Serial No. PCH-17- **ISLAMIC UNIVERSITYOF SCIENCE & TECHNOLOGY**
DEPARMENT OF CHEMISTRY

M Sc. (2nd Semester) (Mid term) **Max. Marks: 30**
Course Title: Metal Clusters…… (PCH-CC-201) **Time: 60min**
Rollno:

1. Arrange the following in the order of increasing ν_{M-C} bond
   (1) $[Mn(CO)_6]^+$,2) $[Cr(CO)_6]$,(3) $[V(CO)_6]^-$
   a) 3>2>1
   b) 1>2>3
   c) 2>1>3
   d) 1>3>2
2. The complex that obeys the 18 electron rule is:
   a) $[Mn(CO)_5]$
   b) $[(\eta^5\text{-}C_5H_5)_2Co]$
   c) $[Mo(CO)_3(CH_3CN)_3]$
   d) $[(\eta^5\text{-}C_5H_5)_4Ti]$
3. Which one of the following has strong σ donating ability
   a) $Ni(CO)_4$
   b) $Ni(CO)_3(PMe_3)$
   c) $Ni(CO)_2(PMe_3)_2$
4. If the CO stretching frequency of $Ni(CO)_3(POMe)_3$ is A, and that of $Ni(CO)_2(PMe_3)_2$ is B, then
   a) A>B
   b) A=B
   c) A<B
   d) None of the these
5. The stretching frequency of NO in a 16 electron complex having the empirical formula $[Ir(NO)Cl(PPh_3)_2(CO)]^+$ is expected to be
   a) $1850cm^{-1}$
   b) $1650cm^{-1}$
   c) $1950cm^{-1}$
   d) $2050cm^{-1}$
6. The oxidation state of iron in $[Fe(\eta^5\text{-}Cp)_2]^+[BF4]$ is
   a) +1
   b) +2
   c) +3
7. The reaction of $Co_2(CO)_8$ with sodium amalgam followed by methyl iodide leads to formation of:
   a) $Me_3(CO)_3Co$
   b) $(MeCO)_3Co(CO)_3$
   c) $MeCo(CO)_4$
   d) $MeCo(CO)_4I$
8. In linear nitrosyl NO act as a /an
   a) One electron donor
   b) Two electron donor
   c) Three electron donor
   d) Four electron donor
9. In metal carbonyl complexes, as more electron density moves from the metal d orbitals to the CO π* orbitals the CO stretching frequency is:
   a) Increases
   b) Decreases
   c) Remain same
   d) Disappears
10. CO bond order is lowest in:
    a) Uncoordinated CO
    b) CO bonded to one metal
    c) CO bridging two metals
    d) CO bridging three metals
11. Arrange the following in the increasing C-O stretching frequency.
    (1)$Ni(CO)_4$ (2) $Fe(CO)_5$ (3) $Cr(CO)_6$
    a) 1>2>3
    b) 2>1>3
    c) 3>2>1
    d) 3>1>2

Signature of Student **Signature of Invigilator**

22-06-2018

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12. For isoelectronic species $[Ti(CO)_6]^{2-}$ $[V(CO)_6]^{-}$, $[Cr(CO)_6]$, $[Mn(CO)_6]^{+}$ and $[Fe(CO)_6]^{2+}$ the C-O stretching frequency increase in the order:
    Ans:

13. Among the following having highest σ- donor ability:
    a) PR_3
    b) PAr_3
    c) $P(OR)_3$
    d) PF_3
14. Which of the following have highest C-O stretching frequency:
    a) $Ni(CO)_4$
    b) $Ni(CO)_3(PF_3)$
    c) $Ni(CO)_3PMe_3$
    d) All of the above
15. How many bands will be observed in cis-$M(CO)_2Cl_2$ and trans-$M(CO)_2Cl_2$ are:
    a) 1, 1
    b) 2, 1
    c) 0, 1
    d) 1, 2
16. In oxidative counting method, number of electrons contributing by linear and bent NO are:
    a) 1 ,1
    b) 3, 1
    c) 2, 2
    d) 2, 1
17. The bond order of NO^{+} , $O2^{2+}$, CO are:
    a) 3 ,3, 3
    b) 3.5, 2 , 3
    c) 2, 3, 3
    d) 2, 2, 3
18. The stable cyclopentadienyl complex of beryllium is:
    a) $[Be(\eta^2\text{-}C_5H_5)_2]$
    b) $[Be(\eta^2\text{-}C_5H_5)\ (\eta^3\text{-}C_5H_5)]$
    c) $[Be(\eta^1\text{-}C_5H_5)\ (\eta^3\text{-}C_5H_5)]$
    d) $[Be(\eta^1\text{-}C_5H_5)(\eta^5\text{-}C_5H_5)]$
19. The reaction of $Ni(CO)_4$ with the ligand (L=PMe3) L yields $Ni(CO)_3L$.The reaction is:
    a) Associative
    b) Dissociative
    c) Both a and b
    d) None of the above
20. For the reaction, trans-$[IrCl(CO)(PPh_3)_2]$ + Cl2 ⟶ trans-$[IrCl_3(CO)(PPh_3)_2]$ the correct observation are:
    a) νco(Pdt) > νco(Reactant)
    b) νco(Pdt) < νco(Reactant)
    c) νco(Pdt) = νco(Reactant)
    d) νco(Pdt) > νco(free CO)

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