2023/06

SET A

M.Sc. CHEMISTRY
FOURTH SEMESTER
BIOINORGANIC & INORGANIC PHOTOCHEMISTRY
MSC – 401B

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

(Objective)

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1X20=20***

1. The physical structure of cells are
   a. Living cells that organelles and enclosed by membranes
   b. The concentration of specific elements may vary greatly different compartments
   c. The cytoplasm which contains the DNA and most of the material used and transformed in the biochemical reaction
   d. All of the above

2. Choose the correct statement
   a. Ferritin is the principal store of non haem Fe in animals
   b. It occurs in all types of organism from mammals to prokaryotes
   c. In mammals it is found particularly in the spleen and in blood
   d. All of the above

3. Which of the following is correct statement for iron Sulphur clusters
   a. Iron Sulphur cluster generally operate at more negative potentials than cytochrome
   b. They are composed of low spin Fe(III)
   c. They are mainly in Octahedral environment
   d. All of the above

4. Choose the correct statement
   a. The oxygenated haemoglobin is called oxyhaemoglobin
   b. Both myoglobin and haemoglobin are paramagnetic
   c. The five coordinated high spin present in haemoglobin and myoglobin
   d. All of the above

5. In Sodium Potassium pump
   a. Both Na^+ and K^+ ions act as cofactors of ATPase enzyme
   b. The osmotic pressure and fluid balance of the cell is well maintained
   c. Both (a) and (b)
   d. None of the above

6. Which of the following is correct statement?
   a. Siderophores are small polydentate ligand
   b. Siderophores have a very high affinity for Fe(III)
   c. Both (a) and (b)
   d. None of the above

7. In higher organisms Mo is coordinated by one
   a. Pterin dithiolene
   b. Pyruvate kinase
   c. Arginase
   d. None of the above.

8. Methyl-transfer reaction of cobalamines exploit the high nucleophilicity of
   a. Tetrahedral Cobalt (III)
   b. Octahedral Cobalt (II)
   c. Square planar Cobalt (I)
   d. None of the above

9. Oxidases are enzymes that catalyse the reduction of
   a. Cl_2 to HCl
   b. Cytochrome C
   c. O_2 to H_2O
   d. None of the above

10. Peroxidases catalyse the
   a. Oxidation of H_2O_2
   b. Oxidation of H_2O
   c. Reduction of H_2O_2
   d. None of the above

11. Exopeptidase is an enzyme which breaks
   a. Glucomate in a peptide chain
   b. Histidine in a peptide chain
   c. Terminal peptide bond in peptide chain
   d. None of the above.

12. Helicobactor pylori is a spiral bacterium found in
   a. Stomach
   b. Lungs
   c. heart
   d. None of the above.

13. Which type of photoisomerisation reaction is observed in coordination complexes?
   a. cis-trans isomerism
   b. Linkage isomerism
   c. Both a and b
   d. None of the above

14. According to Adamson's rule, the preferred mode of photoaquation of trans $[CrCl_2(NH_3)_4]^+$ is
   a. Replacement of an ammonia ligand
   b. Replacement of a chloride ion
   c. Replacement of both ammonia and chloride
   d. None of the above

15. What is the mathematical expression of the Beer-Lambert Law?
   a. $A = \varepsilon c$
   b. $A = \varepsilon b$
   c. $A = \varepsilon l$
   d. $A = \varepsilon cl$

16. Which of the following is an organometallic drug used in the treatment of arthritis?
   a. Methotrexate
   b. Celecoxib
   c. Gold sodium thiomalate
   d. Ibuprofen

17. Which property of gadolinium allows it to provide contrast enhancement in MRI?
   a. Radioactivity
   b. Magnetic susceptibility
   c. High atomic number
   d. Paramagnetism

18. Which metal is used for treatment of gastric ulcer
   a. Bi(I)
   b. Li
   c. Bi(III)
   d. Ag(I)

19. lithium is
    a. anti-alargic
    b. Mood stabilizer
    c. Both a and b
    d. None of the above

20. What is the primary mechanism behind the delayed emission of light in phosphorescence?
    a. Absorption and re-emission of photons
    b. Radiative decay of excited states
    c. Non-radiative decay of excited states
    d. Transition between different spin states

-- --- --

Descriptive

Time : 2 hrs. 30 mins. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. a. Write the function of Sodium and Potassium pump. 4
   b. "Cadmium is normally regarded as highly toxic, is now regarded as being essential nutrient for certain organisms"- elucidate. 4
   c. Write name and structures of three anti-cancer drugs. 2

2. a. Explain the physical structure of cells. 5+5=10
   b. Mention the key points and function of Calcium signaling proteins.

3. a. Explain the function, occurrence and structure of haemoglobin and myoglobin. 5+5=10
   b. Discuss about the following selective transport and storage of iron (i) Siderophores (ii) Ferritin

4. a. Discuss the mechanism of zinc –enzymes in terms of two limiting cases with regard to catalytic specific acid base reactions. 5
   b. Give a plausible mechanism for the action of acotinase, based on structural, kinetic and spectroscopic evidence. 5

5. a. Illustrate the role of Mo-enzymes in direct oxygen transfer for sulphite oxidase. 5
   b. Why is a cobalt-based macrocylic complex rather than an iron complex like haem, is well suited for radical based rearrangement? 5

6. a. Discuss the role of alkaline phosphatase to catalytic zinc centres. 2
   b. What is quantum yield? Give one example of photoredox reaction. 2
   c. What is role of contrast agent in MRI? Give examples. 3
   d. How malaria is treated with organometallic drug. 3

7. a. What type of reaction observed by photolysis of $[Co(CN)_5Br]^{3-}$ in presence of SCN^- ligand? Write down the products. 3
   b. What do you mean by photoisomerisation reaction? Give example. 3
   c. Explain why $[Co(H_2O)_6]^{3+}$ and $[Cr(NH_3)_6]^{3+}$ do not undergo ligand substitution easily in thermal condition but they undergo photochemical substitution easily. 4

8. a. Explain in detail how organometallic anticancer drug kills cancerous cells? 4
   b. What is iron overload? Explain with example how this disease is treated. 3
   c. Which disease can be treated with gold containing organometallic drugs? Explain in detail how they work? 3

= = *** = =