

# Practice

46) A typical triple bond consists of \_\_\_\_\_.

- A) three ionic bonds
- B) three pi bonds
- C) three sigma bonds
- D) two sigma and one pi bond
- E) one sigma and two pi bonds

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## Questions 1-2

Consider atoms of the following elements. Assume that the atoms are in the ground state

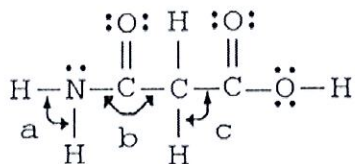
- (A) S
- (B) Ca
- (C) Ga
- (D) Sb
- (E) Br

- 1. The atom that contains exactly two unpaired electrons.
- 2. The atom that contains only one electron in the highest occupied energy sublevel.

46. The effective nuclear charge experienced by the outermost electron of Na is different than the effective nuclear charge experienced by the outermost electron of Ne. This difference best accounts for which of the following?

- (A) Na has a greater density at standard conditions than Ne.
- (B) Na has a lower first ionization energy than Ne.
- (C) Na has a higher melting point than Ne.
- (D) Na has a higher neutron-to-proton ratio than Ne.
- (E) Na has fewer naturally occurring isotopes than Ne.

34) The bond angles marked a, b, and c in the molecule below are about \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ respectively.



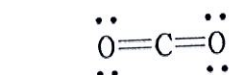
- A)  $120^\circ$ ,  $120^\circ$ ,  $90^\circ$
- B)  $90^\circ$ ,  $90^\circ$ ,  $90^\circ$
- C)  $120^\circ$ ,  $120^\circ$ ,  $109.5^\circ$
- D)  $109.5^\circ$ ,  $90^\circ$ ,  $120^\circ$
- E)  $109.5^\circ$ ,  $120^\circ$ ,  $109.5^\circ$

- 25) According to VSEPR theory, if there are five electron domains in the valence shell of an atom, they will be arranged in a(n) \_\_\_\_\_ geometry.
- A) tetrahedral
  - B) linear
  - C) octahedral
  - D) trigonal planar
  - E) trigonal bipyramidal

| Ionization Energies for element X (kJ mol <sup>-1</sup> ) |        |       |        |        |
|---|--------|-------|--------|--------|
| First   | Second | Third | Fourth | Fifth  |
| 580   | 1,815  | 2,740 | 11,600 | 14,800 |

37. The ionization energies for element X are listed in the table above. On the basis of the data, element X is most likely to be
- (A) Na
  - (B) Mg
  - (C) Al
  - (D) Si
  - (E) P

- 14) The formal charge on carbon in the molecule below is \_\_\_\_\_.



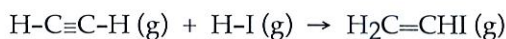
- (A) 0
- B) +1
- C) -1
- D) +3
- E) +2

- 27) The molecular geometry of \_\_\_\_\_ is square planar.

- A) CCl<sub>4</sub>
- B) XeF<sub>4</sub>
- C) ICl<sub>3</sub>
- D) XeF<sub>2</sub>
- E) PH<sub>3</sub>

E-4

- 22) Using the table of average bond energies below, the  $\Delta H$  for the reaction is \_\_\_\_\_ kJ.



|             |              |     |     |     |     |
|-------------|--------------|-----|-----|-----|-----|
| Bond:       | C $\equiv$ C | C=C | H-I | C-I | C-H |
| D (kJ/mol): | 839          | 614 | 299 | 240 | 413 |

- A) +506
- B) -506
- C) -129
- D) +129
- E) -931

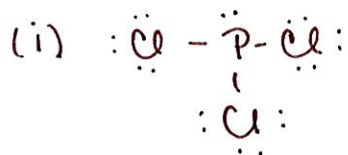
12. As the bond order of a carbon-carbon bond increases, which one of the following decreases?

- a) # of electrons between the carbon atoms
- b) vibrational frequency of bond vibrations
- c) bond energy (bond strength)
- d) bond length**

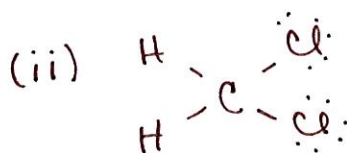
Consider the following species when answering the questions that follow:

- (i)  $\text{PCl}_3$  (ii)  $\text{CH}_2\text{Cl}_2$  (iii)  $\text{HCN}$  (iv)  $\text{C}_2\text{H}_4$  (v)  $\text{NH}_3$

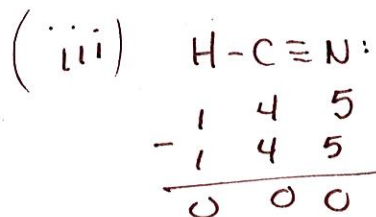
13) In which Lewis structure does the central atom have a non-zero formal charge?  
 A) (i) B) (ii) C) (iii) D) (v) **E) none**



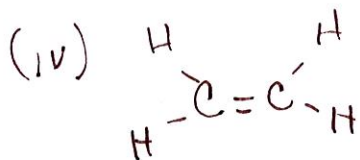
$$\begin{array}{r} \text{P} - \text{Cl} \\ - \quad 5 \quad 7 \\ \hline \quad 0 \quad 0 \end{array}$$



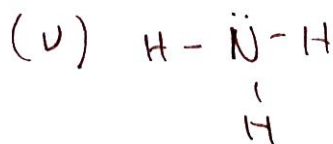
$$\begin{array}{r} \text{H} - \text{C} - \text{Cl} \\ - \quad 1 \quad 4 \quad 7 \\ \hline \quad 0 \quad 0 \quad 0 \end{array}$$



$$\begin{array}{r} \quad 1 \quad 4 \quad 5 \\ - \quad 1 \quad 4 \quad 5 \\ \hline \quad 0 \quad 0 \quad 0 \end{array}$$



$$\begin{array}{r} \text{H} - \text{C} = \text{C} \\ - \quad 1 \quad 4 \quad 4 \\ \hline \quad 0 \quad 0 \quad 0 \end{array}$$



$$\begin{array}{r} \text{H} - \text{N} \\ - \quad 1 \quad 5 \\ \hline \quad 0 \quad 0 \end{array}$$