

QUAID-I-AZAM UNIVERSITY, ISLAMABAD  
DEPARTMENT OF CHEMISTRY

Marks: 50

Time: 60 Min.

**PhD Admission Test (Fall Semester 2020)**

**Inorganic/Analytical Chemistry**

Date: \_\_\_\_\_

Name \_\_\_\_\_ Roll No. \_\_\_\_\_ Signature \_\_\_\_\_

**Note:-** Attempt all questions.

Q.I Encircle the correct option/s in each of the following statements. Thirty five (35) such statements will be given. (35)

- Sol-gel method is \_\_\_\_\_ approach.  
(a) Bottom up (b) Up bottom  
(c) Top down (d) Down top
- What is the work of mineralizer in the hydrothermal method of synthesis?  
a) It increases the amount of water  
b) It speeds up the reaction  
c) It increases the solubility of reaction mixture  
d) It helps in forming the cold seal
- Which of the following is not an inorganic functional material?  
a) Ferroelectric (b) Reverse micelles  
c) Magnetic field sensor (d) Light detectors
- The temperature at which paramagnetic materials converted into antiferromagnetic is called:  
(a) Neel temperature (b) Curie temperature  
(c) transition temperature (d) fusion temperature
- Which of the following ion is kinetically labile?  
a)  $Rh^{3+}$  (b)  $Ti^{3+}$   
c)  $Ru^{2+}$  (d)  $Cr^{3+}$
- The first step in the mechanism of the base hydrolysis of  $[Co(NH_3)_5Cl]^{2+}$  under strong basic condition is:  
a) substitution of  $Cl^-$  by  $H_2O$   
b) dissociation of  $Cl^-$  to give a five-coordinate intermediate  
c) deprotonation of ammine to form amido ligand  
e) attack of  $^-OH$  to give a seven-coordinated intermediate
- In gas-liquid chromatography, when films are used in the interior of the capillary column, then what is the value of Eddy diffusion?  
a) Greater than 1 (b) Less than 1  
c) Zero (d) Less than zero
- In chromatography, peaks are well resolved when resolution value is \_\_\_\_\_  
a) 1 (b) 1.5  
c) 0.5 (d) 0

9. The catalytic activity can be determined by \_\_\_\_\_ of a catalyst.
- a) Turn over Number                      b) Turn over frequency  
 c) Stability                                      d) Selectivity  
 e) All of above
10. In order to determine the structure activity relationship in heterogeneous Catalysis, \_\_\_\_\_ concept/s can be used.
- a) Energetics or thermodynamics                      b) Steric or Geometric  
 c) Electronic                                              d) Acid Base  
 e) All of above
11. Which of the following technique is more useful in determining the crystallite size in polycrystalline material?
- a) Powder X-ray diffraction (PXRD)  
 b) X-ray photoelectron spectroscopy (XPS)  
 c) Scanning electron microscopy (SEM)  
 d) Auger electron microscopy (AEM)  
 e) Atomic force microscopy (AFM)
12. Which of the following equation/s is/are useful in determining the kinetics of electrochemical reaction in the presence of electrocatalyst?
- a) Bulter-Volmer Equation                      b) Tafel Equation  
 c) Randles Sevcik Equation                      d) Levich Equation  
 e) All of above
13. GaAs (Band Gap = 1.4 eV, VB = 1.0 eV, CB = -1.5eV Vs NHE) can act as photocatalyst for \_\_\_\_\_ reaction/s, considering zero over-potential. (Water reduces at 0 V and oxidizes at 1.23 V vs NHE).
- a) Water Oxidation  
 b) Water Reduction  
 c) Simultaneous water oxidation and reduction  
 d) All of above
14. Which of the following metal ion in a catalyst of type  $[\text{Cp}_2\text{MEt}(\text{C}_2\text{H}_4)]^n$  (where n is appropriate charge) is better for ethene polymerization?
- a) Fe(II)                                              b) Pt(II)  
 c) Nb(III)                                              d) Zr(IV)
15. Which one of the following terms has lowest energy?
- (a) 4S                                              (b) 3F  
 (c) 3H                                              (d) 4P

16. Select the non-equivalent parameter among the followings.
- (a) total number of transitions      (b) total number of  $M_j$  values  
(c) total degeneracy                  (d) total microstates
17. Secondary wastewater treatment method is
- (a) physical                                  (b) biochemical  
(c) mechanical                                (d) physicochemical
18. Catalyst poisoning is a major problem in
- (a) BOD                                        (b) coagulation  
(c) primary treatment                        (d) COD
19. What charge,  $n$ , would be necessary for the complex  $[\text{Ru}(\text{CO})_4(\text{SiMe}_3)]^n$  to obey the 18-electron rule?
- a) -1                                              (b) -2  
(c) 2                                                (d) 1
20. The oxidative addition of  $\text{H}_2$  to  $\text{RhCl}(\text{PPh}_3)_3$  is more facile than  $\text{RhCl}(\text{CO})(\text{PPh}_3)_2$  because
- a) Electron-donating phosphine is better able to stabilize the latter in higher oxidation state.  
b) Electron-donating phosphine is better able to stabilize the latter in low oxidation state.  
c) Electron-donating phosphine is better able to stabilize the former in higher oxidation state.  
d) Electron-donating phosphine is better able to stabilize the former in low oxidation state.
- Q.II Define the following terms. (15)
- a) Back bonding                              b) McLafferty rearrangement  
c) Elastomers

\*\*\*\*\*