

# DEPARTMENT OF CHEMISTRY

FORMAN CHRISTIAN COLLEGE

(A CHARTERED UNIVERSITY)

## MPhil Chemistry Admission Test

### SAMPLE TEST

Total Marks = 50

Time Allowed: 2 hr

CANDIDATE'S NAME:

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#### **Instructions to candidates:**

- Write your name in the rectangular box provided above.
  - Write in blue or black ink pen or ball point.
  - Choose the correct/best option. Answer all questions. There is NO choice.
  - Use of mobile phone is not allowed under any circumstances.
  - Crossing/overwriting will give no credit.
  - Candidates must write/mark their answers on the question paper. Rough work may be done on back of the printed sides of the question paper.
  - A copy of the periodic table of elements is given at last page.
  - All questions carry equal marks.
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1. Which of the following solids is NOT used as a primary standard in chemical analysis?
  - a) Sodium hydroxide
  - b) Sodium thiosulphate
  - c) Sodium carbonate
  - d) Potassium hydrogenphthalate
2.  $[\text{Ni}(\text{CO})_4]$  is:
  - a) Square planar and paramagnetic
  - b) Tetrahedral and diamagnetic
  - c) Square planar and diamagnetic
  - d) Tetrahedral and paramagnetic
3. Pick out the complex whose aqueous solution (equal concentrations) is expected to have the highest molar conductivity.
  - a)  $\text{Cr}(\text{NH}_3)_6\text{Br}_3$
  - b)  $\text{Cr}(\text{NH}_3)_3\text{Br}_3$
  - c)  $\text{Cr}(\text{NH}_3)_5\text{Br}_3$
  - d)  $\text{Cr}(\text{NH}_3)_4\text{Br}_3$
4. The instrument used to measure the magnitude of magnetic moment is:
  - a) Magnetic Susceptibility Balance
  - b) Metler balance
  - c) UV spectrometer
  - d) TGA-DSC
5. Which of the following substances is NOT an oxidizing agent?
  - a)  $\text{O}_2$
  - b)  $\text{H}_2\text{O}_2$
  - c) Na
  - d)  $\text{Cr}_2\text{O}_7^{2-}$

6. In which of the following species the atom-to-atom bonds are characteristically more ionic than covalent?
- $\text{Cl}_2(\text{g})$
  - $\text{LiF}(\text{s})$
  - $\text{CO}(\text{g})$
  - $\text{H}_2(\text{g})$

7. Which of the following species is diamagnetic in ground state?
- $\text{O}_2^{2-}$
  - $\text{O}_2^-$
  - $\text{O}_2$
  - $\text{O}_2^+$

8. The molecular shape of  $\text{SCl}_6$  is:
- Tetrahedral
  - Trigonal pyramidal
  - Trigonal planar
  - Octahedral

8. Carbon monoxide has ten bonding electrons and four antibonding electrons. Therefore it has a bond order of:

- 3
- 7
- 1
- $5/2$

9. Which of the following electronic transitions will not be observed in a typical UV-visible spectrum?

- $\sigma\text{-}\sigma^*$
- $\pi\text{-}\pi^*$
- $n\text{-}\pi^*$
- None of the above

10. A student performs five titrations and obtains a mean result of 0.110 M, with a standard deviation of 0.001M. If the actual concentration of titrated solution is 0.100M, which of the following is true about titration results?

- Accurate but not precise
- Precise but not accurate
- Both accurate and precise
- Neither accurate nor precise

11. A complex compound of cobalt has molecular formula containing five  $\text{NH}_3$  molecules, one nitro group and two chlorine atoms for one Co atom. One mole of this compound produces three mole ions in aqueous solution, two moles of  $\text{AgCl}$  get precipitate. the ionic formula of the compound is:

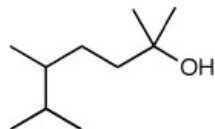
- $[\text{Co}(\text{NH}_3)_4 \text{NO}_2 \text{Cl}] [(\text{NH}_3)\text{Cl}]$
- $\text{Co}(\text{NH}_3)_5 \text{Cl} [\text{Cl}(\text{NO}_2)]$
- $[\text{Co}(\text{NH}_3)_5 (\text{NO}_2)]\text{Cl}_2$
- $\text{Co}(\text{NH}_3)_5 [(\text{NO}_2)\text{Cl}_2]$

13. Mass spectrometers separate isotopes of different elements based on their:

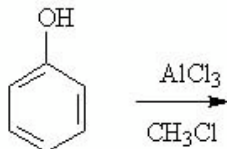
- Mass
- Electric charge
- Mass divided by electric charge
- None of these

14. A strong signal at  $1700 \text{ cm}^{-1}$  in an IR spectrum indicates the presence of:

- a) Alcohol  
 b) Ether  
 c) Carbonyl  
 d) Amine
15. What is the correct name of the following compound?



- a) 4-Isopropyl-1,1-dimethyl-1-pentanol  
 b) 5-Isopropyl-1,1-dimethyl-2-hexanol  
 c) 1,1,4,5-Tetramethyl-1-hexanol  
 d) 2,5,6-Trimethyl-2-heptanol
16. Predict the major product of the following reaction.



- a) *m*-chlorophenol  
 b) *o*-chlorophenol and *p*-chlorophenol  
 c) *o*-hydroxytoluene and *p*-hydroxytoluene  
 d) *m*-hydroxytoluene
17. An auxochrome is one which is
- a) Color enhancing  
 b) A group or atom with lone pair of electrons  
 c) Extending conjugation  
 d) All of these
18. NMR spectra are observed in the.....region.
- a) Radio frequency  
 b) Microwave  
 c) Uv/ Vis  
 d) X-ray
19. Which of the following carboxylic acid is the most acidic?
- a)  $\text{CH}_3\text{COOH}$   
 b)  $\text{HCOOH}$   
 c)  $\text{ClCH}_2\text{COOH}$   
 d)  $\text{Cl}_3\text{CCOOH}$
20. Which of the following is a mono-carboxylic acid
- a) Maleic acid  
 b) Oxalic acid  
 c) Succinic acid  
 d) Formic acid

21. Addition of HBr to propene in the presence of peroxide gives:
- a) Markovnikov's product
  - b) 2-bromopropane
  - c) Anti-Markovnikov's product
  - d) 1,2-dibromopropane
22. The product formed in aldol condensation is:
- a) Beta hydroxyl aldehyde or ketone
  - b) alpha hydroxyl aldehyde or ketone
  - c) alpha beta unsaturated ester
  - d) a beta hydroxyl acid
23. Hexane and 3-Methyl pentane are examples of:
- a) Diastereomers
  - b) Enantiomers
  - c) Stereoisomers
  - d) Constitutional isomer
24. Which of the following is an amino acid.
- a) Glycine
  - b) Ethylene glycol
  - c) Glycerol
  - d) Glucose
25. Which of the following is NOT a nucleic acid base?
- a) Adenine
  - b) Cytosine
  - c) Guanine
  - d) Oxaloacetate
26. Which of the following statements is correct about enzymes?
- a) Enzymes are made up of protein
  - b) Enzymes are biological catalysts
  - c) All of the above
  - d) None of the above
27. ATP is a nucleotide made of three units; .....ribose and phosphate chain
- a) Adenosine
  - b) Adenine
  - c) Alanin
  - d) None of the above
28. One of the products in hydrolysis of fats is .....
- a) Glyceraldehyde
  - b) Glycerol
  - c) Ethanol
  - d) Propanol
29. What is meant by optimum temperature for enzyme activity?
- a) The temperature at which the enzyme shows the maximum activity.
  - b) The temperature at which the enzyme is denatured.

- c) The temperature at which the enzyme is deactivated.  
d) The temperature at which the enzyme shows the minimum activity.
30. A zero order reaction is one in which:  
a) Rate is not affected by changing concentration of reactants  
b) One reactant is in large excess  
c) Concentration of reactants does not change with passage of time  
d) Reactants do not react
31. Which of the following will affect the rate of a chemical reaction:  
a) Last step of the reaction  
b) Fastest step  
c) First step of the reaction  
d) Slowest step
32. For a spontaneous change in a system at constant temperature and pressure, which of the following statements is true?  
a)  $\Delta G < 0$   
b)  $\Delta G = 0$   
c)  $\Delta G > 0$   
d) There is no restriction on the value of  $\Delta G$
33. Heat provided to a thermodynamic system at constant pressure is equal to:  
a)  $\Delta U$   
b)  $\Delta H$   
c)  $\Delta S$   
d)  $\Delta G$
34. Exact solution of the Schrodinger wave equation cannot be obtained for a:  
a) Simple harmonic oscillator  
b) Rigid rotor  
c) Helium atom  
d) Hydrogen atom
35. Which of the following is lower for argon than for neon:  
a) Melting point  
b) Boiling point  
c) Polarizability  
d) First ionization energy
36. How many electrons in an atom can have an  $l$  quantum number of 1 and an  $n$  quantum number of 2:  
a) 2  
b) 3  
c) 6  
d) 5

37. Under constant current electrolysis, how many coulombs would be required to reduce 2 moles of  $\text{Cu}^{2+}$  to metallic copper? ( $F = 96,500$  coulombs/mole)

- a) 2
- b) 48,250
- c) 193,000
- d) 386,000

38. Which of the following is always true of a spontaneous process?

- a) The process is exothermic
- b) The total entropy of the system plus surroundings increases
- c) The process does not involve any work
- d) The entropy of the system increases

39. Potential of an electrochemical cell depends upon:

- a) Temperature
- b) Nature of electrolyte
- c) Concentration of ions
- d) All of above

40. A radioactive isotope, which is used in diagnostic imaging, has half-life of 6.0 hours. If a quantity of this isotope has an activity of  $150\mu\text{Ci}$  when it is delivered to a hospital, how much activity will remain 24 hours after delivery? ( $\mu\text{Ci} = \text{microcuries}$ )

- a)  $150\mu\text{Ci}$
- b)  $38\mu\text{Ci}$
- c)  $19\mu\text{Ci}$
- d)  $9.4\mu\text{Ci}$

41. Which of the following types of spectroscopy is a light-scattering technique?

- a) Electron paramagnetic resonance
- b) Nuclear magnetic resonance
- c) Raman
- d) Infrared

42. Depletion of ozone occur more during the months of\_\_\_\_\_.

- a) January to March
- b) September to November
- c) June to August
- d) December to February

43. DDT is\_\_\_\_\_.

- a) Insecticide
- b) Herbicide
- c) Fungicide
- d) None

44. Ozone in the stratosphere extends up to\_\_\_\_\_.

- a) 0-15 km
- b) 15-40 km
- c) 10-15 km

d) 15-30 km

45. The largest recycled item is \_\_\_\_\_.

- a) Iron
- b) Glass
- c) Newspaper
- d) Plastic

46. Raw materials for production of urea are \_\_\_\_\_.

- a) ammonia and carbon dioxide
- b) oxygen and carbon dioxide
- c) ammonia and oxygen
- d) ammonia and phosphate

47. The main pollutant of leather tanneries on the waste water is due to the salt of \_\_\_\_\_.

- a) Chromium (III)
- b) Chromium (IV)
- c) Cobalt
- d) Lead

48. The destructive distillation of coal gives three products. Which of following is not the product of destructive distillation of coal?

- a) Coal tar
- b) Coke
- c) Coal gas
- d) CO<sub>2</sub>

49. Dark Blue colored glass is made by adding?

- a) CoO
- b) Fe<sup>+2</sup>
- c) Fe<sup>+3</sup>
- d) Ni

50. The process of converting carbohydrates to alcohol or organic acids using microorganisms is called \_\_\_\_\_.

- a) Fermentation
- b) Putrefaction
- c) Rotting
- d) All of above

DO NOT DETACH FROM BOOK.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	
1 <b>H</b> 1.008	2 <b>He</b> 4.00	3 <b>Li</b> 6.94	4 <b>Be</b> 9.01	5 <b>B</b> 10.81	6 <b>C</b> 12.01	7 <b>N</b> 14.01	8 <b>O</b> 16.00	9 <b>F</b> 19.00	10 <b>Ne</b> 20.18	11 <b>Na</b> 22.99	12 <b>Mg</b> 24.30	13 <b>Al</b> 26.98	14 <b>Si</b> 28.09	15 <b>P</b> 30.97	16 <b>S</b> 32.06	17 <b>Cl</b> 35.45	18 <b>Ar</b> 39.95	
19 <b>K</b> 39.10	20 <b>Ca</b> 40.08	21 <b>Sc</b> 44.96	22 <b>Ti</b> 47.90	23 <b>V</b> 50.94	24 <b>Cr</b> 52.00	25 <b>Mn</b> 54.94	26 <b>Fe</b> 55.85	27 <b>Co</b> 58.93	28 <b>Ni</b> 58.69	29 <b>Cu</b> 63.55	30 <b>Zn</b> 65.39	31 <b>Ga</b> 69.72	32 <b>Ge</b> 72.59	33 <b>As</b> 74.92	34 <b>Se</b> 78.96	35 <b>Br</b> 79.90	36 <b>Kr</b> 83.80	
37 <b>Rb</b> 85.47	38 <b>Sr</b> 87.62	39 <b>Y</b> 88.91	40 <b>Zr</b> 91.22	41 <b>Nb</b> 92.91	42 <b>Mo</b> 95.94	43 <b>Tc</b> (98)	44 <b>Ru</b> 101.1	45 <b>Rh</b> 102.91	46 <b>Pd</b> 106.42	47 <b>Ag</b> 107.87	48 <b>Cd</b> 112.41	49 <b>In</b> 114.82	50 <b>Sn</b> 118.71	51 <b>Sb</b> 121.75	52 <b>Te</b> 127.60	53 <b>I</b> 126.91	54 <b>Xe</b> 131.29	
55 <b>Cs</b> 132.91	56 <b>Ba</b> 137.33	57 <b>*La</b> 138.91	72 <b>Hf</b> 178.49	73 <b>Ta</b> 180.95	74 <b>W</b> 183.85	75 <b>Re</b> 186.21	76 <b>Os</b> 190.2	77 <b>Ir</b> 192.2	78 <b>Pt</b> 195.08	79 <b>Au</b> 196.97	80 <b>Hg</b> 200.59	81 <b>Tl</b> 204.38	82 <b>Pb</b> 207.2	83 <b>Bi</b> 208.98	84 <b>Po</b> (209)	85 <b>At</b> (210)	86 <b>Rn</b> (222)	
87 <b>Fr</b> (223)	88 <b>Ra</b> 226.02	89 <b>†Ac</b> 227.03	104 <b>Rf</b> (261)	105 <b>Db</b> (262)	106 <b>Sg</b> (266)	107 <b>Bh</b> (264)	108 <b>Hs</b> (277)	109 <b>Mt</b> (268)	110 <b>Ds</b> (271)	111 <b>Rg</b> (272)								

58 <b>Ce</b> 140.12	59 <b>Pr</b> 140.91	60 <b>Nd</b> 144.24	61 <b>Pm</b> (145)	62 <b>Sm</b> 150.4	63 <b>Eu</b> 151.97	64 <b>Gd</b> 157.25	65 <b>Tb</b> 158.93	66 <b>Dy</b> 162.50	67 <b>Ho</b> 164.93	68 <b>Er</b> 167.26	69 <b>Tm</b> 168.93	70 <b>Yb</b> 173.04	71 <b>Lu</b> 174.97
90 <b>Th</b> 232.04	91 <b>Pa</b> 231.04	92 <b>U</b> 238.03	93 <b>Np</b> (237)	94 <b>Pu</b> (244)	95 <b>Am</b> (243)	96 <b>Cm</b> (247)	97 <b>Bk</b> (247)	98 <b>Cf</b> (251)	99 <b>Es</b> (252)	100 <b>Fm</b> (257)	101 <b>Md</b> (258)	102 <b>No</b> (259)	103 <b>Lr</b> (262)

\*Lanthanide Series

†Actinide Series