CHEMICAL BONDS WORKSHEET

Part A. SUPPLEMENTARY QUESTIONS

1. What kinds of attractive forces must be overcome to melt the following solids?

Si: Cl_2: PF_3:

Al: MgF_2: diamond:

2. Which compound would you expect to be the most ionic in character?

KF KBr KCl KI

3. Which substance in each of the following pairs has the higher melting point?

a) Cl_2 or Br_2 **b)** CF_4 or CCl_4

c) F_2 or Br_2 **d)** ClF, Cl_2, ClI

4. Which substance in each of the following pairs has the higher melting point?

a) LiCl or NaCl **b)** KCl or CaCl

c) KCl or KBr **d)** Na or Mg

5. Which substance in each of the following pairs has the higher melting point?

a) H_2 or Cl_2 **b)** SiF_4 or $SiBr_4$

c) $SrCl_2$ or $SiCl_4$ **d)** $SiCl_4$ or SCl_4

6. Which substance in each of the following pairs has the higher melting point?

a) Diamond or graphite **b)** SiC or $SiCl_4$

c) Cs or Cl_2 **d)** H_2 or HCl

e) He or Kr

7. Which substance in each of the following pairs has the higher boiling point?

a) H_2O or H_2S **b)** HF or HCl

c) NH_3 or PH_3 **d)** CH_3OH or C_2H_5OH

e) H_2O or NH_3

8. What kind of attractive forces exist between particles in each of the following crystals?

a) Ne: **f)** Zn:

b) H_2O: **g)** $MgCl_2$:

c) CH_4: **h)** $NaNO_3$:

d) diamond (C): **i)** NaCl:

e) HCl: **j)** CO:

Part B. MULTIPLE CHOICE QUESTIONS

1. What is the valence electron number of $_{15}P$?

A) 2 B) 3 C) 5 D) 6 E) 15

2. Which one of the following elements forms an ionic compound with $_{17}Cl$?

A) $_6C$ B) $_8O$ C) $_{10}Ne$ D) $_{11}Na$ E) $_{15}P$

3. Which pairs can form a covalent bond?

A) $_{11}Na$ - $_7N$ B) $_{12}Mg$ - $_{17}Cl$ C) $_{18}Ar$ - $_8O$

D) $_6C$ - $_{17}Cl$ E) $_{12}Mg$ - $_9F$

4. Which one of the following statements is **wrong** about the formation of chemical bonds?

A) Chlorine can form both ionic and covalent compounds.

B) The bond type in Cl_2 is non-polar covalent.

C) The bond in KCl is formed by electron exchange.

D) The bond types in HCl and NaCl are the same.

E) Both K^+ and Cl^- ions have a noble gas electron configuration.

5. How many sigma (σ) bonds are there in C_3H_8 molecule?

A) 6 B) 7 C) 8 D) 9 E) 10

6. Which one of the following molecules does not contain any pi (π) bond?

A) HCN B) CO_2 C) C_3H_7Br D) O_2 E) N_2

7. Which one is **wrong** for the bonds in chlorine, oxygen, and nitrogen molecules? ($_{17}Cl$, $_8O$, $_7N$)

A) Chlorine does not contain any pi (π) bond.

B) The bond between nitrogen atoms is the shortest.

C) The bond between chlorine atoms is the weakest.

D) All of them are non-polar covalent bonds.

E) Oxygen has a triple bond.

8. Which one of the following molecules has a shape of triangular planar?

A) BF_3 B) PCl_3 C) SO_3 D) SF_6 E) PCl_5

9. Which one of the following molecules is polar?

A) F_2 B) O_2 C) CH_4 D) SO_2 E) none

10. Which of the following molecules is **not** linear?

A) F_2 B) LiH C) H_2O D) CO_2 E) HCN

11. The shape of CH_4 is

A) triangle planar B) linear C) octahedral

D) tetrahedral E) trigonal bipyramidal

12. Given the elements $_7A$ and $_9B$. What would be the formula and the shape of the molecule formed between A and B?
A) AB_4 – tetrahedral B) A_3B – triangular planar
C) AB_3 – pyramidal D) AB_2 – angular
E) AB_2 – linear

13. Which one of the following molecules is nonpolar?
A) NH_3 B) BH_3 C) H_2O D) SO_2 E) OF_2

14. Which molecule has an angular shape?
A) CH_4 B) $BeCl_2$ C) H_2O D) CO_2 E) F_2

15. For the molecule forming between boron and hydrogen, which ones are true?
I. Its shape is triangular planar
II. Its shape is trigonal bipyramidal
III. It is nonpolar
A) I B) II C) III D) I-III E) II-III

16. I.CO_2 II. C_2H_2 III. CCl_4 IV. C_2Br_4
In which alternatives, carbon atom forms sp hybridization?
A) I-II B) II-III C) II-IV D) I-III E) I-IV

17. What type of hybridization exists in the central atom of $BeCl_2$ molecule?
A) sp B) sp^2 C) sp^3 D) sp^3d E) sp^3d^2

18. I. It contains two sigma (σ) bonds.
II. It contains two pi (π) bonds.
III. It is bent.
Which of the above statements is/are **correct** for a molecule of carbon dioxide?
A) I B) II C) III D) I-II E) I-III

19. The respective bond types in Cl_2, HCl, and NaCl are:
A) Ionic, polar covalent, non-polar covalent
B) Non-polar covalent, polar covalent, ionic
C) Polar covalent, non-polar covalent, ionic
D) Ionic, non-polar covalent, polar covalent
E) Non-polar covalent, ionic, polar covalent

20. Which one has only Van der Waals forces?
A) CCl_4 B) ClBr C) NaCl D) HF E) SiO_2

21. Which one is the most ionic ?
A) KF B) NaF C) HCl D) HF E) LiCl

22. Which one has the highest melting point ?
A) HF B) HCl C) H_2S D) HI E) HBr

23. Noble gases have only .....as intermolecular forces.
A) dipole-dipole forces B) london forces
C) hydrogen bonding D) covalent bond
E) network crystals

24. Which one of the following substances has dipole-dipole forces between its molecules?
A) Xe B) LiF C) HCl D) F_2 E) CH_4

25. I. HF II. H_2S III. NH_3 IV. CF_4
Which substance or substances have hydrogen bonds between their molecules in the liquid state?
A) I B) I-II C) II-III D) III-IV E) I-III

26. Which types of intermolecular and intramolecular forces exist in C_2H_5OH molecule ?

Intermolecular	**Intramolecular**
A) Van der Waals	ionic
B) London forces	covalent
C) Metallic+Ionic	ionic
D) Dipole-Dipole+London	covalent
E) Hydrogen bonding + London and Dipole-Dipole	covalent

27. I. molten KNO_3 II. Silver metal III. NaCl solution
Which ones conduct electricity?

A) III B) I-II C) I-III D) II-III E) I-II-III

28. Which one of the following substances has the highest boiling point in the liquid state?

A) CH_4 B) CF_4 C) Br_2 D) CBr_4 E) Cl_2

29. What type of attractive forces exist between the molecules of H_2S in its liquid state?

A) Hydrogen bond ; dipole-dipole
B) Van der waals; hydrogen bond
C) Ionic bond; van der waals
D) Dipole-dipole; van der waals
E) Covalent; dipole-dipole

30. Which one of the following elements forms a network solid involving covalently bonded atoms?
A) $_{11}A$ B) $_{13}B$ C)$_{14}C$ D) $_{16}D$ E) $_{17}E$