



Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCE: CHEMISTRY (P2)

COMMON TEST

MARCH 2017

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

MARKS: 50

TIME: 1 hour

This question paper consists of 6 pages and a periodic table.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of FOUR questions. Answer ALL the questions in the ANSWER BOOK.
2. Number the answers correctly according to the numbering system used in this question paper.
3. Leave ONE line between two sub questions, for example between QUESTION 2.1 and QUESTION 2.2.
4. You may use a non-programmable calculator.
5. You may use appropriate mathematical instruments.
6. YOU ARE ADVISED TO USE THE ATTACHED DATA SHEET.
7. Show ALL formulae and substitutions in ALL calculations.
8. Round off your FINAL numerical answers to a minimum to TWO decimal places.
9. Give brief motivations, discussions, et cetera where required.
10. Write neatly and legibly.

QUESTION 1: MULTIPLE CHOICE

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write down only the letter (A – D) next to the question number (1.1 – 1.4) in the answer book, for example 1.1 D.

1.1 Which one of the following diatomic molecules is NOT possible to form?

- A Cl₂
- B He₂
- C O₂
- D N₂ (2)

1.2 The type of chemical bond between atoms whereby valence electrons move freely through the lattice structure is called a / an.....

- A Ionic Bond
- B Dipole-dipole
- C Metallic Bond
- D Dative covalent bond (2)

1.3 The shape of the PCl₅ molecule is...

- A Pentagonal
- B Tetrahedral
- C Trigonal planar
- D Trigonal bipyramidal (2)

1.4 Hydrogen bonds and Van der Waals forces are similar in that both

- A Are due to permanent dipoles.
 - B Are stronger than covalent bonds
 - C Are attractive forces between molecules
 - D Originate through the sharing of electrons between charges. (2)
- [8]**

QUESTION 2

2.1 The following diagram represents the bonding that takes place in a molecule.



The electronegativity difference between element **X** and oxygen is 1.0.

2.1.1 Define the term *Electronegativity*. (2)

2.1.2 Which group in the periodic table does element **X** belong to? Give a reason. (2)

2.1.3 Identify element **X** by means of a calculation. (3)

2.1.4 Is the molecule XO_2 polar or non-polar? Explain fully. (3)

2.2 Consider the following substances and answer questions set:



2.2.1 Which substance is ionic? (1)

2.2.2 Name the type of Van de Waals forces in $\text{NaCl}_{(aq)}$ (1)

2.2.3. Which of the above substances is most likely to dissolve in chloroform? (1)

2.2.4. Identify the substance with a dative covalent bond. (1)

2.2.5 Which compound has London forces between its molecules? (1)

2.2.6. Identify the substance with the lowest melting point. (1)

2.7 Draw Lewis dot structures for the following:

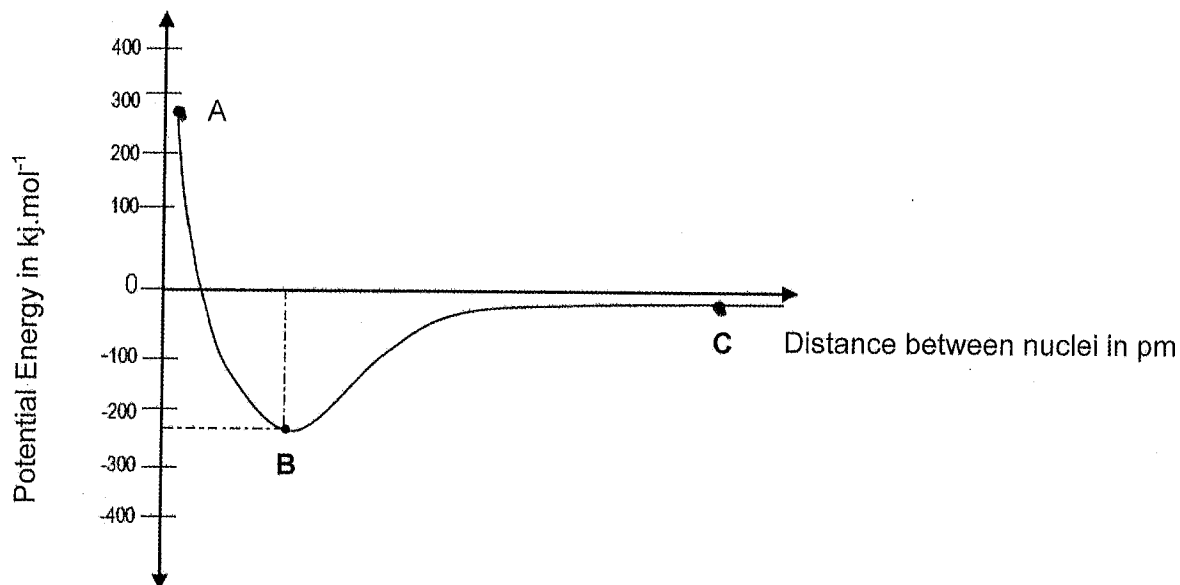
2.7.1 NH_3 (2)

2.7.2 HNO_3 . (3)

[21]

QUESTION 3

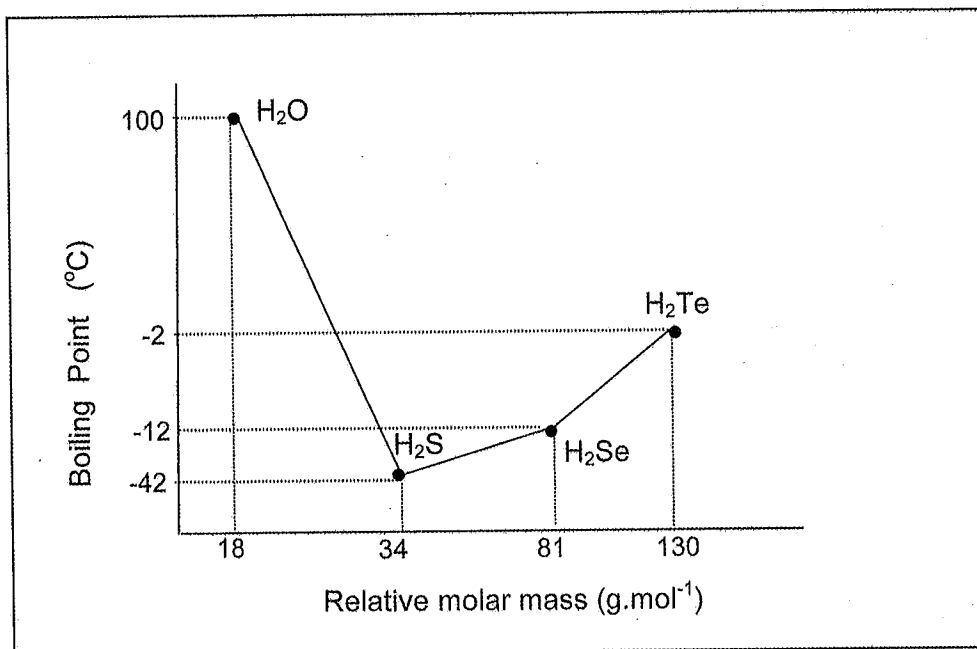
The graph below shows the changes in potential energy that take place when a hydrogen (H) atom approaches a chlorine (Cl) atom.



- 3.1 Define *bond length*. (2)
- 3.2 From the graph, write down the:
- 3.2.1 Energy, in $\text{kJ}\cdot\text{mol}^{-1}$, needed to break the H-Cl bond. (1)
- 3.2.2 Name of the potential energy at **B**. (1)
- 3.2.3 Explain why the potential energy decreases from **C** to **B**. (3)
- 3.2.4. At which point (**A**, **B** or **C**) are the repulsive forces the greatest? (1)
- 3.3 Which molecule has a greater bond length, HCl or HF?
Give a reason for the answer. (2)
- [10]**

QUESTION 4

4. Study the following graph of the boiling points of the hydrides of the group VI elements:



- 4.1. Define the term *Boiling point*. (2)
- 4.2. Explain, why the boiling point increase from H₂S to H₂Te? (3)
- 4.3. It is observed that boiling point of water does not follow the same trend as that of the other hydrides.
FULLY explain this deviation. (4)
- 4.4. Which hydride has the highest vapour pressure?
Give a reason. (2)

[11]**TOTAL MARKS: [50]**

THE PERIODIC TABLE OF ELEMENTS

1 2,1 H 1	2 (II) He 4	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)																																																																																																																																																																																																																																																																																																																																																																								
11 0,9 Na 23	12 1,2 Mg 24	19 0,8 K 39	20 1,0 Ca 40	21 0,2 Sc 45	22 1,5 Ti 48	23 1,0 V 51	24 1,0 Cr 52	25 1,5 Mn 55	26 1,0 Fe 56	27 1,0 Co 59	28 1,0 Ni 58	29 1,0 Cu 63,5	30 1,0 Zn 65	31 1,0 Ga 70	32 1,0 Ge 73	33 1,0 As 75	34 1,0 Se 79	35 1,0 Br 80	36 1,0 Kr 84																																																																																																																																																																																																																																																																																																																																																																						
37 0,8 Rb 86	38 1,0 Sr 88	39 1,0 Y 89	40 1,0 Zr 91	41 1,0 Nb 92	42 1,0 Mo 96	43 1,0 Tc 98	44 1,0 Ru 101	45 1,0 Rh 103	46 1,0 Pd 106	47 1,0 Ag 108	48 1,0 Cd 112	49 1,0 In 115	50 1,0 Sn 119	51 1,0 Sb 122	52 1,0 Te 128	53 1,0 I 127	54 1,0 Xe 131	55 1,0 Cs 133	56 1,0 Ba 137	57 1,0 La 139	58 1,0 Ce 140	59 1,0 Pr 141	60 1,0 Nd 144	61 1,0 Pm 145	62 1,0 Sm 150	63 1,0 Eu 152	64 1,0 Gd 157	65 1,0 Tb 159	66 1,0 Dy 163	67 1,0 Ho 165	68 1,0 Er 167	69 1,0 Tm 169	70 1,0 Yb 173	71 1,0 Lu 175																																																																																																																																																																																																																																																																																																																																																							
87 0,7 Fr 226	88 1,0 Ra 226	89 1,0 Ac 227	90 1,0 Th 232	91 1,0 Pa 231	92 1,0 U 238	93 1,0 Np 237	94 1,0 Pu 242	95 1,0 Am 243	96 1,0 Cm 247	97 1,0 Bk 247	98 1,0 Cf 251	99 1,0 Es 252	100 1,0 Fm 257	101 1,0 Md 288	102 1,0 No 289	103 1,0 Lr 260	104 1,0 Rf 261	105 1,0 Db 262	106 1,0 Sg 263	107 1,0 Bh 264	108 1,0 Hs 265	109 1,0 Mt 266	110 1,0 Ds 267	111 1,0 Rg 268	112 1,0 Cn 269	113 1,0 Nh 270	114 1,0 Fl 271	115 1,0 Mc 272	116 1,0 Lv 273	117 1,0 Ts 274	118 1,0 Og 274	119 1,0 Uu 285	120 1,0 Uub 286	121 1,0 Uut 287	122 1,0 Uuq 288	123 1,0 Uuq 289	124 1,0 Uub 290	125 1,0 Uut 291	126 1,0 Uuq 292	127 1,0 Uub 293	128 1,0 Uut 294	129 1,0 Uuq 295	130 1,0 Uub 296	131 1,0 Uut 297	132 1,0 Uuq 298	133 1,0 Uub 299	134 1,0 Uut 300	135 1,0 Uuq 301	136 1,0 Uub 302	137 1,0 Uut 303	138 1,0 Uuq 304	139 1,0 Uub 305	140 1,0 Uut 306	141 1,0 Uuq 307	142 1,0 Uub 308	143 1,0 Uut 309	144 1,0 Uuq 310	145 1,0 Uub 311	146 1,0 Uut 312	147 1,0 Uuq 313	148 1,0 Uub 314	149 1,0 Uut 315	150 1,0 Uuq 316	151 1,0 Uub 317	152 1,0 Uut 318	153 1,0 Uuq 319	154 1,0 Uub 320	155 1,0 Uut 321	156 1,0 Uuq 322	157 1,0 Uub 323	158 1,0 Uut 324	159 1,0 Uuq 325	160 1,0 Uub 326	161 1,0 Uut 327	162 1,0 Uuq 328	163 1,0 Uub 329	164 1,0 Uut 330	165 1,0 Uuq 331	166 1,0 Uub 332	167 1,0 Uut 333	168 1,0 Uuq 334	169 1,0 Uub 335	170 1,0 Uut 336	171 1,0 Uuq 337	172 1,0 Uub 338	173 1,0 Uut 339	174 1,0 Uuq 340	175 1,0 Uub 341	176 1,0 Uut 342	177 1,0 Uuq 343	178 1,0 Uub 344	179 1,0 Uut 345	180 1,0 Uuq 346	181 1,0 Uub 347	182 1,0 Uut 348	183 1,0 Uuq 349	184 1,0 Uub 350	185 1,0 Uut 351	186 1,0 Uuq 352	187 1,0 Uub 353	188 1,0 Uut 354	189 1,0 Uuq 355	190 1,0 Uub 356	191 1,0 Uut 357	192 1,0 Uuq 358	193 1,0 Uub 359	194 1,0 Uut 360	195 1,0 Uuq 361	196 1,0 Uub 362	197 1,0 Uut 363	198 1,0 Uuq 364	199 1,0 Uub 365	200 1,0 Uut 366	201 1,0 Uuq 367	202 1,0 Uub 368	203 1,0 Uut 369	204 1,0 Uuq 370	205 1,0 Uub 371	206 1,0 Uut 372	207 1,0 Uuq 373	208 1,0 Uub 374	209 1,0 Uut 375	210 1,0 Uuq 376	211 1,0 Uub 377	212 1,0 Uut 378	213 1,0 Uuq 379	214 1,0 Uub 380	215 1,0 Uut 381	216 1,0 Uuq 382	217 1,0 Uub 383	218 1,0 Uut 384	219 1,0 Uuq 385	220 1,0 Uub 386	221 1,0 Uut 387	222 1,0 Uuq 388	223 1,0 Uub 389	224 1,0 Uut 390	225 1,0 Uuq 391	226 1,0 Uub 392	227 1,0 Uut 393	228 1,0 Uuq 394	229 1,0 Uub 395	230 1,0 Uut 396	231 1,0 Uuq 397	232 1,0 Uub 398	233 1,0 Uut 399	234 1,0 Uuq 400	235 1,0 Uub 401	236 1,0 Uut 402	237 1,0 Uuq 403	238 1,0 Uub 404	239 1,0 Uut 405	240 1,0 Uuq 406	241 1,0 Uub 407	242 1,0 Uut 408	243 1,0 Uuq 409	244 1,0 Uub 410	245 1,0 Uut 411	246 1,0 Uuq 412	247 1,0 Uub 413	248 1,0 Uut 414	249 1,0 Uuq 415	250 1,0 Uub 416	251 1,0 Uut 417	252 1,0 Uuq 418	253 1,0 Uub 419	254 1,0 Uut 420	255 1,0 Uuq 421	256 1,0 Uub 422	257 1,0 Uut 423	258 1,0 Uuq 424	259 1,0 Uub 425	260 1,0 Uut 426	261 1,0 Uuq 427	262 1,0 Uub 428	263 1,0 Uut 429	264 1,0 Uuq 430	265 1,0 Uub 431	266 1,0 Uut 432	267 1,0 Uuq 433	268 1,0 Uub 434	269 1,0 Uut 435	270 1,0 Uuq 436	271 1,0 Uub 437	272 1,0 Uut 438	273 1,0 Uuq 439	274 1,0 Uub 440	275 1,0 Uut 441	276 1,0 Uuq 442	277 1,0 Uub 443	278 1,0 Uut 444	279 1,0 Uuq 445	280 1,0 Uub 446	281 1,0 Uut 447	282 1,0 Uuq 448	283 1,0 Uub 449	284 1,0 Uut 450	285 1,0 Uuq 451	286 1,0 Uub 452	287 1,0 Uut 453	288 1,0 Uuq 454	289 1,0 Uub 455	290 1,0 Uut 456	291 1,0 Uuq 457	292 1,0 Uub 458	293 1,0 Uut 459	294 1,0 Uuq 460	295 1,0 Uub 461	296 1,0 Uut 462	297 1,0 Uuq 463	298 1,0 Uub 464	299 1,0 Uut 465	300 1,0 Uuq 466	301 1,0 Uub 467	302 1,0 Uut 468	303 1,0 Uuq 469	304 1,0 Uub 470	305 1,0 Uut 471	306 1,0 Uuq 472	307 1,0 Uub 473	308 1,0 Uut 474	309 1,0 Uuq 475	310 1,0 Uub 476	311 1,0 Uut 477	312 1,0 Uuq 478	313 1,0 Uub 479	314 1,0 Uut 480	315 1,0 Uuq 481	316 1,0 Uub 482	317 1,0 Uut 483	318 1,0 Uuq 484	319 1,0 Uub 485	320 1,0 Uut 486	321 1,0 Uuq 487	322 1,0 Uub 488	323 1,0 Uut 489	324 1,0 Uuq 490	325 1,0 Uub 491	326 1,0 Uut 492	327 1,0 Uuq 493	328 1,0 Uub 494	329 1,0 Uut 495	330 1,0 Uuq 496	331 1,0 Uub 497	332 1,0 Uut 498	333 1,0 Uuq 499	334 1,0 Uub 500	335 1,0 Uut 501	336 1,0 Uuq 502	337 1,0 Uub 503	338 1,0 Uut 504	339 1,0 Uuq 505	340 1,0 Uub 506	341 1,0 Uut 507	342 1,0 Uuq 508	343 1,0 Uub 509	344 1,0 Uut 510	345 1,0 Uuq 511	346 1,0 Uub 512	347 1,0 Uut 513	348 1,0 Uuq 514	349 1,0 Uub 515	350 1,0 Uut 516	351 1,0 Uuq 517	352 1,0 Uub 518	353 1,0 Uut 519	354 1,0 Uuq 520	355 1,0 Uub 521	356 1,0 Uut 522	357 1,0 Uuq 523	358 1,0 Uub 524	359 1,0 Uut 525	360 1,0 Uuq 526	361 1,0 Uub 527	362 1,0 Uut 528	363 1,0 Uuq 529	364 1,0 Uub 530	365 1,0 Uut 531	366 1,0 Uuq 532	367 1,0 Uub 533	368 1,0 Uut 534	369 1,0 Uuq 535	370 1,0 Uub 536	371 1,0 Uut 537	372 1,0 Uuq 538	373 1,0 Uub 539	374 1,0 Uut 540	375 1,0 Uuq 541	376 1,0 Uub 542	377 1,0 Uut 543	378 1,0 Uuq 544	379 1,0 Uub 545	380 1,0 Uut 546	381 1,0 Uuq 547	382 1,0 Uub 548	383 1,0 Uut 549	384 1,0 Uuq 550	385 1,0 Uub 551	386 1,0 Uut 552	387 1,0 Uuq 553	388 1,0 Uub 554	389 1,0 Uut 555	390 1,0 Uuq 556	391 1,0 Uub 557	392 1,0 Uut 558	393 1,0 Uuq 559	394 1,0 Uub 560	395 1,0 Uut 561	396 1,0 Uuq 562	397 1,0 Uub 563	398 1,0 Uut 564	399 1,0 Uuq 565	400 1,0 Uub 566	401 1,0 Uut 567	402 1,0 Uuq 568	403 1,0 Uub 569	404 1,0 Uut 570	405 1,0 Uuq 571	406 1,0 Uub 572	407 1,0 Uut 573	408 1,0 Uuq 574	409 1,0 Uub 575	410 1,0 Uut 576	411 1,0 Uuq 577	412 1,0 Uub 578	413 1,0 Uut 579	414 1,0 Uuq 580	415 1,0 Uub 581	416 1,0 Uut 582	417 1,0 Uuq 583	418 1,0 Uub 584	419 1,0 Uut 585	420 1,0 Uuq 586	421 1,0 Uub 587	422 1,0 Uut 588	423 1,0 Uuq 589	424 1,0 Uub 590	425 1,0 Uut 591	426 1,0 Uuq 592	427 1,0 Uub 593	428 1,0 Uut 594	429 1,0 Uuq 595	430 1,0 Uub 596	431 1,0 Uut 597	432 1,0 Uuq 598	433 1,0 Uub 599	434 1,0 Uut 600	435 1,0 Uuq 601	436 1,0 Uub 602	437 1,0 Uut 603	438 1,0 Uuq 604	439 1,0 Uub 605	440 1,0 Uut 606	441 1,0 Uuq 607	442 1,0 Uub 608	443 1,0 Uut 609	444 1,0 Uuq 610	445 1,0 Uub 611	446 1,0 Uut 612	447 1,0 Uuq 613	448 1,0 Uub 614	449 1,0 Uut 615	450 1,0 Uuq 616	451 1,0 Uub 617	452 1,0 Uut 618	453 1,0 Uuq 619	454 1,0 Uub 620	455 1,0 Uut 621	456 1,0 Uuq 622	457 1,0 Uub 623	458 1,0 Uut 624	459 1,0 Uuq 625	460 1,0 Uub 626	461 1,0 Uut 627	462 1,0 Uuq 628	463 1,0 Uub 629	464 1,0 Uut 63