Bonding Test, HL Chemistry, Spring 2017 *[54 marks]*

You may use your calculator and the supplied tables from the Data booklet.

Multiple choice.

Circle the correct answer on your answer sheet.

1. *[1 mark]*

Markscheme

B

2. *[1 mark]*

Markscheme

A

3. *[1 mark]*

Markscheme

C

4. *[1 mark]*

Markscheme

C

5. *[1 mark]*

Markscheme

D

6. *[1 mark]*

Markscheme

C

7. *[1 mark]*

Markscheme

C

8. *[1 mark]*

Markscheme

C

9. *[1 mark]*

Markscheme

B

10. *[1 mark]*

Markscheme

B

11. *[1 mark]*

Markscheme

C

12. *[1 mark]*

Markscheme

A

13. *[1 mark]*

Markscheme

A

14. *[1 mark]*

Markscheme

D

15. *[1 mark]*

Markscheme

A

16. *[1 mark]*

Markscheme

A

17. *[1 mark]*

Markscheme

B

18. *[1 mark]*

Markscheme

D

19. *[1 mark]*

Markscheme

A

20. *[1 mark]*

Markscheme

A

21. *[1 mark]*

Markscheme

D

22. *[1 mark]*

Markscheme

C

23. *[1 mark]*

Markscheme

A

24. *[1 mark]*

Markscheme

A

25. *[1 mark]*

Markscheme

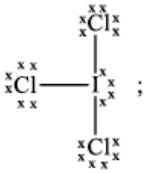
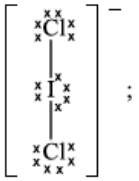
C

Free response.

Please write all answers in the provided answer box. Show all work on calculation questions.

26. *[4 marks]*

Markscheme

	ICl_3	ICl_2^-
Lewis (electron dot) structure	 ;	 ;
	Do not penalize for an incorrect shape for Lewis structures. *Accept lines, dots or crosses for electron pairs for both Lewis structures.* *Penalize missing lone pairs <u>on Cl</u> once only.* *Square brackets and negative charge must be shown for Lewis structure of $[ICl_2]^-$.*	
Name of shape	T-shaped;	linear;

No ECF for shape if Lewis structure is incorrect.

27a. *[2 marks]*

Markscheme

Shape: non-linear / bent / v-shaped / angular;

Bond angle: 117°;

Accept values from 115° to 119° / <u>just/slightly</u> less than 120°.

27b. *[1 mark]*

Markscheme

sp^2;

27c. *[1 mark]*

Markscheme

one is just one σ **and** one has one σ and one π;

Accept "both bonds comprise one σ and a shared π "/ OWTTE.

27d. *[2 marks]*

Markscheme

delocalization occurs / delocalized π-bond / (has two) resonance structures / it is a resonance hybrid;

length intermediate between H_2O_2 and O_2 / *OWTTE*;

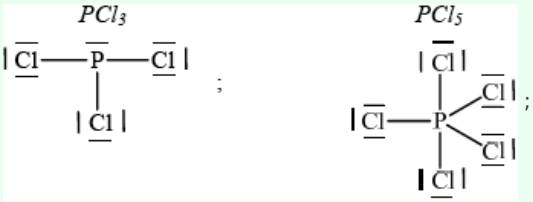
28a. *[1 mark]*

Markscheme

$1s^2 2s^2 2p^6 3s^2 3p^3$;

28b. *[2 marks]*

Markscheme



Penalize missing lone pairs on chlorine only once.

Accept any combination of lines, dots or crosses to represent electron pairs.

28c. *[4 marks]*

Markscheme

	PCl_3	PCl_5
Shape	trigonal/triangular pyramidal;	trigonal/triangular bipyramidal;
Bond angles	any angle between 99° and 108°;	90° **and** 120°; *ignore* 180°

Shape and bond angle must be consistent with the number of electron domains given in the diagram in (ii).

28d. *[1 mark]*

Markscheme

sp^3 (hybridization);

28e. *[3 marks]*

Markscheme

PCl_5 has higher melting point than PCl_3;

PCl_5 has stronger intermolecular/London/dispersion/van der Waals' forces;

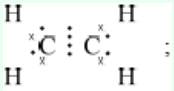
(because of) more electrons/greater mass;

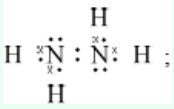
Accept the opposite argument for PCl_3.

*Award **[1 max]** for answers suggesting PCl_3 has higher melting point because it is polar and PCl_5 is not.*

29a. *[2 marks]*

Markscheme

(i)  ;

 ;

Accept x's, dots or lines for electron pairs

29b. *[4 marks]*

Markscheme

(i) (relative) measure of an atoms attraction for electrons;

in a covalent bond / shared pair;

(ii) C–H is less polar as C is less electronegative / N–H bond is more polar as N is more electronegative / difference in electronegativity is greater for N-H than C-H;

(iii) bond polarities cancel in C_2H_4 / *OWTTE*;

29c. *[2 marks]*

Markscheme

weaker van der Waals'/London/dispersion/intermolecular forces in ethene;

stronger (intermolecular) hydrogen bonding in hydrazine;

If no comparison between strengths then ***[1 max]***.