4.2 Resonance, Shapes & Giant Structures

Question Paper

Course	DP IB Chemistry
Section	4. Chemical Bonding & Structure
Topic	4.2 Resonance, Shapes & Giant Structures
Difficulty	Medium

Time allowed: 20

Score: /10

Percentage: /100

Question 1

The following equation shows the dissociation equilibrium of PCl_5.

$$PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g)$$

The percentage yield of PCl_3 varies with temperature.

At 160°C PCl_3 yield is 13% and at 300°C yield is 100%.

Which of the following rows is correct?

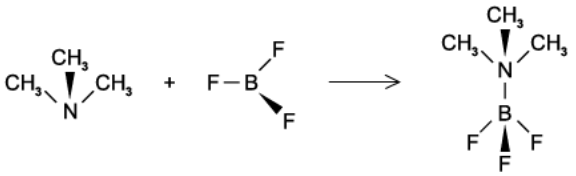
	The reaction is	Shape of PCl_3 molecule
A	exothermic	trigonal pyramidal
B	exothermic	trigonal planar
C	endothermic	trigonal pyramidal
D	endothermic	trigonal planar

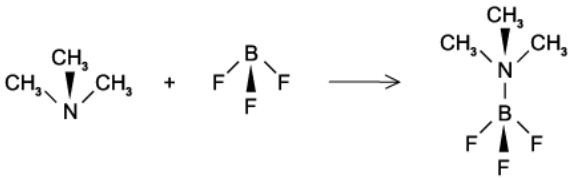
[1 mark]

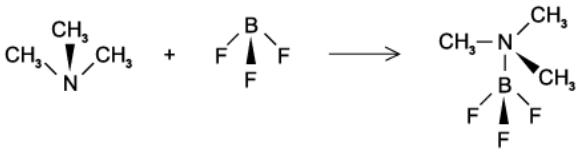
Question 2

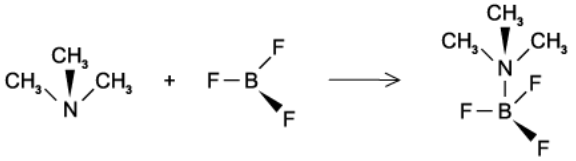
Boron trifluoride, BF_3, reacts with trimethylamine, $(CH_3)_3N$, to form a compound of formula $(CH_3)_3N.BF_3$.

How may this reaction be written using 3D structures to show the shapes of the reactants and products?

A 

B 

C 

D 

A.
B.
C.
D.

[1 mark]

Question 3

Which of the following statements about graphite are correct?

I. The carbon atoms are joined together by three covalent bonds
II. Graphite contains delocalised electrons
III. The C-C-C bond angle is 109.5°

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

[1 mark]

Question 4

Which statement below shows the correct information about diamond and silicon?

A. Diamond is macromolecular and silicon is simple molecular

B. The bond angles in the two structures are the same

C. The bond lengths are longer in C-C than in Si-Si

D. Diamond and silicon both conduct electricity due to delocalised electrons in their structure

[1 mark]

Question 5

How many lone pairs of electrons are there around the chlorine atom in a molecule of chlorine trifluoride, ClF_3?

A. 1

B. 2

C. 3

D. 0

[1 mark]

Question 6

Which one of these species has a bond angle of 120°?

A. H_3O^+

B. $TlBr_3^{2-}$

C. BCl_3

D. NH_3

[1 mark]

Question 7

Which of the following statements about silicon dioxide is correct?

I. Silicon dioxide forms a giant covalent network
II. Each silicon atom is covalently bonded to four oxygen atoms
III. Silicon dioxide molecules are V-shaped

A. I and II only

B. I and III only

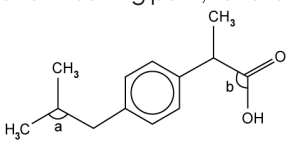
C. II and III only

D. I, II and III

[1 mark]

Question 8

Ibuprofen is an anti-inflammatory drug that is used for treating pain, fever and inflammation. The structure is shown below.



Ibuprofen

What are the correct bond angles for *a* and *b*?

	a	*b*
A	120°	120°
B	107°	109.5°
C	109.5°	120°
D	120°	109.5°

[1 mark]

Question 9

Which of the following molecules obeys the octet rule?

A. BF_3

B. HCN

C. $BeCl_2$

D. CS_2

[1 mark]

Question 10

Which row in the table is correct?

	Shape of diamond structure	Melting point of buckminsterfullerene	Bond angle in graphene
A	Square planar	Relatively high	90°
B	Tetrahedral	Relatively low	107°
C	Trigonal Planar	Relatively high	109.5°
D	Tetrahedral	Relatively low	120°

[1 mark]