$
- [6 Marks]**
- d. State Le Châtelier's principle. **[4 Marks]**

QUESTION FOUR

a. Write out the full electron configuration of the following elements.

- (i) Pb
- (ii) Br₂
- (iii) Ag

[3 × 3 Marks]

b. If a sample containing only phosphorous and oxygen has percent composition 56.34% P & 43.66% O, is the sample P₄O₁₀? **[10 Marks]**

c. Determine the pH of a 0.35 M aqueous solution of CH₃NH₂ (methylamine). The K_b of methylamine is 4.4 × 10⁻⁴. **[6 Marks]**

QUESTION FIVE

a. What is an Arrhenius base and Arrhenius acid?

[5 Marks]

b. Complete the following statements;

- (i) Precision refers to _____.
- (ii) Accuracy refers to _____.
- (iii) A separation process that depends on differing abilities of substances to form gases is called _____.
- (iv) Gases and liquids share the property of _____.
- (v) A common English set of units for expressing velocity is miles/hour. The SI unit for velocity is _____.
- (vi) An atom of the most common isotope of gold, ¹⁹⁷Au, has _____ protons, _____ neutrons, and _____ electrons

- (vii) The elements in groups 2A, 6A, and 7A are called, _____, respectively.
- (viii) Gold has a density of 0.01932 kg/cm^3 . What volume (in cm^3) would be occupied by a 10.0 g sample of gold?
- (ix) Aluminum reacts with a certain nonmetallic element to form a compound with the general formula Al_2X_3 . The oxidation number of Element X must be _____.
- (x) The oxidation number of Nitrogen in NH_3 is _____.

[2 × 10 Marks]

SI Units and Conversions

Unit	Symbol	SI units
Newton	N	kg.m.s^{-2}
Pascal	Pa	$\text{kg.m}^{-1}.\text{s}^{-2}$ or N.m^{-2}
Joule	J	$\text{kg.m}^2.\text{s}^{-2}$ or N.m or AVs
Watt	W	$\text{kg.m}^2.\text{s}^{-3}$ or J.s^{-1}
Coulomb	C	A.s
Volt	V	$\text{kg.m}^2.\text{s}^{-3}.\text{A}^{-1}$ or J.C^{-1}
Ohm	Ω	$\text{kg.m}^2.\text{s}^{-3}.\text{A}^{-2}$ or v.A^{-1}
Amp	A	1Cs^{-1}

Pressure Units and conversion factors

Pa	1 Pa = 1 N.m^{-2}
Bar	1 bar = 10^5 Pa
Atmosphere	1 atm = 101.325 kPa
Torr	760 Torr = 1 atm
	760 Torr = 760 mmHg = 101.325 kPa

General data and Fundamental Constants

Gas constant	R	8.314 51 $\text{J.K}^{-1}.\text{mol}^{-1}$ 8.314 51 $\times 10^{-2}$ $\text{L.bar.K}^{-1}.\text{mol}^{-1}$ 8.205 78 $\times 10^{-2}$ $\text{L.atm.K}^{-1}.\text{mol}^{-1}$ 62.364 $\text{L.Torr.K}^{-1}.\text{mol}^{-1}$
Avogadro constant	N_A	$6.022169 \times 10^{23} \text{ mol}^{-1}$
Molar volume of an ideal gas at 0°C and 1 atm	V_m	22.414 dm^3

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1	H	1.0079	2	He	4.0026
3	Li	6.941	4	Be	9.0122
11	Na	22.990	12	Mg	24.305
19	K	39.098	20	Ca	40.078
37	Rb	85.47	38	Sr	87.62
55	Cs	132.91	56	Ba	137.33
87	Fr	(223)	88	Ra	226.03

Atomic Number Atomic Weight

21	Sc	44.956	22	Ti	47.88	23	V	50.942	24	Cr	51.996	25	Mn	54.938	26	Fe	55.847	27	Co	58.933	28	Ni	58.69	29	Cu	63.546	30	Zn	65.39
39	Y	88.906	40	Zr	91.224	41	Nb	92.906	42	Mo	95.94	43	Tc	(98)	44	Ru	101.07	45	Rh	102.91	46	Pd	106.42	47	Ag	107.87	48	Cd	112.41
57	La	138.91	72	Hf	178.49	73	Ta	180.95	74	W	183.85	75	Re	186.2	76	Os	190.2	77	Ir	192.22	78	Pt	195.08	79	Au	196.97	80	Hg	200.59
89	Ac	227.03																											

5	B	10.811	6	C	12.011	7	N	14.007	8	O	15.999	9	F	18.998	10	Ne	20.179
13	Al	26.982	14	Si	28.086	15	P	30.974	16	S	32.064	17	Cl	35.453	18	Ar	39.948
31	Ga	69.723	32	Ge	72.61	33	As	74.922	34	Se	78.96	35	Br	79.904	36	Kr	83.80
49	In	114.82	50	Sn	118.71	51	Sb	121.75	52	Te	127.60	53	I	126.90	54	Xe	131.29
81	Tl	204.38	82	Pb	207.2	83	Bi	208.98	84	Po	(209)	85	At	(210)	86	Rn	(222)

58	Ce	140.12	59	Pr	140.91	60	Nd	144.24	61	Pm	146.92	62	Sm	150.36	63	Eu	151.97	64	Gd	157.25	65	Tb	158.93	66	Dy	162.50	67	Ho	164.93	68	Er	167.26	69	Tm	168.93	70	Yb	173.04	71	Lu	174.97
90	Th	232.04	91	Pa	231.04	92	U	238.03	93	Np	237.05	94	Pu	(244)	95	Am	(254)	96	Cm	(247)	97	Bk	247	98	Cf	(251)	99	Es	(252)	100	Fm	(257)	101	Md	(258)	102	No	(259)	103	Lr	(260)

Electronegativity Table

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162
163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198
199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216
217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234
235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252
253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288
289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306
307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324
325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378
379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396
397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414
415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432
433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
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469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486
487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504
505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522
523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558
559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576
577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594
595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612
613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648
649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666
667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684
685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702
703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738
739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756
757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774
775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792
793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828
829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846
847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864
865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882
883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918
919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936
937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954
955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972
973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990
991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008
1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026
1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044
1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062
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1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098
1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116
1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134
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1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170
1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188
1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206
1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224
1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242
1243	1244	1245	1246	1247	1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260
1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278
1279	1280	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291	1292	1293	1294	1295	1296
1297	1298	1299	1300	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312	1313	1314
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1351	1352	1353	1354	1355	1356	1357	1358	1359	1360	1361	1362	1363	1364	1365	1366	1367	1368
1369	1370	1371	1372	1373	1374	1375	1376	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386
1387	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400	1401	1402	1403	1404
1405	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	1421	1422
1423	1424	1425	1426	1427	1428	1429	1430	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440
1441	1442	1443	1444	1445	144												