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CHEMISTRY

MULTIPLE CHOICE - 8

CHEMICAL BONDING

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Chemical Bonding - 8

- 1)** In microwave ovens, the wave energy produced is absorbed by certain polar molecules.

Which of the following would absorb microwave energy?

(1) $\text{C}_2\text{H}_5\text{OH}$

(2) NaCl

(3) SiO_2

- 2)** Which of the following statements about the properties of graphite are correct?

(1) Graphite can be used as a lubricant.

(2) Graphite is a good conductor of electricity in the direction parallel to the planes containing hexagonal rings of carbon but a poor conductor perpendicular to these planes.

(3) Carbon-to-carbon distances between the planes of hexagonal rings are greater than carbon-to carbon distances within those planes.

- 3)** Silicon tetrachloride, SiCl_4 , is a liquid of low boiling point.

In the presence of water, it decomposes to form silicon (IV) oxide and hydrogen chloride.

What types of bonding occur in SiCl_4 (ℓ)?

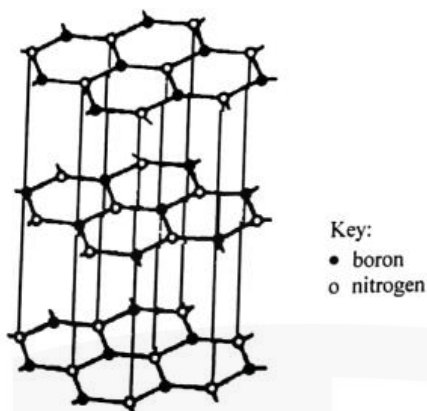
(1) co-ordinate bonding

(2) covalent bonding

(3) van der Waals' forces

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4. The diagram shows the structure of boron nitride which is similar to that of graphite.



Which properties is this compound likely to have?

- (1) It is a lubricant
- (2) It is transparent when pure
- (3) It is very hard

- 5 Which of the following contain hydrogen bonds?

- (1) $\text{NH}_4\text{Cl}(\text{s})$
- (2) $\text{NH}_3(\ell)$
- (3) $\text{HNO}_3(\ell)$

- 6 Which of the following are true statements about the structure of sodium chloride?

- (1) The Na^+ and Cl^- ions are both arranged in a face-centred cubic lattice.
- (2) The distance between the nuclei of adjacent ions is the sum of the two ionic radii.
- (3) Each Na^+ ion is surrounded by six Cl^- ions.

- 7 In which sequences are the molecules quoted in order of increasing bond angle within the molecule?

- (1) H_2O NH_3 CH_4
- (2) H_2O SF_6 BF_3
- (3) CH_4 CO_2 SF_6

8 Which statements concerning the lattice structures of graphite and diamond are correct?

- (1) The C-C-C bond angle between nearest neighbours is smaller in diamond than in graphite.
- (2) The shortest carbon-carbon bond occurs in diamond.
- (3) All covalent bonds in diamond are of the same strength but those in graphite are not.

9 Which are correct descriptions of the properties of anhydrous aluminium chloride?

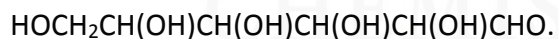
- (1) It dissolves in benzene to give a solution which conducts electricity.
- (2) It fumes in moist air due to the formation of hydrogen chloride.
- (3) In the vapour phase it has a covalent molecular structure.

10 The Group II metals have higher melting point than the Group I metals.

Which factors could contribute towards the higher melting points?

- (1) There are smaller interatomic distances in the metallic lattice of the Group II metals.
- (2) Two valency electrons are available from each Group II metal atom for bonding the atom into the metallic lattice.
- (3) Group II metals have the higher first ionization energies.

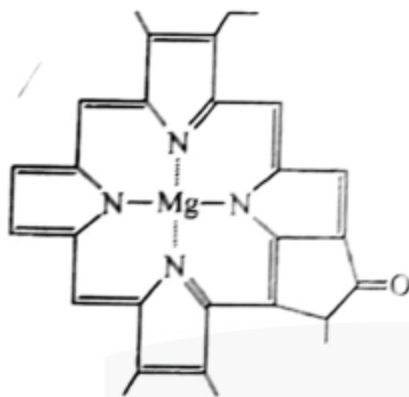
11 Glucose can be regarded as a simple molecular solid of formula



It is readily soluble in water because water molecules form hydrogen bonds to

- (1) the carbon atoms of the glucose molecules.
- (2) the oxygen atom of the C=O group of the glucose molecules.
- (3) the -OH groups of the glucose molecules.

12 A simplified structure of a molecule of chlorophyll is shown.



The magnesium atom is situated in the centre of a planar arrangement of nitrogen atoms. What does this structure suggest about the nature of the bonding around the magnesium atom?

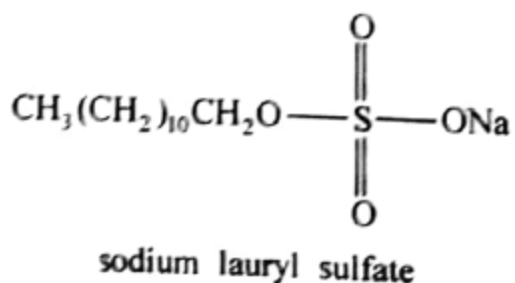
- (1) dative covalency
- (2) σ bonding
- (3) sp^3 hybridisation

13 After an oil spillage at sea, a liquid hydrocarbon layer floats on the surface of the water.

Which of the following statements helps to explain why liquid hydrocarbons both float on, and are less dense than, water?

- (1) There are only van der Waals' interactions between hydrocarbon molecules.
- (2) Hydrogen bonding between the molecules in liquid water causes them to pack close together.
- (3) Hydrocarbon molecules are not solvated by water.

14 Long-chain alkanes are converted on an industrial scale into alkylsulfates for use as detergents, e.g. sodium lauryl sulfate.



What deductions about the properties of this substances can be made from this structure?

- (1) Part of the structure is polar and is water attracting.
- (2) The alkyl chain is soluble in oil droplets.
- (3) All the C-C-C bond angles are tetrahedral.

15 Carbon forms double bonds with each of the Group VI elements oxygen, sulfur and selenium.

In each case, the double bond is polar.

In the molecules carbon dioxide (CO₂), carbonyl sulfide (COS) and carbonyl selenide (COSe), the polarities of these double bonds do not necessarily cancel.

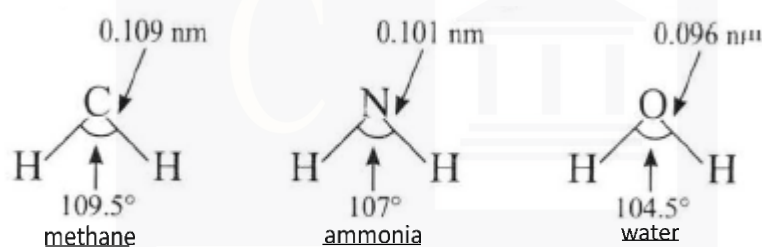
	Overall polarity of molecule
CO ₂	0
COS	0.71
COSe	0.73

Which factors could account for these observations?

- (1) The C=S bond is more polar than the C=Se bond
- (2) The C=O bond is more polar than C=S bond.
- (3) The C=Se bond is more polar than the C=O bond.

- 16) Which of the following properties of a aluminium chloride are related to the lack of an octet of electrons in the aluminium atom in this compound?
- (1) its tendency to dimerise
 - (2) its covalent character
 - (3) its acidity in aqueous solution

- 17) The bond lengths and bond angles in the molecules of methane, ammonia and water may be represented as follows.



What causes this trend in the bond angles shown?

- (1) increasing repulsion between hydrogen atoms as the bond length decreases
- (2) the number of non-bonding electron pairs in the molecule
- (3) a non-bonding electron pair having a greater repulsive force than a bonding electron pair.

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- Founder & CEO of Chemistry Online Tuition Ltd.
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