



UNIVERSITY OF KELANIYA - SRI LANKA
FACULTY OF SCIENCE

Bachelor of Science (General) Degree Examination – 2022
Academic Year 2020/2021-Semester I

CHEMISTRY
CHEM 11612/CHEM 11612(R)- Atomic Structure, Periodic Table and
Chemical Bonding

Number of Questions: Four (04)
Number of pages: Four (04)

Time: Two (02) hours
Answer all Four (04) questions.

(1). Answer **all** parts.

- (a) Briefly explain the following observations;
- (i) The melting point of MgCl_2 is 714°C and that of AlCl_3 is 192°C .
 - (ii) AlCl_3 exists as a dimer.
 - (iii) A solution of sodium in liquid ammonia at -37°C conducts electricity. (3 x 20 Marks)
- (b) (i) Arrange the following ions in the increasing order of their enthalpy of hydration.
 Mg^{2+} , Sr^{2+} , Be^{2+} , Ca^{2+} and Ba^{2+}
- (ii) Give reasons for your choice.
 - (iii) Among these ions, which one has the highest electrical conductivity in aqueous solution? Explain your answer briefly. (20 Marks)
- (c) Answer all parts.
- (i) With the aid of a suitable diagram show how the valence electrons and orbitals of Xe involve in the formation of compound XeF_4 .
 - (ii) What is the electron-pair geometry of XeF_4 ?
 - (iii) What is the molecular geometry (shape) of XeF_4 ?
 - (iv) What is the hybridization of valence orbitals of Xe in XeF_4 ?

(20 Marks)

(2) Answer **all** parts.

- (a) Beryllium hydride is covalent and polymeric.
- (i) Draw the polymeric structure of beryllium hydride.
 - (ii) What type of bonding is present in it? (10 Marks)
- (b) A common example of cyclic silicates or ring silicates is Beryl, $(\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18})$. Draw the structure of the silicate ion of Beryl and clearly indicate the negatively charged positions. (15 Marks)

- (c) The important allotropic forms of phosphorus are white phosphorus, and red phosphorus.

- (i) Draw the structures of white phosphorous and red phosphorus.
(ii) Which one of these two types of phosphorus is more reactive and why?

(20 Marks)

- (d) Phosphorus pentachloride (PCl_5) is prepared by passing an excess of dry chlorine into liquid trichloride (PCl_3).

- (i) Explain why PCl_5 is considered a Lewis acid.
(ii) On hydrolysis, PCl_5 forms phosphoric acid. Write the balanced chemical equation for the hydrolysis reaction of PCl_5 .
(iii) Draw the structure of pyrophosphorous acid ($\text{H}_4\text{P}_2\text{O}_5$) and indicate its basicity.
(iv) What is the oxidation state of P in pyrophosphorous acid?

(25 Marks)

- (e) Clathrates provide a convenient means of storing radioactive isotopes of Kr and Xe produced in nuclear reactors.

- (i) What are clathrate compounds of noble gases?
(ii) Ar, Kr, and Xe can form clathrate compounds with 1,4- dihydroxybenzene, but He and Ne do not form clathrate compounds. Explain.

(30 Marks)

- (3) Answer all parts.

- (a) For the $4p_x$ and $5d_{z^2}$ hydrogen-like atomic orbitals, sketch the followings:

- i. The radial Function, R
ii. The radial probability function, $4\pi r^2 R^2$
iii. Angular wave function, Y

(30 Marks)

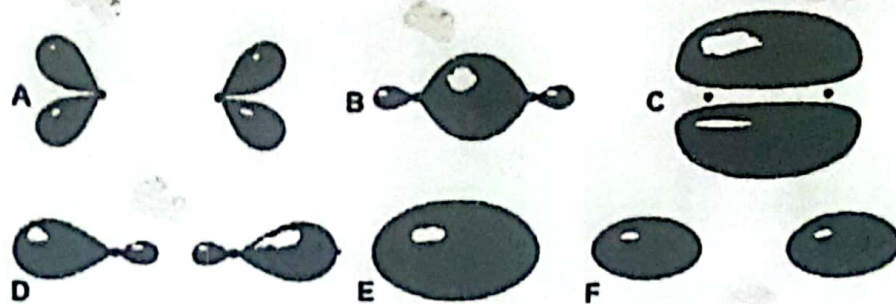
- (b) Calculate the effective nuclear charge (Z^*) experienced by the valence electrons in the three isoelectronic species: fluorine anion (F^-), neutral neon atom (Ne), and sodium cation (Na^+)?

(15 Marks)

- (c) Give the formula of an anion comprised of iodine and fluorine in which the iodine atom is sp^3d^2 hybridized.

(15 Marks)

- (d) The molecular orbitals depicted below are derived from $n = 2$ atomic orbitals.



- (i) Give the orbital designations.
- (ii) Rank the MOs in order of increasing energy for B_2 .

(20 Marks)

- (c) A single bond is almost always a sigma bond, and a double bond is almost always made up of a sigma bond and a pi bond. There are very few exceptions to this rule. Show that the C_2 molecule is an example for this exception.

(20 Marks)

(4) Answer all parts.

- (a) Considering that there is a strong $s-p$ mixing, sketch the molecular orbital energy diagram for NF and calculate the bond order. (Use appropriate labels for molecular orbitals and for starting atomic orbitals).

(30 Marks)

- (b) Barium (atomic mass = 137.33 u) metal crystallizes in a body-centered cubic lattice. The unit cell edge length is 502 pm, and the density of the metal is 3.50 g/cm^3 . Using this information, calculate

- (i) Radius of the barium atom
- (ii) Avogadro's number

(40 Marks)

- (c)
- (i) Calcium sulfide adopts the sodium chloride crystal structure. How many S^{2-} ions are in the CaS unit cell?
 - (ii) A face-centered cubic cell contains 8 X atoms at the corners of the cell and 6 Y atoms at the faces. What is the empirical formula of the solid?

(30 Marks)

Supporting Information

Slater's rules

1. For ns and np valence electrons:
 - a. Each electron in the same group contributes 0.35 to the value of S for each other electron in the group.
Exception: A $1s$ electron contributes 0.30 to S for another $1s$ electron.
 - b. Each electron in $n - 1$ groups contributes 0.85 to S .
 - c. Each electron in $n - 2$ or lower groups contributes 1.00 to S .
2. For nd and nf valence electrons:
 - a. Each electron in the same group contributes 0.35 to the value of S for each other electron in the group
 - b. Each electron in groups to the left contributes 1.00 to S .

1 IA	2 IIA	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIII	9 VIII	10 VIII	11 IB	12 IIB	13 IIIA	14 IIIA	15 IVA	16 VIA	17 VIA	18 VIIA	19 VIIA	20 IIA	21 IIIB	22 IVB	23 VB	24 VIB	25 VIIB	26 VIII	27 VIII	28 VIII	29 IB	30 IIB	31 IIIA	32 IIIA	33 IVA	34 IVA	35 VA	36 VA	37 VIA	38 VIA	39 VIIA	40 VIIA	41 VIIA	42 VIIA	43 VIIA	44 VIIA	45 VIIA	46 VIIA	47 VIIA	48 VIIA	49 VIIA	50 VIIA	51 VIIA	52 VIIA	53 VIIA	54 VIIA	55 VIIA	56 VIIA	57 VIIA	58 VIIA	59 VIIA	60 VIIA	61 VIIA	62 VIIA	63 VIIA	64 VIIA	65 VIIA	66 VIIA	67 VIIA	68 VIIA	69 VIIA	70 VIIA	71 VIIA	72 VIIA	73 VIIA	74 VIIA	75 VIIA	76 VIIA	77 VIIA	78 VIIA	79 VIIA	80 VIIA	81 VIIA	82 VIIA	83 VIIA	84 VIIA	85 VIIA	86 VIIA	87 VIIA	88 VIIA	89 VIIA	90 VIIA	91 VIIA	92 VIIA	93 VIIA	94 VIIA	95 VIIA	96 VIIA	97 VIIA	98 VIIA	99 VIIA	100 VIIA	101 VIIA	102 VIIA	103 VIIA	104 VIIA	105 VIIA	106 VIIA	107 VIIA	108 VIIA	109 VIIA	110 VIIA	111 VIIA	112 VIIA	113 VIIA	114 VIIA	115 VIIA	116 VIIA	117 VIIA	118 VIIA	119 VIIA	120 VIIA	121 VIIA	122 VIIA	123 VIIA	124 VIIA	125 VIIA	126 VIIA	127 VIIA	128 VIIA	129 VIIA	130 VIIA	131 VIIA	132 VIIA	133 VIIA	134 VIIA	135 VIIA	136 VIIA	137 VIIA	138 VIIA	139 VIIA	140 VIIA	141 VIIA	142 VIIA	143 VIIA	144 VIIA	145 VIIA	146 VIIA	147 VIIA	148 VIIA	149 VIIA	150 VIIA	151 VIIA	152 VIIA	153 VIIA	154 VIIA	155 VIIA	156 VIIA	157 VIIA	158 VIIA	159 VIIA	160 VIIA	161 VIIA	162 VIIA	163 VIIA	164 VIIA	165 VIIA	166 VIIA	167 VIIA	168 VIIA	169 VIIA	170 VIIA	171 VIIA	172 VIIA	173 VIIA	174 VIIA	175 VIIA	176 VIIA	177 VIIA	178 VIIA	179 VIIA	180 VIIA	181 VIIA	182 VIIA	183 VIIA	184 VIIA	185 VIIA	186 VIIA	187 VIIA	188 VIIA	189 VIIA	190 VIIA	191 VIIA	192 VIIA	193 VIIA	194 VIIA	195 VIIA	196 VIIA	197 VIIA	198 VIIA	199 VIIA	200 VIIA	201 VIIA	202 VIIA	203 VIIA	204 VIIA	205 VIIA	206 VIIA	207 VIIA	208 VIIA	209 VIIA	210 VIIA	211 VIIA	212 VIIA	213 VIIA	214 VIIA	215 VIIA	216 VIIA	217 VIIA	218 VIIA	219 VIIA	220 VIIA	221 VIIA	222 VIIA	223 VIIA	224 VIIA	225 VIIA	226 VIIA	227 VIIA	228 VIIA	229 VIIA	230 VIIA	231 VIIA	232 VIIA	233 VIIA	234 VIIA	235 VIIA	236 VIIA	237 VIIA	238 VIIA	239 VIIA	240 VIIA	241 VIIA	242 VIIA	243 VIIA	244 VIIA	245 VIIA	246 VIIA	247 VIIA	248 VIIA	249 VIIA	250 VIIA	251 VIIA	252 VIIA	253 VIIA	254 VIIA	255 VIIA	256 VIIA	257 VIIA	258 VIIA	259 VIIA	260 VIIA	261 VIIA	262 VIIA	263 VIIA	264 VIIA	265 VIIA	266 VIIA	267 VIIA	268 VIIA	269 VIIA	270 VIIA	271 VIIA	272 VIIA	273 VIIA	274 VIIA	275 VIIA	276 VIIA	277 VIIA	278 VIIA	279 VIIA	280 VIIA	281 VIIA	282 VIIA	283 VIIA	284 VIIA	285 VIIA	286 VIIA	287 VIIA	288 VIIA	289 VIIA	290 VIIA	291 VIIA	292 VIIA	293 VIIA	294 VIIA	295 VIIA	296 VIIA	297 VIIA	298 VIIA	299 VIIA	300 VIIA	301 VIIA	302 VIIA	303 VIIA	304 VIIA	305 VIIA	306 VIIA	307 VIIA	308 VIIA	309 VIIA	310 VIIA	311 VIIA	312 VIIA	313 VIIA	314 VIIA	315 VIIA	316 VIIA	317 VIIA	318 VIIA	319 VIIA	320 VIIA	321 VIIA	322 VIIA	323 VIIA	324 VIIA	325 VIIA	326 VIIA	327 VIIA	328 VIIA	329 VIIA	330 VIIA	331 VIIA	332 VIIA	333 VIIA	334 VIIA	335 VIIA	336 VIIA	337 VIIA	338 VIIA	339 VIIA	340 VIIA	341 VIIA	342 VIIA	343 VIIA	344 VIIA	345 VIIA	346 VIIA	347 VIIA	348 VIIA	349 VIIA	350 VIIA	351 VIIA	352 VIIA	353 VIIA	354 VIIA	355 VIIA	356 VIIA	357 VIIA	358 VIIA	359 VIIA	360 VIIA	361 VIIA	362 VIIA	363 VIIA	364 VIIA	365 VIIA	366 VIIA	367 VIIA	368 VIIA	369 VIIA	370 VIIA	371 VIIA	372 VIIA	373 VIIA	374 VIIA	375 VIIA	376 VIIA	377 VIIA	378 VIIA	379 VIIA	380 VIIA	381 VIIA	382 VIIA	383 VIIA	384 VIIA	385 VIIA	386 VIIA	387 VIIA	388 VIIA	389 VIIA	390 VIIA	391 VIIA	392 VIIA	393 VIIA	394 VIIA	395 VIIA	396 VIIA	397 VIIA	398 VIIA	399 VIIA	400 VIIA	401 VIIA	402 VIIA	403 VIIA	404 VIIA	405 VIIA	406 VIIA	407 VIIA	408 VIIA	409 VIIA	410 VIIA	411 VIIA	412 VIIA	413 VIIA	414 VIIA	415 VIIA	416 VIIA	417 VIIA	418 VIIA	419 VIIA	420 VIIA	421 VIIA	422 VIIA	423 VIIA	424 VIIA	425 VIIA	426 VIIA	427 VIIA	428 VIIA	429 VIIA	430 VIIA	431 VIIA	432 VIIA	433 VIIA	434 VIIA	435 VIIA	436 VIIA	437 VIIA	438 VIIA	439 VIIA	440 VIIA	441 VIIA	442 VIIA	443 VIIA	444 VIIA	445 VIIA	446 VIIA	447 VIIA	448 VIIA	449 VIIA	450 VIIA	451 VIIA	452 VIIA	453 VIIA	454 VIIA	455 VIIA	456 VIIA	457 VIIA	458 VIIA	459 VIIA	460 VIIA	461 VIIA	462 VIIA	463 VIIA	464 VIIA	465 VIIA	466 VIIA	467 VIIA	468 VIIA	469 VIIA	470 VIIA	471 VIIA	472 VIIA	473 VIIA	474 VIIA	475 VIIA	476 VIIA	477 VIIA	478 VIIA	479 VIIA	480 VIIA	481 VIIA	482 VIIA	483 VIIA	484 VIIA	485 VIIA	486 VIIA	487 VIIA	488 VIIA	489 VIIA	490 VIIA	491 VIIA	492 VIIA	493 VIIA	494 VIIA	495 VIIA	496 VIIA	497 VIIA	498 VIIA	499 VIIA	500 VIIA	501 VIIA	502 VIIA	503 VIIA	504 VIIA	505 VIIA	506 VIIA	507 VIIA	508 VIIA	509 VIIA	510 VIIA	511 VIIA	512 VIIA	513 VIIA	514 VIIA	515 VIIA	516 VIIA	517 VIIA	518 VIIA	519 VIIA	520 VIIA	521 VIIA	522 VIIA	523 VIIA	524 VIIA	525 VIIA	526 VIIA	527 VIIA	528 VIIA	529 VIIA	530 VIIA	531 VIIA	532 VIIA	533 VIIA	534 VIIA	535 VIIA	536 VIIA	537 VIIA	538 VIIA	539 VIIA	540 VIIA	541 VIIA	542 VIIA	543 VIIA	544 VIIA	545 VIIA	546 VIIA	547 VIIA	548 VIIA	549 VIIA	550 VIIA	551 VIIA	552 VIIA	553 VIIA	554 VIIA	555 VIIA	556 VIIA	557 VIIA	558 VIIA	559 VIIA	560 VIIA	561 VIIA	562 VIIA	563 VIIA	564 VIIA	565 VIIA	566 VIIA	567 VIIA	568 VIIA	569 VIIA	570 VIIA	571 VIIA	572 VIIA	573 VIIA	574 VIIA	575 VIIA	576 VIIA	577 VIIA	578 VIIA	579 VIIA	580 VIIA	581 VIIA	582 VIIA	583 VIIA	584 VIIA	585 VIIA	586 VIIA	587 VIIA	588 VIIA	589 VIIA	590 VIIA	591 VIIA	592 VIIA	593 VIIA	594 VIIA	595 VIIA	596 VIIA	597 VIIA	598 VIIA	599 VIIA	600 VIIA	601 VIIA	602 VIIA	603 VIIA	604 VIIA	605 VIIA	606 VIIA	607 VIIA	608 VIIA	609 VIIA	610 VIIA	611 VIIA	612 VIIA	613 VIIA	614 VIIA	615 VIIA	616 VIIA	617 VIIA	618 VIIA	619 VIIA	620 VIIA	621 VIIA	622 VIIA	623 VIIA	624 VIIA	625 VIIA	626 VIIA	627 VIIA	628 VIIA	629 VIIA	630 VIIA	631 VIIA	632 VIIA	633 VIIA	634 VIIA	635 VIIA	636 VIIA	637 VIIA	638 VIIA	639 VIIA	640 VIIA	641 VIIA	642 VIIA	643 VIIA	644 VIIA	645 VIIA	646 VIIA	647 VIIA	648 VIIA	649 VIIA	650 VIIA	651 VIIA	652 VIIA	653 VIIA	654 VIIA	655 VIIA	656 VIIA	657 VIIA	658 VIIA	659 VIIA	660 VIIA	661 VIIA	662 VIIA	663 VIIA	664 VIIA	665 VIIA	666 VIIA	667 VIIA	668 VIIA	669 VIIA	670 VIIA	671 VIIA	672 VIIA	673 VIIA	674 VIIA	675 VIIA	676 VIIA	677 VIIA	678 VIIA	679 VIIA	680 VIIA	681 VIIA	682 VIIA	683 VIIA	684 VIIA	685 VIIA	686 VIIA	687 VIIA	688 VIIA	689 VIIA	690 VIIA	691 VIIA	692 VIIA	693 VIIA	694 VIIA	695 VIIA	696 VIIA	697 VIIA	698 VIIA	699 VIIA	700 VIIA	701 VIIA	702 VIIA	703 VIIA	704 VIIA	705 VIIA	706 VIIA	707 VIIA	708 VIIA	709 VIIA	710 VIIA	711 VIIA	712 VIIA	713 VIIA	714 VIIA	715 VIIA	716 VIIA	717 VIIA	718 VIIA	719 VIIA	720 VIIA	721 VIIA	722 VIIA	723 VIIA	724 VIIA	725 VIIA	726 VIIA	727 VIIA	728 VIIA	729 VIIA	730 VIIA	731 VIIA	732 VIIA	733 VIIA	734 VIIA	735 VIIA	736 VIIA	737 VIIA	738 VIIA	739 VIIA	740 VIIA	741 VIIA	742 VIIA	743 VIIA	744 VIIA	745 VIIA	746 VIIA	747 VIIA	748 VIIA	749 VIIA	750 VIIA	751 VIIA	752 VIIA	753 VIIA	754 VIIA	755 VIIA	756 VIIA	757 VIIA	758 VIIA	759 VIIA	760 VIIA	761 VIIA	762 VIIA	763 VIIA	764 VIIA	765 VIIA	766 VIIA	767 VIIA	768 VIIA	769 VIIA	770 VIIA	771 VIIA	772 VIIA	773 VIIA	774 VIIA	775 VIIA	776 VIIA	777 VIIA	778 VIIA	779 VIIA	780 VIIA	781 VIIA	782 VIIA	783 VIIA	784 VIIA	785 VIIA	786 VIIA	787 VIIA	788 VIIA	789 VIIA	790 VIIA	791 VIIA	792 VIIA	793 VIIA	794 VIIA	795 VIIA	796 VIIA	797 VIIA	798 VIIA	799 VIIA	800 VIIA	801 VIIA	802 VIIA	803 VIIA	804 VIIA	805 VIIA	806 VIIA	807 VIIA	808 VIIA	809 VIIA	810 VIIA	811 VIIA	812 VIIA	813 VIIA	814 VIIA	815 VIIA	816 VIIA	817 VIIA	818 VIIA	819 VIIA	820 VIIA	821 VIIA	822 VIIA	823 VIIA	824 VIIA	825 VIIA	826 VIIA	827 VIIA	828 VIIA	829 VIIA	830 VIIA	831 VIIA	832 VIIA	833 VIIA	834 VIIA	835 VIIA	836 VIIA	837 VIIA	838 VIIA	839 VIIA	840 VIIA	841 VIIA	842 VIIA	843 VIIA	844 VIIA	845 VIIA	846 VIIA	847 VIIA	848 VIIA	849 VIIA	850 VIIA	851 VIIA	852 VIIA	853 VIIA	854 VIIA	855 VIIA	856 VIIA	857 VIIA	858 VIIA	859 VIIA	860 VIIA	861 VIIA	862 VIIA	863 VIIA	864 VIIA	865 VIIA	866 VIIA	867 VIIA	868 VIIA	869 VIIA	870 VIIA	871 VIIA	872 VIIA	873 VIIA	874 VIIA	875 VIIA	876 VIIA	877 VIIA	878 VIIA	879 VIIA	880 VIIA	881 VIIA	882 VIIA	883 VIIA	884 VIIA	885 VIIA	886 VIIA	887 VIIA	888 VIIA	889 VIIA	890 VIIA	891 VIIA	892 VIIA	893 VIIA	894 VIIA	895 VIIA	896 VIIA	897 VIIA	898 VIIA	899 VIIA	900 VIIA	901 VIIA	902 VIIA	903 VIIA	904 VIIA	905 VIIA	906 VIIA	907 VIIA	908 VIIA	909 VIIA	910 VIIA	911 VIIA	912 VIIA	913 VIIA	914 VIIA	915 VIIA	916 VIIA	917 VIIA	918 VIIA	919 VIIA	920 VIIA	921 VIIA	922 VIIA	923 VIIA	924 VIIA	925 VIIA	926 VIIA	927 VIIA	928 VIIA	929 VIIA	930 VIIA	931 VIIA	932 VIIA	933 VIIA	934 VIIA	935 VIIA	936 VIIA	937 VIIA	938 VIIA	939 VIIA	940 VIIA	941 VIIA	942 VIIA	943 VIIA	944 VIIA	945 VIIA	946 VIIA	947 VIIA	948 VIIA	949 VIIA	950 VIIA	951 VIIA	952 VIIA	953 VIIA	954 VIIA	955 VIIA	956 VIIA	957 VIIA	958 VIIA	959 VIIA	960 VIIA	961 VIIA	962 VIIA	963 VIIA	964 VIIA	965 VIIA	966 VIIA	967 VIIA	968 VIIA	969 VIIA	970 VIIA	971 VIIA	972 VIIA	973 VIIA	974 VIIA	975 VIIA	976 VIIA	977 VIIA	978 VIIA	979 VIIA	980 VIIA	981 VIIA	982 VIIA	983 VIIA	984 VIIA	985 VIIA	986 VIIA	987 VIIA	988 VIIA	989 VIIA	990 VIIA	991 VIIA	992 VIIA	993 VIIA	994 VIIA	995 VIIA	996 VIIA	997 VIIA	998 VIIA	999 VIIA	1000 VIIA
---------	----------	-----------	----------	---------	----------	-----------	-----------	-----------	------------	----------	-----------	------------	------------	-----------	-----------	-----------	------------	------------	-----------	------------	-----------	----------	-----------	------------	------------	------------	------------	----------	-----------	------------	------------	-----------	-----------	----------	----------	-----------	-----------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	--------------