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**5 SEM TDC CHM M 3 (N/O)**

**2019**

( November )

**CHEMISTRY**

( Major )

Course : 503

**( Inorganic Chemistry—II )**

( New Course )

Full Marks : 48

Pass Marks : 14

Time : 2 hours

*The figures in the margin indicate full marks  
for the questions*

1. Select the correct answer from the following :

1×5=5

(a) The stretching wave number of the CO molecule is  $2143\text{ cm}^{-1}$ . The C—O stretching wave number of CO in  $\text{Mo}(\text{CO})_6$  is

(i)  $2000\text{ cm}^{-1}$

(ii)  $2260\text{ cm}^{-1}$

(iii)  $2003\text{ cm}^{-1}$

(iv)  $2160\text{ cm}^{-1}$

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(b)  $\text{Mn}(\text{CO})_5$  is isolobal with

(i)  $\text{CH}_3$  (ii)  $\text{CH}_3^-$

(iii)  $\text{CH}$  (iv)  $\text{CH}_2^+$

(c) Eriochrome black T is an example of

(i) adsorption indicator

(ii) redox indicator

(iii) metal ion indicator

(iv) neutralization indicator

(d) Total electron count for the compound  $[\text{Fe}_4\text{N}(\text{CO})_{12}]^-$  is

(i) 60 (ii) 62

(iii) 72 (iv) 59

(e)  $\text{C}_6\text{H}_5\text{CH}(\text{OH})\text{C}(=\text{NOH})\text{C}_6\text{H}_5$  is

(i) Vaska's compound

(ii) cupferron

(iii) benzoin- $\alpha$ -oxime

(iv) dithizone

2. Answer the following questions :  $2 \times 5 = 10$

(a) Write a note on Zeise's salt.

(b) Outline the conditions necessary for isolobality of two molecular fragments.

- (c) Write a preparation for nickel nitrosyl compounds.
- (d) Write the synthesis of  $\text{Fe}_2(\text{CO})_9$ .
- (e) Define accuracy and precession.

3. Answer any *three* of the following questions :

3×3=9

- (a) Give the reaction path of the hydrogenation of olefin with the help of Wilkinson's catalyst.
- (b) How will you distinguish terminal carbonyl group from bridging carbonyl group in metal carbonyl compounds?
- (c) Discuss the structure and bonding in ferrocene.
- (d) Explain reductive elimination reaction with suitable example.

4. Answer any *two* of the following questions :

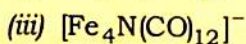
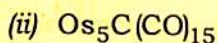
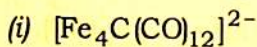
3×2=6

- (a) Give the synthesis of a carbonyl cluster containing three iron atoms and discuss its structure.
- (b) Explain how nitric oxide can form metal complexes as (i) 3-electron donor, (ii) 2-electron donor and (iii) 1-electron donor. Give one example of each.



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(c) Predict the structures of the following clusters in the light of PSEP theory :



5. Write the preparation of nitroso-ferrous sulphate (give reactions). Give one property of nitroso-ferrous sulphate and explain its structure and bonding.

$$1\frac{1}{2} + 1 + 1\frac{1}{2} = 4$$

6. Answer any *two* of the following questions :

$$4 \times 2 = 8$$

(a) Explain the action of diphenyl amine indicator in titrating ferrous ion with potassium dichromate in acidic medium. Give examples of two redox indicators.

$$3 + 1 = 4$$

(b) Mention the types of errors encountered in quantitative analysis. How can errors be minimized?

$$2 + 2 = 4$$

(c) What types of indicators will you use in the titration of (i) strong acid and weak base and (ii) weak acid and strong base? Explain, giving reasons.

$$2 + 2 = 4$$

7. Discuss the uses of the following reagents in the inorganic analysis (any *three*) :  $2 \times 3 = 6$

- (a) 8-hydroxyquinoline
- (b) Diphenyl carbazide
- (c) Thiourea
- (d) Salicylaldehyde
- (e) 1-nitroso-2-naphthol

( Old Course )

Full Marks : 48

Pass Marks : 19

Time : 3 hours

*The figures in the margin indicate full marks for the questions*

1. Select the correct answer from the following :  $1 \times 5 = 5$

(a)  $\text{Mn}(\text{CO})_5$  is isolobal with

(i) CH

(ii)  $\text{CH}_2$

(iii)  $\text{CH}_2^+$

(iv)  $\text{CH}_3$

(b) Sodium nitroprusside contains species

(i) NO

(ii)  $\text{NO}^-$

(iii)  $\text{NO}^+$

(iv)  $\text{NO}_2$

(c) Which of the following is a redox indicator?

(i) Methylene blue

(ii) Methyl orange

(iii) Congo red

(iv) Thymol blue

(d) The number 0.007050 has \_\_\_\_\_ significant figures.

(i) three

(ii) four

(iii) five

(iv) six

(e) Vaska's compound is

(i)  $[\text{IrCl}_3\text{CO}(\text{PPh}_3)_2]$

(ii)  $[\text{IrCl}(\text{CO})(\text{PPh}_3)_2]$

(iii)  $[\text{HCo}(\text{CO})_4]$

(iv)  $[\text{Ir}(\text{CO})_4(\text{PPh}_3)_2]$

2. Answer the following questions : 2×5=10

(a) Explain oxidative addition reaction with the help of Vaska's compound.

(b) What do you mean by an error? How are they expressed?

(c) Give a method of preparation of sodium nitroprusside.

(d) What are metal clusters? How are they generally classified?



(e)  $\text{Fe}_2(\text{CO})_9$  contains both bridging and terminal CO. Justify the statement.

3. Answer any *three* of the following questions :

3×3=9

(a) Give the preparations of ferrocene and Zeise's salt.

(b) Give the reaction path of the hydrogenation of olefin with the help of Wilkinson's catalyst.

(c) Explain the route of hydroformylation reaction catalyzed by  $\text{HCO}(\text{CO})_4$ .

(d) What do you mean by reductive elimination? Give an example.

(e) Discuss about the bonding in mononuclear metal carbonyls.

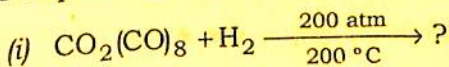
4. Answer any *three* of the following questions :

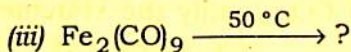
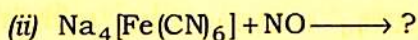
3×3=9

(a) Outline the rules for polyhedral skeletal electron pair theory.

(b) In what ways NO can form bond with a metal? Discuss.

(c) Complete the following reactions :





- (d) Give one preparation of sodium nitroprusside. Discuss about its structure.

5. Answer any *three* of the following questions :

3×3=9

- (a) What are metal ion indicators? Give two examples with structure. 1+2=3

- (b) What indicators will you use in the titration of (i) strong acid and weak base and (ii) strong acid and strong base? Give reasons. 1+2=3

- (c) What are determinate errors? Explain additive and proportional errors. 1+2=3

- (d) Write a note on minimization of errors. 3

6. Discuss the uses of the following reagents in inorganic analysis (any *three*) :

2×3=6

- (a) Cupferron  
(b) Thiourea  
(c) Salicylaldoxime  
(d) Zinc uranyl acetate

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