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**THE OPEN UNIVERSITY OF SRI LANKA**
**B. Sc DEGREE PROGRAMME 2017/2018**
**CYU4300 – INORGANIC CHEMISTRY- LEVEL 4**
**ASSIGNMENT TEST-I**

**MCQ ANSWER SHEET: Mark a cross (X) over the most suitable answer.**

| | Marks |
|---|---|
| **Total (%)** | |

Reg. No. | | For Examiners Use

| | | Marks |
|---|---|---|
| Correct Answers | | |
| Wrong Answers | | |
| Total | | |

| | | | | | |
|---|---|---|---|---|---|
| 01. | 1 2 3 4 5 | 02. | 1 2 3 4 5 | 03. | 1 2 3 4 5 |
| 04. | 1 2 3 4 5 | 05. | 1 2 3 4 5 | 06. | 1 2 3 4 5 |
| 07. | 1 2 3 4 5 | 08. | 1 2 3 4 5 | 09. | 1 2 3 4 5 |
| 10. | 1 2 3 4 5 | 11. | 1 2 3 4 5 | 12. | 1 2 3 4 5 |
| 13. | 1 2 3 4 5 | 14. | 1 2 3 4 5 | 15. | 1 2 3 4 5 |
| 16. | 1 2 3 4 5 | 17. | 1 2 3 4 5 | 18. | 1 2 3 4 5 |
| 19. | 1 2 3 4 5 | 20. | 1 2 3 4 5 | 21. | 1 2 3 4 5 |
| 22. | 1 2 3 4 5 | 23. | 1 2 3 4 5 | 24. | 1 2 3 4 5 |
| 25. | 1 2 3 4 5 | | | | |

ADDRESS SHEET

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**THE OPEN UNIVERSITY OF SRI LANKA**
**B.Sc./B.Ed. DEGREE PROGRAMME - 2017/2018**
**LEVEL 4 – CYU4300**
**INORGANIC CHEMISTRY**
**ASSIGNMENT TEST I (NBT)**

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DATE: 18th June 2018 4.15 p.m. – 5.15 p.m.

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***Answer all questions*** (25)

- Select the most correct answer to each question given below and mark a cross ***X*** over the answer on the **given answer sheet**. Any answer with more than one ***X*** will not be counted
- **Mobile phones and other electronic equipment** are not allowed; please leave them outside.

1. Consider the following ligands.
   (a) en (b) $H_2NCH_2CH_2NMe_2$ (c) bipyridine
   The **bidentate** ligand/s is/are
   1) (a) only 2) (a) & (b) only 3) (a) & (c) only.
   4) (b) & (c) only. 5) (a), (b) & (c)

2. Choose the **correct** formula of the complex, tetraaquadicyanocobalt(III) chloride.
   1) $[CoCl(CN)_2(H_2O)_4]$
   2) $[CoCl(CN)(H_2O)_4]$
   3) $[CoCl(CN)_2(H_2O)_3]\cdot H_2O$
   4) $[Co(CN)_2(H_2O)_4]Cl$
   5) $[Co(CN)_2(H_2O)_3]Cl\cdot H_2O$

3. What is the most likely **geometry** of $[Fe(SO_4)(bipy)(acac)]$?
   (bipy = bipyridine: acac = acetylacetonate)
   1) Trigonal planar 2) Tetrahedral 3) Octahedral
   4) Square pyramidal 5) Trigonal bipyramidal

4. The number of **geometric** isomers of the complex with the formula $[CoCl(CN)(H_2O)_4]$ is
   1) 1 2) 2 3) 3 4) 4 5) 0

5. Which one of the following complexes would give a molar conductivity of 250 $m^2\ \Omega^{-1}\ mol^{-1}$?
   1) $K_3[Fe(CN)_6]$ 2) $[FeBr(NH_3)_5]Br_2$
   3) $[Fe(H_2O)_2(NH_3)_4]Br_3$ 4) $[FeBr_2(CO)_4]Br\cdot H_2O$
   5) $[FeBr_3(CO)_3]\cdot 2H_2O$

6. Predict the spin only **magnetic moment** of the complex $[Co(NH_3)_4]Cl_2$ in BM. $NH_3$ is a **strong field ligand** and $\mu = [n(n+2)]^{1/2}$. (Atomic no. of Co = 27)
   1) 1.73 2) 2.83 3) 3.87 4) 4.89 5) 5.91

7. Consider the following statements regarding $[Cr(H_2O)_6]Cl_3$.
   (a) It has two *d*-electrons in the $e_g$ level.
   (b) It has all the *d*-electrons in the $t_{2g}$ level.
   (c) The CFSE of the above complex is $-1.2\ \Delta_o$.

The **correct** statement/s is/are

1) (b) only. 2) (a) and (b) only. 3) (a) and (c) only.
4) (b) and (c) only. 5) (a), (b) and (c).

8. Which one of the following statements is **true** about *mer*-$[CrBr(SO_4)(CO)_3]$.
   1) It does show optical isomerism.
   2) Bromide ligand is *trans* to carbon atom.
   3) Bromide ligand is *trans* to oxygen atom.
   4) Oxidation number of Cr is +2.
   5) Secondary valency of Cr is five.

9. Pick the **incorrect** statement from the following statements about $[Fe(CN)_6]^{3-}$. Assume $\mu = 1.73$ BM.
   1) It is a $d^5$ complex.
   2) It is a paramagnetic complex.
   3) It is a low-spin complex.
   4) Hybridization of iron centre is $sp^3d^2$.
   5) It is not an outer-orbital complex.

10. The IUPAC name of the complex $[CoI(CO)_3(NH_3)]SO_4$ is
   1) Ammineiodotricarbonylcobalt(II) sulphate
   2) Amminetricarbonyliodosulphatocobalt(III)
   3) Amminetricarbonyliodocobalt(III) sulphate(VI)
   4) Amminetricarbonyliodocobaltate(II) sulphate(VI)
   5) Iodotricarbonylamminecobalt(III) sulphate

11. Consider the following statements.
   (a) $\beta_4 = K_1 + K_2 + K_3 + K_4$
   (b) Five membered chelate rings are more stable than four membered chelate rings.
   (c) $[PtCl_2(en)]$ is more stable than $[PtCl_2(NH_3)_2]$.

   The **correct** statement is/are

   1) (b) only 2) (b) & (c) only 3) (a) & (c) only
   4) (a) & (b) only 5) (a), (b), & (c)

12. Consider the following statements (a), (b) and (c).
   (a) CO is a good σ-donor ligand.
   (b) $NH_3$ is a good σ-donor ligand than $NMe_3$.
   (c) $PF_3$ is a good π-acceptor ligand than $PH_3$.

   The **correct** statement/s is/are

   1) (c) only. 2) (a) and (b) only. 3) (a) and (c) only.
   4) (b) and (c) only. 5) (a), (b) and (c).

13. Select the **correct** statement regarding the complex $[CoH(CO)_3]$. (Atomic number of Co is 27).
   1) It is a tetrahedral complex.
   2) Its IUPAC name is tricarbonylhydridocobalt.
   3) The hybridization of Co in this complex is $sp^3$.
   4) Cobalt centre obeys the EAN rule.
   5) The co-ordination number of Co is four and its oxidation number is +1.

14. Consider the following statements.
(a) Soft ligands form stable complexes with soft metals.
(b) Stability of complexes of Group 1 metal ions decreases in the following order. $Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$
(c) Generally, 18e-complexes are relatively more stable.
Pick the **correct** statement/s
1) (a) only. 2) (a) and (b) only.
3) (a) and (c) only. 4) (b) and (c) only.
5) (a), (b) and (c).

15. Pick the **incorrect** statement. (Atomic no. of Co = 27)
1) The valence electron count of Co in $[CoH(CO)_4]$ is 18.
2) $[CoH(CO)_4]$ is a coordinatively saturated complex.
3) $[CoH(CO)_3] + H_2 \rightarrow [CoH_3(CO)_3]$ is an oxidative addition reaction.
4) $[CoMe(CO)_3] + CO \rightarrow [Co(COMe)(CO)_3]$ is an insertion reaction.
5) All the above statements are false.

16. A compound formed by elements X and Y crystallizes in a cubic structure in which X atoms are at the corners of the cube and Y atoms are at the centers of the faces. The formula of the compound is

(1) $X_3Y$ (2) XY (3) $XY_2$ (4) $XY_3$ (5) $X_4Y_3$

17. Consider the following statements regarding a crystalline solid.

(a) Ordered arrays of atoms, ions or molecules are present in the solid.
(b) Has a sharp melting point.
(c) Sugar and glass are two examples of crystalline solids.

Which of the following statement/s is/are true?

(1) (a) only (2) (b) only (3) (a) and (b) only (4) (a) and (c) only
(5) All of (a), (b) and (c)

18. The density of nickel, if it crystallized in a simple cubic structure, would be 2.23 $g/cm^3$. What would be the density (in $g/cm^3$) if it crystallised in a body centred cubic structure?

(1) 2.23 (2) 4.46 (3) 3.35 (4) 8.92
(5) more data is needed for the calculation.

19. If a crystalline solid corresponds to a simple cubic unit cell (edge length ***a***), then the % free space in this solid is equal to

[Atomic Packing Efficiency, APF= $\frac{\text{volume of atoms in a unit cell}}{\text{volume of unit cell}}$]

(1) $100 - \frac{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}{a^3}$ (2) $\left[1 - \frac{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}{a^3}\right]100$ (3) $\left[1 - 2 \times \frac{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}{a^3}\right]100$

(4) $100 - 2x\ \frac{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}{a^3}$ (5) $\frac{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}{a^3} \times 100$

20. Which of the following statement/s is/are true?

(a) In a unit cell, an atom's coordination number is the number of atoms per unit cell.

(b) The face-centered cubic (fcc) has a coordination number of 12 and contains 4 atoms per unit cell.

(c) The "closest packed structures" are the most tightly packed or space-efficient composition of crystal structures (lattices)

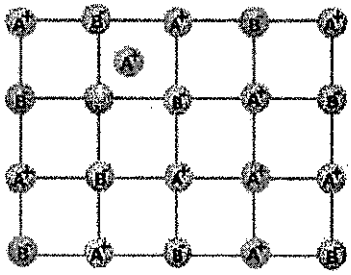
(1) (a) only (2) (b) only (3) (a) and (b) only
(4) (b) and (c) only (5) All of (a),(b) and (c)

21. Select the correct set that identifies / defines Bragg equation and the symbols used as given in the first row.

| Bragg Equation | λ | n | d | θ |
|---|---|---|---|---|
| (1) $n\lambda = 2\theta\sin\theta$ | wavelength of radiation | No of moles | - | angle between the incident rays and the crystal surface |
| (2) $n\lambda = 2d\sin\theta$ | wavelength of radiation | integer | Spacing between crystal layers | angle between the incident rays and the crystal surface |
| (3) $d\lambda = 2n\sin\theta$ | wavelength of radiation | No of moles | Spacing between crystal layers | Angle between the axes of unit cell |
| (4) $n\lambda = 2d\sin\theta$ | wavelength of radiation | integer | Density of the unit cell | angle between the incident rays and the crystal surface |
| (5) $n\lambda = d\sin\theta$ | Frequency of radiation | integer | Spacing between crystal layers | angle between the incident rays and the crystal surface |

22. Which of the following may **not** give rise to a crystal defect?

(1) an ion dislocated to an interstitial site.
(2) formation of a hole in the lattice.
(3) a plane shift.
(4) substitution of a $M^{2+}$ cation with an $M^{3+}$ cation.
(5) passing X-rays through a crystal.



23.The defect shown by the 2-D diagram above is

(1) Schottky defect (2) Frenkel defect (3) a substitutional defect

(4) F- centre formation (5) a vacancy and substitution

24. Which of the following gives correct way to represent Miller indices of a lattice plane?

(1) (2,1,1) (2) ( 2,4,6) (3) (2 0 0)

(4) ( -2 0 0) (5) $(\frac{1}{2}\ \frac{1}{1}\ \frac{1}{1})$

25. Miller Indices for a plane intersecting at x = ¼, y =1, and z =½ is,

(1) (4 1 2) (2) (1 1 2) (3) (4,1,2)

(4) (¼ ,1, ½) (5) [4 ,1, 2]

**The Open University of Sri Lanka**

**B.Sc. Degree Program 2017/2018**

**CYU4300 – Inorganic Chemistry – Level 4**

**Assignment Test – I – Answer Guide**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **(01)** | **5** | **(02)** | **4** | **(03)** | **3** | **(04)** | **2** | **(05)** | **2** |
| **(06)** | **3** | **(07)** | **4** | **(08)** | **3** | **(09)** | **4** | **(10)** | **3** |
| **(11)** | **2** | **(12)** | **1** | **(13)** | **5** | **(14)** | **5** | **(15)** | **5** |
| **(16)** | **4** | **(17)** | **5** | **(18)** | **2** | **(19)** | **2** | **(20)** | **4** |
| **(21)** | **2** | **(22)** | **5** | **(23)** | **2** | **(24)** | **3** | **(25)** | **1** |