KATHMANDU UNIVERSITY
End Semester Examination
September 2024

Marks Scored:

Level : B.Sc.
Year : I

Course : CHEM 102
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 20 SEP 2024

SECTION "A"
[15Q. × 1 = 15 marks]

Choose and mark [X] in the most appropriate answer. Symbols have their usual meanings.

1. The shape, the number of lone pairs and bond pair electrons in the BrF_5 molecule are:
   [ ] Trigonal bipyramid; 2 and 3 [ ] Octahedral; 0 and 6
   [ ] Square planar; 0 and 4 [ ] Square pyramid; 1and 5

2. Which statement is *correct* in regard of tetrahedral complex?
   [ ] All the tetrahedral complexes are low –spin.
   [ ] The crystal field splitting in tetrahedral complexes is considerably less than in octahedral fields.
   [ ] The direction of orbitals coincide with direction of ligands.
   [ ] The central metal ion with high oxidation state favors the formation of tetrahedral complex.

3. Two complex ions, $[Co(NH_3)_5(NO_2)]^{2+}$ and $[Co(NH_3)_5(ONO)]^{2+}$ are:
   [ ] Ionization isomers [ ] Linkage isomers
   [ ] Hydrate isomers [ ] Cis-trans isomers

4. The method by which electrical conduction can occur in beryllium metal, is:
   [ ] Half- filled band [ ] Impurity band
   [ ] Overlapping band [ ] Valence band

5. Which one of the following is correct relation for conversion of Mulliken electronegativity values into the Pauling scale?
   [ ] [Ei + Eea]/450 [ ] $0.744 + 0.359 \times Z_{effective}/r^2$
   [ ] $0.744 + 0.359 \times Z^2_{effective}/r^2$ [ ] [Ei + Eea]/540

6. The coordination numbers of spheres in body-centred cubic, simple cubic and cubic close-packed lattices are, respectively;
   [ ] 6, 12, 8 [ ] 6, 8, 12 [ ] 8, 6, 12 [ ] 8, 12, 8

7. Which of the following statements is true?
   [ ] The electrical conductivity of a semiconductor increases with temperature.
   [ ] The electrical conductivity of a metal increases with temperature.
   [ ] The resistivity of a semiconductor increases with temperature.
   [ ] Metals and semiconductors have similar electrical conducting properties

8. The CFSE for a high-spin d^6 for octahedral complex is:
   [ ] $-0.4\Delta o$ [ ] $-0.6\Delta o$ [ ] $-1.2\Delta o$ [ ] $-2.4\Delta o$

9. Which of the following is the paramagnetic in nature?
   [ ] CO [ ] O_2^{2-} [ ] N_2 [ ] O_2^+

10. The total number of electrons involved for the delocalization of π- bonding in NO_2^- is;
[ ] 8 [ ] 6 [ ] 4 [ ] 10

11. Consider a nuclear reaction: $^{27}_{13}Al + {}^{4}_{2}He \longrightarrow {}^{30}_{15}P + X$. The particle (X) produced in the reaction is:
[ ] A deuteron [ ] A gamma photon
[ ] An alpha particle [ ] A neutron

12. Which one of the following series represents an iso-electronic species?
[ ] NO, $[CN]^-$ and $[O_2]^+$ [ ] O_2, $[O_2]^-$ and $[O_2]^{2-}$
[ ] O_2, $[NO]^+$ and $[CN]^-$ [ ] $[NO]^+$, $[CN]^-$ and N_2

13. Which one of the following complex ion obeys EAN rule?
[ ] $[Pt(NH_3)_4]^{2+}$ [ ] $[Ni(NH_3)_6]^{2+}$ [ ] $[Fe(CN)_6]^{3-}$ [ ] $[Pt(NH_3)_3Cl_3]^+$

14. A radioactive isotope with an N/P ratio below the stable value tends to stabilize by;
[ ] Neutrino emission [ ] Neutron emission
[ ] Positron-emission [ ] β-emission

15. The ligand ethylenediamine is typically:
[ ] Bidentate, and an N,N'-donor [ ] Monodentate, and an *N*-donor
[ ] Bidentate, and an *N,O'*-donor [ ] Monodentate, and an *O*-donor

SECTION "B"
[5Q. × 1 = 5 marks]

Fill in the blanks with most appropriate value or words.

16. The type of hybridization involved in the PF_5 molecule is_____

17. In the World War II, two atom bombs (^{235}U and ^{239}Pu) were blasted in Japan. The nuclear process on which they were based, is called_____

18. The IUPAC name of the complex, $Na_3[Ag(S_2O_3)_2]$ is _____

19. If theoretical mass of $^{4}_{2}He$ is 4.034116 amu and actual mass of $^{4}_{2}He$ is 4.0039, then the amount of energy that will be required to separate all nucleons of 1 mole of Helium atoms is_____.

20. The order of energy of MO for O_2^- molecule is_____