



## ENTRANCE EXAMINATION – JULY 2016

### QUESTION PAPER

**PROGRAMME : Ph. D**

### CHEMISTRY

**Time : 2 hours**

**Marks: 100**

#### INSTRUCTION TO THE CANDIDATES

1. Use only Pencil to indicate your answers. Use Ball-Point only for writing Name, Register Number and Signature.
2. Darken the square completely. Mark your answers like this 

1	2	3	4
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3. Part A is common to all.

Name of the Student: .....	Register Number										
Programme Applied: .....	<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>										
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Signature of the Student	Signature of the Invigilator										

**NIUEE 2016**

## Part A

1. The development of a solid foundation of reliable knowledge typically is built from which type of research?
  - a. basic research
  - b. action research
  - c. evaluation research
  - d. orientational research
2. The idea that when selecting between two different theories with equal explanatory value, one should select the theory that is the most simple, concise, and succinct is known as \_\_\_\_\_.
  - a. criterion of falsifiability
  - b. critical theory
  - c. guide of simplicity
  - d. rule of parsimony
3. Research that is done to examine the findings of someone else using the "same variables but different people" is which of the following?
  - a. exploration
  - b. Hypothesis
  - c. Replication
  - d. empiricism
4. A researcher designs an experiment to test how variables interact to influence how well children learn spelling words. In this case, the main purpose of the study was:
  - a. Explanation
  - b. Description
  - c. Influence
  - d. Prediction
5. What is the key defining characteristic of experimental research?
  - a. extraneous variables are never present
  - b. a positive correlation usually exists
  - c. a negative correlation usually exists
  - d. manipulation of the independent variable
6. Which of the following includes examples of quantitative variables?
  - a. age, temperature, income, height
  - b. grade point average, anxiety level, reading performance
  - c. gender, religion, ethnic group
  - d. both a and b
7. One step that is not included in planning a research study is:
  - a. Identifying a researchable problem
  - b. A review of current research
  - c. Statement of the research question
  - d. Developing a research plan
8. Sources of researchable problems can include:
  - a. Researchers' own experiences as educators
  - b. Practical issues that require solutions
  - c. Theory and past research
  - d. All of the above
9. The feasibility of a research study should be considered in light of:
  - a. Cost and time required to conduct the study
  - b. Skills required of the researcher
  - c. Potential ethical concerns
  - d. All of the above
10. A formal statement of the research question or "purpose of research study" generally \_\_\_\_\_.
  - a. Is made prior to the literature review
  - b. Is made after the literature review
  - c. Will help guide the research process
  - d. b and c

11. Which term refers to publishing several articles from the data collected in one large study?
- Duplicate publication
  - Partial publication
  - Triplicate publication
  - None of these
12. Which of the following is a right of each participant according to the AERA?
- Deception
  - Utilitarianism
  - Freedom to withdraw
  - Participants have no rights
13. Which of the following is a type of criterion-related validity evidence?
- Concurrent evidence
  - Predictive evidence
  - Internal consistency
  - Both a and b are correct answers
14. Which of the following is not a type of reliability?
- Test-retest
  - Split-half
  - Content
  - Internal consistency
15. Which of the following types of reliability refers to the consistency of test scores over time?
- Equivalent forms reliability
  - Split-half reliability
  - Test-retest reliability
  - Inter-scorer reliability
16. Which type of reliability refers to the consistency of a group of individuals' scores on two equivalent forms of a test designed to measure the same characteristic?
- Split-half
  - Test-retest
  - Split-forms
  - Equivalent forms
17. \_\_\_\_\_ refers to how well the particular sample of behaviors used to measure a characteristic reflects the entire domain of behaviors that constitutes that characteristic.
- Construct validity evidence
  - Criterion-related validity evidence
  - Content validity evidence
  - Face validity evidence
18. Which of these is not a method of data collection.
- Questionnaires
  - Interviews
  - Experiments
  - Observations
19. Another name for a Likert Scale is a(n):
- Interview protocol
  - Event sampling
  - Summated rating scale
  - Ranking
20. A question during an interview such as “Why do you feel that way?” is known as a:
- Probe
  - Filter question
  - Response
  - Pilot
21. A census taker often collects data through which of the following?
- Standardized tests
  - Interviews
  - Secondary data
  - Observations
22. In which of the following nonrandom sampling techniques does the researcher ask the research participants to identify other potential research participants?
- Snowball
  - Convenience
  - Purposive
  - Quota
23. Which of the following is the most efficient random sampling technique?
- Simple random sampling
  - Proportional stratified sampling
  - Cluster random sampling
  - Systematic sampling

24. Which of the following would usually require the smallest sample size because of its efficiency?
- a. One stage cluster sampling                      b. Simple random sampling  
c. Two stage cluster sampling                      d. Quota sampling
25. \_\_\_\_\_ is a set of elements taken from a larger population according to certain rules.
- a. Sample                      b. Population                      c. Statistic                      d. Element

### Part B

26. Schottky defect generally appears in
- a. NaCl                      b. CsCl                      c. KCl                      d. All of these
27. How many space lattices are obtainable from the different crystal systems
- a. 7                      b. 32                      c. 14                      d. 23
28. The existence of a substance in more than one solid modifications is known as
- a. Polymorphism    b. Allotropy                      c. Isomorphism                      d. Enantiomorphism
29. Space lattice of  $\text{CaF}_2$  is
- a. Face centred cubic                      b. Simple cubic  
c. Body centred cubic                      d. Hexagonal closed packing
30. Glass is
- a. Super cooled liquid                      b. Amorphous solid  
c. Crystalline solid                      d. Liquid crystal
31. Which of the following statements about amorphous solids is incorrect.
- a. They melt over a range of temperature  
b. There is no orderly arrangement of particles  
c. They are anisotropic  
d. They are rigid and incompressible
32. The characteristic features of solids are
- a. Definite shape                      b. Definite shape and size  
c. Definite size                      d. Definite shape, size and rigidity
33. A crystalline solid have
- a. Long range order                      b. Disordered arrangement  
c. Short range order                      d. None of these
34. The crystal system of a compound with unit cell dimensions  $a = 0.387$ ,  $b = 0.387$  and  $c = 0.504$  and  $\alpha = \beta = 90^\circ$  and  $\gamma = 120^\circ$ .
- a. Cubic                      b. Orthorhombic  
c. Hexagonal                      d. Rhombohedral
35. An example of a body cube is
- a. Sodium                      b. Zinc                      c. Magnesium                      d. Copper
36. In which of the following crystals alternate tetrahedral voids are occupied?
- a. NaCl                      b.  $\text{CaF}_2$                       c. ZnS                      d.  $\text{Na}_2\text{O}$

37. In a face-centered cubic lattice, a unit cell is shared equally by how many unit cells.
- a. 8                                      b. 2                                      c. 4                                      d. 6
38. In acetylene molecule, between the carbon atoms there are
- a. three sigma bonds                                      b. two sigma and one pi bonds  
c. one sigma and two pi bonds                                      d. three pi bonds
39. In a solid lattice the cation has left a lattice site and is located at an interstitial position, the lattice defect is
- a. Interstitial defect                                      b. Frenkel defect  
c. Valency defect                                      d. Schottky defect
40. Rhombic sulphur has the following structure
- a. Open chain                                      b. Puckered 6-membered ring  
c. Tetrahedral                                      d. Puckered 8-membered ring
41. The number of atoms present in unit cell of a monoatomic substance of simple cubic lattice is
- a. 6                                      b. 2                                      c. 3                                      d. 1
42. A crystalline solid
- a. Changes abruptly from solid to liquid when heated  
b. Undergoes deformation of its geometry easily  
c. Has no definite melting point  
d. Has an irregular 3-dimensional arrangements
43. Which one of the following pairs of species have the same bond order?
- a.  $\text{CN}^-$  and  $\text{NO}^+$     b.  $\text{CN}^-$  and  $\text{CN}^+$     c.  $\text{O}_2^-$  and  $\text{CN}^-$     d.  $\text{NO}^+$  and  $\text{CN}^+$
44. For a stable molecule the value of bond order must be
- a. negative                                      b. Positive  
c. zero                                      d. there is no relationship between stability and bond order
45. What is the coordination number of sodium in  $\text{Na}_2\text{O}$
- a. 6                                      b. 8                                      c. 4                                      d. 2
46. Under which category iodine crystals are placed among the following
- a. Ionic crystal    b. Molecular crystal    c. Metallic crystal    d. Covalent crystal
47. Diamond is an example of
- a. Solid with hydrogen bonding                                      b. Covalent solid  
c. Electrovalent solid                                      d. Glass
48. Which solid will have the weakest intermolecular forces
- a. Ice                                      b. Naphthalene                                      c. Phosphorus                                      d. Sodium fluoride
49. Which one of the following metal oxides is antiferromagnetic in nature
- a.  $\text{MnO}_2$                                       b.  $\text{VO}_2$                                       c.  $\text{TiO}_2$                                       d.  $\text{CrO}_2$
50. The number of tetrahedral voids in the unit cell of a face centered cubic lattice of similar atoms is
- a. 4                                      b. 8                                      c. 6                                      d. 10
51. The vacant space in the bcc unit cell is

52. Frenkel defect is caused due to  
a. An ion missing from the normal lattice site creating a vacancy  
b. An extra negative ion occupying an interstitial position in the lattice  
c. An extra positive ion occupying an interstitial position in the lattice  
d. The shift of a positive ion from its normal lattice site to an interstitial site
53. Na and Mg crystallize in BCC and FCC type crystals respectively, then the number of atoms of Na and Mg present in the unit cell of their respective crystal is  
a. 5 and 7                      b. 9 and 14                      c. 4 and 2                      d. 14 and 9
54. The number of close neighbour in a body-centred cubic lattice of identical sphere is  
a. 8                              b. 4                              c. 6                              d. 2
55. Schottky defect in crystals is observed when  
a. Density of crystal is increased  
b. An ion leaves its normal site and occupies an interstitial site  
c. Unequal number of cations and anions are missing from the lattice  
d. Equal number of cations and anions are missing from the lattice
56. Which one of the following is employed as Antihistamine?  
a. Omeprazole    b. Chloramphenicol    c. Diphenhydramine    d. Norethindrone
57. Which one of the followings is employed as a Tranquilizer drug?  
a. Promethazine    b. Valium                      c. Naproxen                      d. Mifepristone
58. Arsenic containing medicine used for the treatment of syphilis is  
a. Tetracycline    b. Ofloxacin                      c. Erythromycin                      d. Salvarsan
59. The artificial sweetener containing chlorine that has the appearance and taste as that of sugar and is stable at cooking temperature is  
a. Aspartame                      b. Saccharin                      c. Sucralose                      d. Alitame
60. The class of drugs used for the treatment of stress is  
a. Analgesics                      b. Antiseptic                      c. Antihistamine                      d. Tranquilizers
61. The dyes which are used in reduced state and are then oxidized in the fabric by air are called  
a. Azo dyes                      b. Dispersed dyes                      c. Basic dyes                      d. Vat dyes
62. Aspirin is  
a. Acetyl salicylic acid                      b. Benzoyl salicylic acid  
c. Chloro benzoic acid                      d. Anthranilic acid
63. Which one of the following is employed as a tranquilizer?  
a. Naproxen                      b. Tetracycline                      c. Chlorpheniramine    d. Equanil
64. The role of phosphate in detergent powder is to  
a. Control pH level of the detergent water mixture  
b. Remove  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ions from the water that causes the hardness of water  
c. Provide whiteness to the fabrics  
d. Form solid detergent as phosphate-less detergent are liquid in nature

65. The oxidant which is used as an antiseptic is  
 a.  $\text{KBrO}_3$                       b.  $\text{KMnO}_4$                       c.  $\text{CrO}_3$                       d.  $\text{KNO}_3$
66. Bithional is generally added to the soaps as an additive to function as  
 a. Softener                      b. Dryer                      c. Buffering agent                      d. Antiseptic
67. Which among the following is not an antibiotic?  
 a. Erythromycin    b. Oxytocin                      c. Penicillin                      d. Tetracycline
68. Which of the following is used as a "morning after pill"?  
 a. Mifepristone    b. Ethynylestradiol    c. Norethindrone                      d. Promethazine
69. Tincture of iodine is  
 a. alcoholic solution of  $\text{I}_2$                       b. solution of  $\text{I}_2$  in aqueous KI  
 c. aqueous solution of  $\text{I}_2$                       d. aqueous solution of KI
70. 2-Acetoxy benzoic acid is used as  
 a. Antiseptic                      b. Antidepressant  
 c. Antimalarial                      d. Antipyretic
71. Li occupies higher position in the electrochemical series of metals as compared to Cu since  
 a. the standard reduction potential of  $\text{Li}^+/\text{Li}$  is lower than that of  $\text{Cu}^{2+}/\text{Cu}$   
 b. the standard reduction potential of  $\text{Cu}^{2+}/\text{Cu}$  is lower than that of  $\text{Li}^+/\text{Li}$   
 c. the standard oxidation potential of  $\text{Li}/\text{Li}^+$  is lower than that of  $\text{Cu}/\text{Cu}^{2+}$   
 d. Li is smaller in size as compared to Cu
72. The standard reduction potential  $E^\circ$  for half reactions are  
 $\text{Zn} \rightarrow \text{Zn}^{2+} + 2e^-$                        $E^\circ = +0.76 \text{ V}$   
 $\text{Fe} \rightarrow \text{Fe}^{2+} + 2e^-$                        $E^\circ = +0.41 \text{ V}$   
 The EMF of the cell reaction  $\text{Fe}^{2+} + \text{Zn} \rightarrow \text{Zn}^{2+} + \text{Fe}$ , is  
 a.  $-0.35 \text{ V}$                       b.  $+0.35$                       c.  $+1.17 \text{ V}$                       d.  $-1.17 \text{ V}$
73. Consider the following cell reaction:  
 $2\text{Fe}(\text{s}) + \text{O}_2(\text{g}) + 4\text{H}^+(\text{aq}) \rightarrow 2\text{Fe}^{2+}(\text{aq}) + 2\text{H}_2\text{O}(\text{l});$                        $E^\circ = 1.67 \text{ V}$   
 At  $[\text{Fe}^{2+}] = 10^{-3} \text{ M}$ ,  $P(\text{O}_2) = 0.1 \text{ atm}$  and  $\text{pH} = 3$ , the cell potential at  $25^\circ\text{C}$  is  
 a.  $1.47 \text{ V}$                       b.  $1.77 \text{ V}$                       c.  $1.87 \text{ V}$                       d.  $1.57 \text{ V}$
74. The reduction potential of hydrogen half-cell will be negative if:  
 a.  $p(\text{H}_2) = 2 \text{ atm}$  and  $[\text{H}^+] = 2.0 \text{ M}$                       b.  $p(\text{H}_2) = 1 \text{ atm}$  and  $[\text{H}^+] = 2.0 \text{ M}$   
 c.  $p(\text{H}_2) = 1 \text{ atm}$  and  $[\text{H}^+] = 1.0 \text{ M}$                       d.  $p(\text{H}_2) = 2 \text{ atm}$  and  $[\text{H}^+] = 1.0 \text{ M}$
75. Hydrogen gas is not liberated when the following metal is added to dil. HCl.  
 a. Mg                      b. Sn                      c. Ag                      d. Zn
76. Given the data at  $25^\circ\text{C}$ ,  $\text{Ag} + \text{I}^- \rightarrow \text{AgI} + e^-$ ;  $E^\circ = 0.152 \text{ V}$   
 $\text{Ag} \rightarrow \text{Ag}^+ + e^-$ ;  $E^\circ = -0.800 \text{ V}$ . What is the value of  $\log K_{\text{sp}}$  for AgI?  
 a.  $-8.12$                       b.  $+8.612$                       c.  $-37.83$                       d.  $-16.13$
77. The hydrogen electrode is dipped in a solution of pH 3 at  $25^\circ\text{C}$ . The potential would be (the value of  $2.303 \text{ RT}/F$  is  $0.059 \text{ V}$ )  
 a.  $0.177 \text{ V}$                       b.  $0.087 \text{ V}$                       c.  $0.059 \text{ V}$                       d.  $-0.177 \text{ V}$
78. Equimolar solution in the same solvent have  
 a. same boiling point but different freezing point

- b. same freezing point but different boiling point
- c. same boiling point and same freezing point
- d. different boiling point and different freezing point

79. Molarity of 0.2 N  $\text{H}_2\text{SO}_4$  is  
 a. 0.2                      b. 0.4                      c. 0.6                      d. 0.1
80. The molarity of a NaOH solution by dissolving 4 g of it in 250 ml water is  
 a. 0.4 M                      b. 0.8 M                      c. 0.2 M                      d. 0.1 M
81. In a cell that utilizes the reaction  $\text{Zn(s)} + 2\text{H}^+(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{H}_2(\text{g})$  addition of  $\text{H}_2\text{SO}_4$  to cathode compartment, will:  
 a. lower the E and shift equilibrium to the left  
 b. lower the E and shift the equilibrium to the right  
 c. increase the E and shift the equilibrium to the right  
 d. increase the E and shift the equilibrium to the left
82. The values of Cr, Mn, Fe and Co are -0.41, +1.57, +0.77 and +1.97 V respectively. For which one of these metals the change in oxidation state from +2 to +3 is easiest?  
 a. Cr                      b. Mn                      c. Fe                      d. Co
83. In a reaction,  $\text{A} + \text{B} \rightarrow \text{Product}$ , rate is doubled when the concentration of B is doubled, and rate increases by a factor of 8 when the concentrations of both the reactants (A and B) are doubled, rate law for the reaction can be written as  
 a.  $\text{Rate} = k[\text{A}][\text{B}]$     b.  $\text{Rate} = k[\text{A}]^2[\text{B}]$     c.  $\text{Rate} = k[\text{A}][\text{B}]^2$     d.  $\text{Rate} = k[\text{A}]^2[\text{B}]^2$
84. In a zero-order reaction for every  $10^\circ$  rise of temperature, the rate is doubled. If the temperature is increased from  $10^\circ\text{C}$  to  $100^\circ\text{C}$ , the rate of the reaction will become  
 a. 64 times                      b. 128 times                      c. 256 times                      d. 512 times
85. For a first order reaction  $\text{a} \rightarrow \text{products}$  the concentration of A changes from 0.1M to 0.025 M in 40 minutes. The rate of reaction when the concentration of A is 0.01 M is:  
 a.  $1.73 \times 10^{-5} \text{ M/min}$                       b.  $3.47 \times 10^{-4} \text{ M/min}$   
 c.  $3.47 \times 10^{-5} \text{ M/min}$                       d.  $1.73 \times 10^{-4} \text{ M/min}$
86. The activation energy of a reaction at a given temperature is found to be  $2.303 \text{ RT J mol}^{-1}$ . The ratio of rate constant to the Arrhenius factor is  
 a. 0.1                      b. 0.01                      c. 0.001                      d. 0.02
87. The following data were obtained during the first order decomposition of  $2\text{A(g)} \rightarrow \text{B(g)} + \text{C(s)}$  at a constant volume and at a particular temperature.
- | Sr. No. | Time                 | Total pressure in Pascal |
|---------|----------------------|--------------------------|
| 1.      | At the end of 10 min | 300                      |
| 2.      | After completion     | 200                      |
- The rate constant in  $\text{min}^{-1}$  is  
 a. 69.3                      b. 0.0693                      c.  $6.93 \times 10^{-4}$                       d. 6.93
88. Density of a 2.05 M solution of acetic acid in water is 1.20 g/mL. The molarity of the solution is  
 a.  $3.28 \text{ mol kg}^{-1}$     b.  $2.28 \text{ mol kg}^{-1}$     c.  $0.44 \text{ mol kg}^{-1}$     d.  $2.14 \text{ mol kg}^{-1}$

89. The rate of a chemical reaction doubles for every 10°C rise of temperature. If the temperature is raised by 50°C, the rate of the reaction increases by about  
 a. 64 times      b. 10 times      c. 24 times      d. 32 times
90. In the hydrolysis of an organic chloride in presence of large excess of water,  
 $\text{RCl} + \text{H}_2\text{O} \rightarrow \text{ROH} + \text{HCl}$   
 a. Molecularity and order of reaction both are 2  
 b. Molecularity is 2 but order of reaction is 1  
 c. Molecularity is 1 but order of reaction is 2  
 d. Molecularity is 1 and order of reaction is also 1
91. Radioactivity of a sample ( $z = 22$ ) decreases 90% after 10 years. What will be the half-life of the sample?  
 a. 5 years      b. 2 years      c. 3 years      d. 10 years
92. 18 g of glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) is added to 178.2 g of water. The vapour pressure of water for this aqueous solution at 100°C is [AIEEE 2006]  
 a. 7.60 torr      b. 76.00 torr      c. 752.40 torr      d. 759.00 torr
93. Which of the following acids does not exhibit optical isomerism?  
 a. Lactic acid      b. Tartaric acid      c. Maleic acid      d.  $\alpha$ -amino acids
94.  $\text{CH}_3\text{CHO}$  and  $\text{C}_6\text{H}_5\text{CH}_2\text{CHO}$  can be distinguished chemically by  
 a. Tollen's reagent test      b. Fehling solution test  
 c. Benedict test      d. Iodoform test
95. The correct order of decreasing acid strength of trichloroacetic acid a., trifluoroacetic acid b., acetic acid c. and formic acid d. is  
 a.  $A > B > C > D$       b.  $A > C > B > D$       c.  $B > A > D > C$       d.  $B > D > C > A$
96. Which of the following reactions will not result in the formation of carbon-carbon bond?  
 a. Reimer-Tieman reaction      b. Friedel Crafts acylation  
 c. Wurtz reaction      d. Cannizzaro reaction
97. One mole of a symmetrical alkane on ozonolysis gives two moles of an aldehyde having molecular mass of 44. The alkane is  
 a. Ethene      b. Propene      c. 1-butene      d. 2-butene
98. One mole of an organic compound 'A' with the formula  $\text{C}_3\text{H}_8\text{O}$  reacts completely with two moles of HI to form X and Y. When 'Y' is boiled with aqueous alkali it forms Z. Z answers the iodoform test. The compound 'A' is \_\_\_\_\_.  
 a. Propan-1-ol      b. Propan-2-ol      c. ethoxyethane      d. methoxyethane
99. A 5.2 molal aqueous solution of methyl alcohol,  $\text{CH}_3\text{OH}$  is supplied. What is the mole fraction of methyl alcohol in the solution?  
 a. 0.050      b. 0.100      c. 0.190      d. 0.086
100. The correct sequence of steps involved in the mechanism of Cannizzaro's reaction is \_\_\_\_\_.  
 a. nucleophilic attack, transfer of  $\text{H}^-$  and transfer of  $\text{H}^+$   
 b. electrophilic attack by  $\text{OH}^-$ , transfer of  $\text{H}^+$  and transfer of  $\text{H}^-$   
 c. transfer of  $\text{H}^-$ , transfer of  $\text{H}^+$  and nucleophilic attack  
 d. transfer of  $\text{H}^+$ , nucleophilic attack and transfer of  $\text{H}^-$

