

(6 pages)

Reg. No. :

Code No. : 30075 E Sub. Code : GMCH 61

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester

Chemistry – Main

INORGANIC CHEMISTRY – III

(For those who joined in July 2012 – 2015)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. Inert gases are separated by
 - (a) Ramsay method
 - (b) Ramsay and Rayleigh method
 - (c) Dewar's method
 - (d) Corendish method

2. The noble gas used for Magnetic Resonance Imaging (MRI) is
- (a) Helium (b) Krypton
(c) Argon (d) Xenon
3. Which complex is Paramagnetic?
- (a) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (b) $\text{K}_4[\text{Fe}(\text{CN})_6]$
(c) $[\text{Co}(\text{CN})_6]^{3-}$ (d) $[\text{CoF}_6]^{3-}$
4. How many axial orbitals are available in 'd' orbital?
- (a) 1 (b) 2
(c) 3 (d) 4
5. Which one of the following is having a higher trans effect?
- (a) CN^- (b) NH_3
(c) Cl^- (d) None of the above
6. The Half-Life period of Labile complexes are
- (a) short (b) very short
(c) high (d) medium
7. Which of the complex is used for cancer therapy?
- (a) Cis-platin (b) Trans-platin
(c) Platocyanin (d) None of the above

8. Lack of Zinc deficiency may lead to _____ disease.
- (a) Dwarfism (b) Dermatitis
(c) Loss of appetite (d) All the above
9. Which transition is a forbidden one?
- (a) $g \rightarrow g$ (b) $U \rightarrow u$
(c) $g \rightarrow u$ (d) $g \rightarrow g$ and $U \rightarrow u$
10. Staggered rules was formulated by
- (a) Adamson (b) Kirk
(c) Wilfred (d) Werner

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the clathrate compounds of noble gases with examples.

Or

- (b) Discuss the importance of Inert gases in theoretical chemistry.

12. (a) How will you determine the stability constant of a complex by Bjerrum method?

Or

(b) Explain the splitting of 'd' orbital in octahedral geometry complex.

13. (a) Write notes on :

(i) Labile complexes

(ii) Inert complexes

Or

(b) Explain in detail about metal nitrosyls.

14. (a) Explain the differences between Haemoglobin and myoglobin.

Or

(b) Discuss the effect of excess and deficiency of essential trace elements.

15. (a) State and explain the Quenching Process.

Or

(b) Write notes on Photovoltaic Cell.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the separation of noble gases from one another using Dewar's method.

Or

- (b) Discuss the structure of the following compounds.

(i) Xenon tetra fluoride

(ii) Xenon trioxide

(iii) Xenon tetroxide.

17. (a) Explain the applications of crystal field theory with suitable examples.

Or

- (b) Write notes :

(i) Effective Atomic Number

(ii) Factors affecting the stability of complexes.

18. (a) What is meant by Trans effect? Explain the applications of trans effect in detail with suitable examples.

Or

(b) Write notes on the following :

(i) 18 Electron Rule

(ii) Nature of M-L bonding in metal carbonyls.

19. (a) Explain the structure and mechanism of action of hemoglobin.

Or

(b) Explain the role of the complexes of Copper, Gold and Platinum in therapeutic treatment.

20. (a) Explain the different types of photo chemical reactions in detail.

Or

(b) Write notes on :

(i) Adamson's rule

(ii) Charge transfer and its types.

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B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2020.

Sixth Semester

Chemistry — Main

ORGANIC CHEMISTRY–IV

(For those who joined in July 2012–2015)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer

1. An example for monosaccharide is _____
(a) Sucrose (b) Lactose
(c) Glucose (d) All
2. Reduction of fructose with HI/P gives
(a) n-hexane (b) Sorbitol
(c) Manitol (d) None

3. Substituted benzoic acid is _____
acidic than benzoic acid
- (a) Less (b) Same
(c) More (d) None
4. Electron withdrawing substituents _____
acidity of aromatic carboxylic acid.
- (a) Enhance (b) Decrease
(c) No effect (d) None
5. Lead tetra acetate is used as _____
- (a) Oxidizing agent (b) Acetoxyating agent
(c) Methylating agent (d) All
6. LiAlH_4 is a _____
- (a) Oxidizing agent (b) Reducing agent
(c) Hydrolyzing agent (d) None
7. Neutral ferric chloride produce _____
colour with phenolic group.
- (a) Pink (b) Red
(c) Green (d) Violet

8. N-CH₃ group in an alkaloid is estimated by
- (a) Zeisel method
 - (b) Herzig-Meyer method
 - (c) Hofmann exhaustive methylation method
 - (d) None
9. Shift of adsorption maximum to shorter wavelength side is called _____
- (a) Red shift
 - (b) Hyper chromic effect
 - (c) Blue shift
 - (d) Hypo chromic effect
10. An example for auxochrome is called
- (a) -NH₂
 - (b) -N=N-
 - (c) >C=O
 - (d) All

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Write note on Epimerisation.

Or

- (b) How will you convert fructose into glucose?

12. (a) What is Cannizzaro reaction? Write its mechanism.

Or

(b) How is benzene 1,2-dicarboxylic acid prepared?

13. (a) Explain the mechanism of Schmidt rearrangement.

Or

(b) Discuss Hofmann rearrangement with suitable example.

14. (a) Write note on Isoprene rule.

Or

(b) How are alkaloids classified?

15. (a) Write note on spin-spin coupling.

Or

(b) Explain chromophore and auxochrome with example.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Discuss the open chain structure of fructose.

Or

(b) Write any four chemical properties of sucrose with example.

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[P.T.O.]

17. (a) Explain the evidence quinone mono oxime tautomerism.

Or

- (b) How are the following prepared? Mention their uses

- (i) Mitchler's Ketone
- (ii) Benzene 1,4-dicarboxylic acid

18. (a) Explain Fries rearrangement with suitable example.

Or

- (b) Write the application of the following in organic chemistry.

- (i) BF_3
- (ii) $\text{H}_2/\text{Pd}-\text{BaSO}_4$

19. (a) Discuss the structure of piperine.

Or

- (b) Discuss the structure of Citra.

20. (a) Explain Woodward – Fischer rule with suitable example.

Or

(b) How is the following determined by uv spectroscopy

(i) Cis – trans isomer

(ii) Nature of double bond.

4. ESR spectrum is shown by
(a) benzene (b) toluene
(c) methane (d) methylradical
5. In low resolution NMR spectrum the number of signals obtained for ethanol is
(a) 1 (b) 2
(c) 3 (d) 4
6. Which of the following molecule shows a rotational spectra.
(a) H₂ (b) CH₄
(c) CO₂ (d) HCl
7. The symbol for proper axis of rotation is
(a) S_n (b) E
(c) σ (d) C_n
8. C_{2v} point group is assigned to
(a) H₂O (b) CO₂
(c) B₇₃ (d) CH₄
9. 1nm is equal to
(a) 9m (b) 9cm
(c) 10⁻⁹m (d) 10⁻⁹cm
10. Nano compounds can be prepared by
(a) Vapour deposition method
(b) Reduction
(c) Sol-Gel method
(d) All the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Write the differences between thermal and photochemical reactions.

Or

- (b) Explain phosphorescence.

12. (a) Write the application of rotational spectrum.

Or

- (b) Explain force constant.

13. (a) Write the differences between Raman spectra and IR spectra.

Or

- (b) Explain chemical shift.

14. (a) Explain the elements of symmetry.

Or

- (b) Explain the character table for C_{2v} point group.

15. (a) Write any one method of synthesis of Nano particles.

Or

- (b) Explain Nano clusters.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

16. (a) Explain photochemical decomposition of HI.

Or

- (b) Write the applications of Lasers.

17. (a) Write the applications of IR spectra.

Or

- (b) Explain rotational spectra of diatomic molecules.

18. (a) Write the advantages of Raman Spectroscopy over IR spectroscopy.

Or

- (b) Give the applications of NMR spectroscopy.

19. (a) Explain Abelian and cyclic groups.

Or

- (b) Explain C_{3v} character table.

20. (a) Write the applications of CNT.

Or

- (b) Write the applications of Nanochemistry in various fields.

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B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester

Chemistry – Main

Major Elective — APPLIED CHEMISTRY

(For those who joined in July 2012 – 2015 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Hardness of water is due to the presence of salts of
(a) Potassium (b) Chlorine
(c) Magnesium (d) Boron
2. The pH of the drinking water is about _____.
(a) 6.5 – 8.5 (b) 5.5 – 6.5
(c) 4.5 – 5.5 (d) 3.5 – 4.5

3. A high temperature lubricants used many undergoes
- (a) vulcanization (b) volatilization
(c) lubrication (d) combustion
4. Pensky – Marten's apparatus is used to find out the _____.
- (a) cloud point (b) pour point
(c) flash point (d) fire point
5. Which one of the following does not contain silver?
- (a) Horn silver (b) Ruby silver
(c) German silver (d) Lunar caustic
6. An alloy is a _____.
- (a) Pure metal
(b) Mixture of metals in any proportion
(c) Mixture of metal in fixed proportion
(d) Mixture of two-non-metals
7. What is the raw material in the leather industry?
- (a) By-products of the food industry
(b) By-products of the metal industry
(c) By-products of the fishing industry
(d) By-products of computer industry

8. Factors leading to the world shortage of leather is
- (a) Population explosion
 - (b) Decrease in world wide tanns
 - (c) High demand for cheaper food source
 - (d) All the above
9. Waste water released from _____ are not the sources of bacteria.
- (a) Sanitaria
 - (b) Municipalites
 - (c) Tanning
 - (d) Industries
10. Which one of the following is the main cause of air pollution?
- (a) Decrease in the factories
 - (b) Increase in the factories
 - (c) Increase in the sea water level
 - (d) Increase in the modern technologies

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Write a short notes on Permutit's Process.

Or

- (b) Explain in brief about electro dialysis.

12. (a) Give a short note on mechanism of lubrication.

Or

(b) Define Greases. Classify it with a suitable examples.

13. (a) Write a short note on Indian iron resources.

Or

(b) Give the applications involved in powder metallurgy.

14. (a) Give a brief note on leather industries in India.

Or

(b) Describe a brief note on waste management from leather industry.

15. (a) Write a short note on green house effect.

Or

(b) Explain in brief about the composition of atmosphere.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain in detail about the various methods of internal conditioning of boiler feed water.

Or

- (b) Describe the reverse osmosis method of desalination of H₂O.

17. (a) Explain in detail about the dropping point and its determination.

Or

- (b) Give a detailed classification involved in lubricating oils.

18. (a) Explain in detail about the determination of ferrous Ibu and total iron by dichrometry method.

Or

- (b) Describe the fabrication method involved in powder metallurgy.

19. (a) Explain in detail about the leather tanning and its processes.

Or

(b) Discuss any five leather products and its uses.

20. (a) Describe in detail about the sources, causes and control of soil pollution.

Or

(b) Explain the following :

(i) Acid rain

(ii) Ozone depletion.

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SMCH61

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester

Chemistry – Main

INORGANIC CHEMISTRY – III

(For those who joined in July 2016 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. $K_3[CrF_6]$ என்ற அணைவுச் சேர்மத்தின் IUPAC பெயர்
(அ) பொட்டாசியம் ஹெக்ஸா புளுவோரோ குரோமேட்
(II)
(ஆ) பொட்டாசியம் குரோமோ ஹெக்ஸா புளுவோரைடு
(II)
(இ) பொட்டாசியம் ஹெக்ஸா புளுவோரோ குரோமேட்
(III)
(ஈ) குரோமியம் ஹெக்ஸா புளுவோரோ பொட்டாசியம்
(I)

The IUPAC name of $K_3[CrF_6]$ is

- (a) Potassium hexafluoro chromate (II)
- (b) Potassium chromo hexafluoride (II)
- (c) Potassium hexafluoro chromate (III)
- (d) Chromium hexafluoro potassium (I)

2. VB கொள்கையை அறிமுகப்படுத்தியவர்

- (அ) பாலிங்
- (ஆ) வெர்னர்
- (இ) சிட்ஸ்விக்
- (ஈ) பேதே மற்றும் வான்வெளக்

VB theory was introduced by

- (a) Pauling
- (b) Warner
- (c) Sidgwick
- (d) Bethe and Vanvleck

3. படிக்கப்பல பிளப்பு ஆற்றல் குறைவாக உள்ள அணைவுச் சேர்மங்களின் கிளர்வு ஆற்றல்

- (அ) அதிகமாக இருக்கும்
- (ஆ) குறைவாக இருக்கும்
- (இ) பூஜ்ஜியமாக இருக்கும்
- (ஈ) படிக்கப்பல பிளப்பு ஆற்றலுக்கும் கிளர்வு ஆற்றலுக்கும் தொடர்பு கிடையாது

If the crystal field splitting energy for any complex is lower the complex requires the excitation energy.

- (a) high
- (b) low
- (c) zero
- (d) no relationship between crystal field splitting energy and excitation energy

4. Mn^{2+} -ல் தனித்து இருக்கும் எலக்ட்ரான்களின் எண்ணிக்கை

- (அ) 5 (ஆ) 4
- (இ) 3 (ஈ) 2

The number of unpaired electrons present in Mn^{2+} is

- (a) 5 (b) 4
- (c) 3 (d) 2

5. கீழ்க்கண்டவற்றில் எதற்கு ட்ரான்ஸ் விளைவு அதிகம்?

- (அ) H_2O (ஆ) NH_3
- (இ) பிரிடின் (ஈ) I^-

Which one of the following has more transeffect?

- (a) H_2O (b) NH_3
- (c) Pyridine (d) I^-

6. பொதுவாக கார நீராற்பகுத்தல் வினையின் வேகம் அமில் நீராற் பகுத்தல் வினையின் வேகத்தை விட _____ இருக்கும்.

(அ) அதிகமாக இருக்கும் (ஆ) குறைவாக இருக்கம்

(இ) 0 (ஈ) சமமாக இருக்கம்

Commonly, the rate of base hydrolysis is _____ than that of acid hydrolysis.

(a) more (b) lesser

(c) 0 (d) equal

7. ஆக்ஸோ முறையில் பயன்படுத்தப்படும் வினையூக்கி

(அ) $(\text{Ph}_3\text{P})_2\text{RhCl}$

(ஆ) $\text{HCo}(\text{CO})_4$

(இ) வாக்கர் வினையூக்கி

(ஈ) சீக்ளர்-நட்டா வினையூக்கி

The catalyst used in O × O process is

(a) $(\text{Ph}_3\text{P})_2\text{RhCl}$

(b) $\text{HCo}(\text{CO})_4$

(c) Wacker catalyst

(d) Ziegler-Natta catalyst

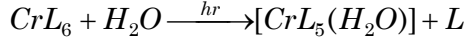
8. கார்பன் மோனாக்சைடை நன்கு தூளாக்கப்பட்ட கோபால்ட்டுடன் $150 - 200^\circ \text{C}$ மற்றும் 250 வளிமண்டல அழுத்தத்தில் வினைபடுத்தும் போது கிடைக்கும் உலோகக் கார்பனைல்

- (அ) $\text{Co}(\text{CO})_3$ (ஆ) $\text{Co}_2(\text{CO})_8$
(இ) $\text{Co}(\text{CO})_2$ (ஈ) $[\text{Co}_4(\text{CO})_{12}]$

The metal carbonyl obtained by the action of carbon-monoxide on finely divided cobalt at $150 - 200^\circ \text{C}$ and 250 atm pressure is

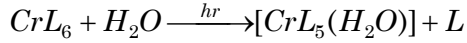
- (a) $\text{Co}(\text{CO})_3$ (b) $\text{Co}_2(\text{CO})_8$
(c) $\text{Co}(\text{CO})_2$ (d) $[\text{Co}_4(\text{CO})_{12}]$

9. கீழ்க்கண்ட வினை எவ்வாறு அழைக்கப்படுகிறது?

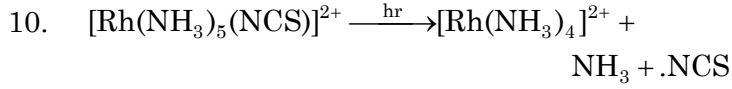


- (அ) ஒளி ஆக்ஸிஜனேற்ற ஒடுக்க வினை
(ஆ) கார நீராற்பகுத்தல்
(இ) அமில நீராற்பகுத்தல்
(ஈ) ஒளி நீரேற்றம்

How is the following reaction called?

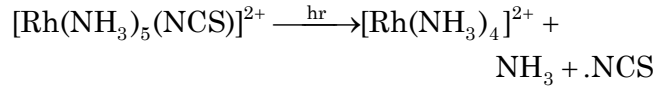


- (a) Photoredox (b) Base hydrolysis
(c) Acid hydrolysis (d) Photoequation



மேற்கண்ட வினை இதற்கோர் சான்று. அது

- (அ) ஒளி பதிலீட்டு வினை
 (ஆ) ஒளி ஆக்ஸிஜனேற்ற ஒடுக்க வினை
 (இ) அம்மோனியாக்கல் வினை
 (ஈ) ஒளி நீரேற்ற வினை



is an example for

- (a) Photosubstitution reaction
 (b) Photoredox
 (c) Ammoniacal reaction
 (d) Photoaquation reaction

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (அ) எண்முகி அணைவுச் சேர்மங்களில் வடிவமைப்பு மாற்றியங்களை தகுந்த சான்றுகளுடன் விளக்குக.

Explain with suitable examples the structural isomerism in octahedral complexes.

Or

(ஆ) ஈனிகள் என்றால் என்ன? அவற்றின் வகைகள் யாவை? ஒவ்வொன்றிற்கும் ஓர் சான்றினைத் தருக.

What are ligands? How are they classified? Give one example for each type.

12. (அ) படிக்கப்புல நிலைப்பு ஆற்றல் என்றால் என்ன? அதன் பயன்களை எழுதுக.

What is meant by crystal field stabilization energy? Write down its uses.

Or

(ஆ) படிக்கப்புல பிளத்தலைப் பாதிக்கும் காரணிகள் ஐந்தினை விளக்குக.

Explain any five factors which affect the crystal field splitting.

13. (அ) உள்கோள் எலக்ட்ரான் பரிமாற்ற வினையை வழிமுறையுடன் விளக்குக.

Explain the inner-sphere electron transfer reaction with mechanism.

Or

(ஆ) அணைவுச் சேர்மங்களில் எதிர்வினைகள் பற்றி ஒரு குறிப்பு வரைக.

Write a note on anation reactions in co-ordination compounds.

14. (அ) 18 எலக்ட்ரான் விதியைக் கூறி விளக்குக.

State and explain 18 electron rule.

Or

(ஆ) ஏதேனும் இரண்டு துத்தநாக கரிமச் சேர்மங்களைக் கூறுக. அவை எவ்வாறு தயாரிக்கப்படுகின்றன?

Mention any two organometallic compounds of zinc. How are they prepared?

15. (அ) உலோக-மைய மற்றும் மின்சுமை-பரிமாற்ற வினைகளை தகுந்த சான்றுகளுடன் விளக்குக.

Explain the metal-centred and charge-transfer transitions with suitable examples.

Or

(ஆ) ஆடம்சன் விதிகளைக் கூறி விளக்குக.

State and explain the Adamson's rules.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (அ) எண்முகி மற்றும் நான்முகி அணைவுச் சேர்மங்களின் முப்பரிமான வடிவமைப்பு மாற்றியங்களை சான்றுகளுடன் விளக்குக.

Discuss briefly the stereoisomerism in octahedral and tetrahedral co-ordination compounds.

Or

(ஆ) எண்முகி மற்றும் நான்முகி அணைவுச் சேர்மங்களில் VB கொள்கையின் பயன்பாடுகளை விரிவாக விளக்குக.

Explain briefly the applications of VB theory in octahedral and tetrahedral complexes.

17. (அ) அணைவுச் சேர்மங்களின் காந்த மற்றும் நிறமாலைப் பண்புகளை தகுந்த சான்றுகளுடன் விளக்குக.

Explain briefly the magnetic and spectral properties of transition metal complexes.

Or

(ஆ) அணைவுச் சேர்மங்களின் நிலைப்புத் தன்மை என்றால் என்ன? அதைப் பாதிக்கும் காரணிகளை விளக்குக. நிலைப்புத்தன்மையை மதிப்பிடப் பயன்படும் முறைகளுள் ஏதேனும் ஒன்றை விரிவாக எழுதுக.

What is meant by stability of complexes? What are the factors which affect it? Write anyone method to determine the stability constant.

18. (அ) செயலற்ற மற்றும் செயலுடைய அணைவுச் சேர்மங்களைத் தகுந்த சான்றுடன் விளக்குக. கார நீராற்பகுத்தல் வினையை வழிமுறையுடன் விளக்குக.

Explain the inert and labile complexes with suitable examples. Discuss the base hydrolysis with mechanism.

Or

(ஆ) ட்ரான்ஸ் விளைவு என்றால் என்ன? அதன் கொள்கைகளுள் ஏதேனும் இரண்டை விளக்குக.

What is meant by trans-effect? Explain any two theories of trans-effect.

19. (அ) உலோக நைட்ரோசைல்கள் என்றால் என்ன? அவற்றின் அமைப்பு மற்றும் பிணைப்பு முறைகளை எழுதுக.

What are metal nitrosyls? Write down their structure and bonding.

Or

(ஆ) வில்சன் மற்றும் சீக்ளர்-நட்டா வினையூக்கிகள் என்றால் என்ன? அவற்றின் முக்கியத்துவத்தை எழுதுக.

What are Wilkinson's and Ziegler-Natta catalysts? Write down their importance.

20. (அ) (i) ஒளி ஆக்ஸிஜனேற்ற - ஒடுக்க வினை மற்றும்
(ii) ஒளி பதிலீட்டு வினை ஆகியவற்றை தகுந்த சான்றுகளுடன் விளக்குக.

Discuss briefly the photosubstitution and photoredox reactions with suitable examples.

Or

(ஆ) ஒளி கால்வானிக் மின்கலன்கள் மற்றும் குறைகடத்திகளை அடிப்படையாகக் கொண்ட ஒளிவோல்டாயிக் மின்கலன்கள் ஆகியவற்றைப் பற்றி விரிவாக விளக்குக.

Explain briefly the photogalvanic cells and semiconductor based photovoltaic cells.

(6 pages)

Reg. No. :

Code No. : 30285E Sub. Code : JMCH61/
SMCH61

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester

Chemistry – Main

INORGANIC CHEMISTRY – III

(For those who joined in July 2016 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The IUPAC name of $K_3[CrF_6]$ is
 - (a) Potassium hexafluoro chromate (II)
 - (b) Potassium chromo hexafluoride (II)
 - (c) Potassium hexafluoro chromate (III)
 - (d) Chromium hexafluoro potassium (I)

2. VB theory was introduced by
- (a) Pauling
 - (b) Warner
 - (c) Sidgwick
 - (d) Bethe and Vanvleck
3. If the crystal field splitting energy for any complex is lower the complex requires the excitation energy.
- (a) high
 - (b) low
 - (c) zero
 - (d) no relationship between crystal field splitting energy and excitation energy
4. The number of unpaired electrons present in Mn^{2+} is
- (a) 5
 - (b) 4
 - (c) 3
 - (d) 2
5. Which one of the following has more transeffect?
- (a) H_2O
 - (b) NH_3
 - (c) Pyridine
 - (d) I^-

6. Commonly, the rate of base hydrolysis is _____ than that of acid hydrolysis.

- (a) more (b) lesser
(c) 0 (d) equal

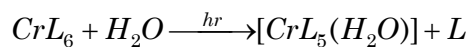
7. The catalyst used in O x O process is

- (a) $(\text{Ph}_3\text{P})_2\text{RhCl}$
(b) $\text{HCo}(\text{CO})_4$
(c) Wacker catalyst
(d) Ziegler-Natta catalyst

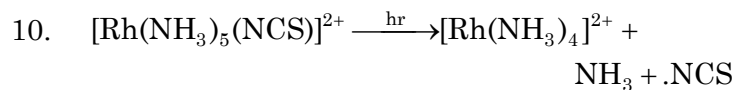
8. The metal carbonyl obtained by the action of carbon-monoxide on finely divided cobalt at $150 - 200^\circ \text{C}$ and 250 atm pressure is

- (a) $\text{Co}(\text{CO})_3$ (b) $\text{Co}_2(\text{CO})_8$
(c) $\text{Co}(\text{CO})_2$ (d) $[\text{Co}_4(\text{CO})_{12}]$

9. How is the following reaction called?



- (a) Photoredox (b) Base hydrolysis
(c) Acid hydrolysis (d) Photoequation



is an example for

- (a) Photosubstitution reaction
- (b) Photoredox
- (c) Ammoniacal reaction
- (d) Photoaquation reaction

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain with suitable examples the structural isomerism in octahedral complexes.

Or

- (b) What are ligands? How are they classified? Give one example for each type.

12. (a) What is meant by crystal field stabilization energy? Write down its uses.

Or

- (b) Explain any five factors which affect the crystal field splitting.

13. (a) Explain the inner-sphere electron transfer reaction with mechanism.

Or

- (b) Write a note on anation reactions in co-ordination compounds.

14. (a) State and explain 18 electron rule.

Or

- (b) Mention any two organometallic compounds of zinc. How are they prepared?

15. (a) Explain the metal-centred and charge-transfer transitions with suitable examples.

Or

- (b) State and explain the Adamson's rules.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss briefly the stereoisomerism in octahedral and tetrahedral co-ordination compounds.

Or

- (b) Explain briefly the applications of VB theory in octahedral and tetrahedral complexes.

17. (a) Explain briefly the magnetic and spectral properties of transition metal complexes.

Or

- (b) What is meant by stability of complexes? What are the factors which affect it? Write anyone method to determine the stability constant.

18. (a) Explain the inert and labile complexes with suitable examples. Discuss the base hydrolysis with mechanism.

Or

- (b) What is meant by trans-effect? Explain any two theories of trans-effect.

19. (a) What are metal nitrosyls? Write down their structure and bonding.

Or

- (b) What are Wilkinson's and Ziegler-Natta catalysts? Write down their importance.

20. (a) Discuss briefly the photosubstitution and photoredox reactions with suitable examples.

Or

- (b) Explain briefly the photogalvanic cells and semiconductor based photovoltaic cells.

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SMCH 62

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester

Chemistry – Main

ORGANIC CHEMISTRY – IV

(For those who joined in July 2016 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. $C_6H_{12}O_6$ மூலக்கூறு வாய்ப்பாட்டிற்கு எத்தனை ஆல்டோ
கெக்சோஸைடுகள் இருக்கலாம்?

(அ) 2

(ஆ) 4

(இ) 8

(ஈ) 16

How many aldohexoses are possible for the molecular formula $C_6H_{12}O_6$?

- (a) 2 (b) 4
(c) 8 (d) 16

2. பின்வருவனவற்றுள் எது பலபடி சர்க்கரை அல்ல?

- (அ) செல்லுலோஸ் (ஆ) சுக்ரோஸ்
(இ) அமைலோஸ் (ஈ) இன்சலீன்

Which one of the following is not a polysaccharide?

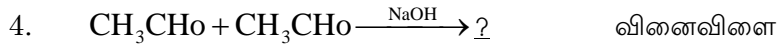
- (a) Cellulose (b) Sucrose
(c) Amylose (d) Insulin

3. பெர்கின் வினை ————— உடன் தொடர்பு உடையது.

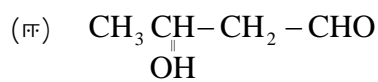
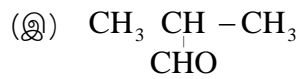
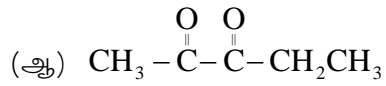
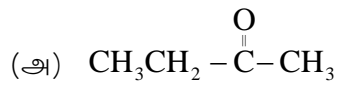
- (அ) ஆல்டால் சுருக்கம் (ஆ) கன்னிசரோ வினை
(இ) விட்டிக் வினை (ஈ) மானிச் வினை

Perkin reaction is related to —————.

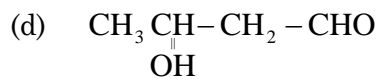
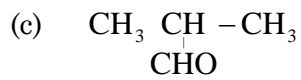
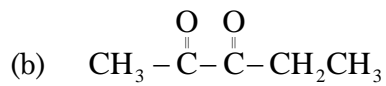
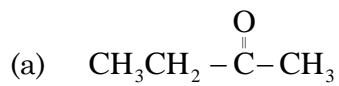
- (a) Aldol condensation
(b) Cannizzaro reaction
(c) Wittig reaction
(d) Mannich reaction



பொருளை கண்டுபிடி.



$\text{CH}_3\text{CHO} + \text{CH}_3\text{CHO} \xrightarrow{\text{NaOH}} ?$ Predict the product.



5. பின்வருவனவற்றுள் எது பென்சீல்-பென்சீலிக் அமிலம் மறுசீரமைப்பிற்குச் செல்லும்?
- (அ) பியூட்டேன்-2,3-டைஆல்
(ஆ) 1,2-டைகீட்டோன்கள்
(இ) பீனாலிக் எஸ்டர்கள்
(ஈ) அமீன்கள்

Which of the following will undergo benzil-benzilic acid rearrangement?

- (a) butane-2,3-diol (b) 1,2-diketones
(c) Phenolic esters (d) Amines
6. காப்மென் மறுசீரமைப்பு ————— முன்னிலையில் நடைபெறுகிறது.

- (அ) $\text{Br}_2 + \text{KOH}$ (ஆ) $\text{Cl}_2 + \text{KOH}$
(இ) $\text{Br}_2 + \text{NaOH}$ (ஈ) $\text{Cl}_2 + \text{NaOH}$

Hoffman rearrangement takes place in the presence of —————.

- (a) $\text{Br}_2 + \text{KOH}$ (b) $\text{Cl}_2 + \text{KOH}$
(c) $\text{Br}_2 + \text{NaOH}$ (d) $\text{Cl}_2 + \text{NaOH}$
7. டெர்பினாய்டுகளின் அடிப்படை அலகு —————.
- (அ) 1,3-பியூட்டாடையீன்
(ஆ) 2-மெத்தில்-1,3-பியூட்டாடையீன்
(இ) அல்லீன்
(ஈ) பீனால்கள்

The fundamental unit in terpenoids is _____.

- (a) 1,3-butadiene
- (b) 2-methyl-1,3-butadiene
- (c) Allene
- (d) Phenols

8. பின்வருவனவற்றுள் எது ஒரு அல்கலாய்டு அல்ல?

- (அ) நிக் கோட்டின் (ஆ) மார்பிபின்
- (இ) சிட்ரால் (ஈ) கோனைன்

Which of the following is not a alkaloid?

- (a) nicotine (b) morphine
- (c) citral (d) conine

9. பின்வருவனவற்றுள் எது நிறந்தாங்கி?

- (அ) $\text{C}=\text{O}$
- (ஆ) $\text{C}=\text{S}$
- (இ) $-\text{N}=\text{O}$
- (ஈ) மேற்கூறிய அனைத்தும்

Which of the following is a chromophore?

- (a) $\text{C}=\text{O}$ (b) $\text{C}=\text{S}$
- (c) $-\text{N}=\text{O}$ (d) all the above

10. NMR-ல் δ (deta) மற்றும் τ (tau) அளவுகள்
_____ என்ற கோவை மூலம்
தொடர்புபடுத்தப்படுகிறது.

(அ) $\tau = 10 - \delta$ (ஆ) $\tau = 10 + \delta$

(இ) $\delta = 2\tau$ (ஈ) $\tau + 10 = \delta$

In NMR the δ (deta) and τ (tau) scales are
related by the expression _____.

(a) $\tau = 10 - \delta$ (b) $\tau = 10 + \delta$

(c) $\delta = 2\tau$ (d) $\tau + 10 = \delta$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (அ) பிரக்டோஸ் குளுக்கோஸாக மாறுவதை எழுதுக.

Write the conversion of fructose to glucose.

Or

(ஆ) ஆல்டோஸ்களின் சங்கிலி குறுக்கத்தை விளக்குக.

Explain the chain shortening of aldoses.

12. (அ) ஆர்த்தோ விளைவு என்றால் என்ன? விளக்குக.

What is ortho effect? Explain.

Or

(ஆ) நோவநேகல் வினையின் வழிமுறையைத் தருக.

Give the mechanism of Knoevenagel reaction.

13. (அ) பென்சீல் – பென்சீலிக் அமிலம் மறுசீரமைப்பின் வழிமுறையைத் தருக.

Write the mechanism of benzil – benzilic acid rearrangement.

Or

(ஆ) குறிப்பு எழுதுக : கர்டியஸ் மறுசீரமைப்பு.

Write a note on : Curtius rearrangement.

14. (அ) ஐசோப்பிரின் விதி என்றால் என்ன? விளக்குக.

What is isoprene rule? Explain.

Or

(ஆ) அல்கலாய்டுகள் என்றால் என்ன? அவைகளின் வகைப்பாட்டினைத் தருக.

What are alkaloids? Give their classification.

15. (அ) UV நிறமாலையின் பயன்பாடுகளைத் தருக.

Give the application of UV spectra.

Or

(ஆ) அனிசோலின் NMR நிறமாலையை விளக்குக.

Discuss the NMR spectrum of anisole.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (அ) பலபடி சர்க்கரைகள் என்றால் என்ன? ஸ்டார்ச் மற்றும் செல்லுலோஸின் கட்டமைப்பை விளக்குக.

What are polysaccharides? Explain the structure of starch and cellulose.

Or

- (ஆ) (i) ஓசோன் உருவாதலுக்கான வினையை எழுதுக.
(ii) சிறு குறிப்பு வரைக : மாற்றுச் சுழற்சி.
(i) Write down the reaction of Osazone formation. (5)
(ii) Write note on : Mutarotation. (3)

17. (அ) வானிலீன் தயாரித்தல் மற்றும் பயன்களைத் தருக.

Give the preparation and uses of Vanillin.

Or

- (ஆ) (i) கிரசால் தயாரித்தலை எழுதுக.
(ii) கௌபென்-கோஸ்ச் தயாரித்தல் முறையை விளக்குக.
(i) Write the preparation of Cresol. (3)
(ii) Explain Houben-Hoesch synthesis. (5)

18. (அ) சிறு குறிப்பு வரைக :

(i) பேயர்-வில்லிஜர் ஆக்ஸிஜனேற்றம்

(ii) டாகின் வினை.

Write note on :

(i) Bayer–Villiger oxidation (4)

(ii) Dakin reaction. (4)

Or

(ஆ) ஆக்ஸிஜனில் இருந்து வளைய கார்பன் அணுவிற்கு நடைபெறும் ஏதாவது இரண்டு மறுசீரமைப்பினை விளக்குக.

Discuss any two rearrangements from oxygen to ring carbon atom.

19. (அ) நிக்கோட்டின் தயாரித்தலை எழுதுக.

Write the synthesis of nicotine.

Or

(ஆ) கேம்ஃபரின் கட்டமைப்பை கண்டறிதலைத் தருக.

Give the structural elucidation of camphor.

20. (அ) பின்வருவனவற்றை விளக்குக :
- (i) சிகப்பு நகர்வு
 - (ii) ஊதா நகர்வு
 - (iii) அலைநீளம் குறைந்த நகர்வு
 - (iv) உயர்நிற விளைவு

Define the following :

- (i) Red shift
- (ii) Blue shift
- (iii) Hypochromic shift
- (iv) Hypsochromic shift

Or

(ஆ) IR நிறமாலையின் பயன்பாடுகளை விவரி.

Describe the applications of IR spectroscopy.

(6 pages)

Reg. No. :

**Code No. : 30286 E Sub. Code : JMCH 62/
SMCH 62**

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester

Chemistry – Main

ORGANIC CHEMISTRY – IV

(For those who joined in July 2016 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. How many aldohexoses are possible for the molecular formula $C_6H_{12}O_6$?
(a) 2 (b) 4
(c) 8 (d) 16

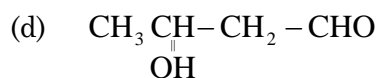
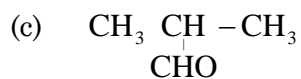
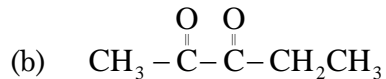
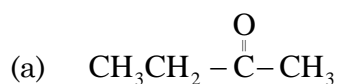
2. Which one of the following is not a polysaccharide?

- (a) Cellulose (b) Sucrose
(c) Amylose (d) Insulin

3. Perkin reaction is related to _____.

- (a) Aldol condensation
(b) Cannizzaro reaction
(c) Wittig reaction
(d) Mannich reaction

4. $\text{CH}_3\text{CHO} + \text{CH}_3\text{CHO} \xrightarrow{\text{NaOH}}$? Predict the product.



5. Which of the following will undergo benzil-benzilic acid rearrangement?

- (a) butane-2,3-diol (b) 1,2-diketones
(c) Phenolic esters (d) Amines

6. Hoffman rearrangement takes place in the presence of _____.
- (a) $\text{Br}_2 + \text{KOH}$ (b) $\text{Cl}_2 + \text{KOH}$
(c) $\text{Br}_2 + \text{NaOH}$ (d) $\text{Cl}_2 + \text{NaOH}$
7. The fundamental unit in terpenoids is _____.
- (a) 1,3-butadiene
(b) 2-methyl-1,3-butadiene
(c) Allene
(d) Phenols
8. Which of the following is not a alkaloid?
- (a) nicotine (b) morphine
(c) citral (d) conine
9. Which of the following is a chromophore?
- (a) >C=O (b) >C=S
(c) $-\text{N}=\text{O}$ (d) all the above
10. In NMR the δ (deta) and τ (tau) scales are related by the expression _____.
- (a) $\tau = 10 - \delta$ (b) $\tau = 10 + \delta$
(c) $\delta = 2\tau$ (d) $\tau + 10 = \delta$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Write the conversion of fructose to glucose.

Or

- (b) Explain the chain shortening of aldoses.

12. (a) What is ortho effect? Explain.

Or

- (b) Give the mechanism of Knoevenagel reaction.

13. (a) Write the mechanism of benzil – benzilic acid rearrangement.

Or

- (b) Write a note on : Curtius rearrangement.

14. (a) What is isoprene rule? Explain.

Or

- (b) What are alkaloids? Give their classification.

15. (a) Give the application of UV spectra.

Or

- (b) Discuss the NMR spectrum of anisole.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) What are polysaccharides? Explain the structure of starch and cellulose.

Or

- (b) (i) Write down the reaction of Osazone formation. (5)
(ii) Write note on : Mutarotation. (3)

17. (a) Give the preparation and uses of Vanillin.

Or

- (b) (i) Write the preparation of Cresol. (3)
(ii) Explain Houben–Hoesch synthesis. (5)

18. (a) Write note on :

- (i) Bayer–Villiger oxidation (4)
(ii) Dakin reaction. (4)

Or

- (b) Discuss any two rearrangements from oxygen to ring carbon atom.

19. (a) Write the synthesis of nicotine.

Or

(b) Give the structural elucidation of camphor.

20. (a) Define the following :

(i) Red shift

(ii) Blue shift

(iii) Hypochromic shift

(iv) Hypsochromic shift

Or

(b) Describe the applications of IR spectroscopy.

(8 pages)

Reg. No. :

Code No. : 30287 B **Sub. Code : JMCH 63/
SMCH 63**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2020.

Sixth Semester

Chemistry — Core

PHYSICAL CHEMISTRY – IV

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. பின்வருவனவற்றுள் எந்த மூலக்கூறு ராமன் நிறமாலையைத் தரும்

(அ) N_2

(ஆ) O_2

(இ) Cl_2

(ஈ) மேற்கூறிய அனைத்தும்

Which of the following molecule will given Raman spectra

(a) N_2

(b) O_2

(c) Cl_2

(d) All the above

2. $\text{CH}_3 - \text{O} - \text{CH}_3$ ல் எத்தனை வேறுபட்ட புரோட்டான்கள் உள்ளன?

(அ) 1 (ஆ) 2

(இ) 3 (ஈ) 4

How many different types of protons are present in $\text{CH}_3 - \text{O} - \text{CH}_3$?

(a) 1 (b) 2

(c) 3 (d) 4

3. முதல் படித்தான வினையின் வினைவேக மாறிலி _____ சார்ந்தது.

(அ) வினைபடு பொருட்களின் செறிவு

(ஆ) நேரம்

(இ) வெப்பநிலை

(ஈ) வினைவிளை பொருட்களின் செறிவு

The specific rate constant of a first order reaction depends on the

(a) concentration of the reactant

(b) time

(c) temperature

(d) concentration of the product

4. முதல் படி வினைவேக மாறிலின் அலகு _____.

(அ) $\text{mole lit}^{-1} \text{ s}^{-1}$ (ஆ) s^{-1}

(இ) lit sec^{-1} (ஈ) lit mole^{-1}

Unit of first order rate constant is _____.

- (a) mole lit⁻¹ s⁻¹ (b) s⁻¹
(c) lit sec⁻¹ (d) lit mole⁻¹

5. பின்வருவனவற்றுள் எது வலிமை மிகு அமிலம் மற்றும் வலிமை மிகு காரத்தின் உப்பு?

- (அ) KCN (ஆ) NaNO₃
(இ) NH₄Cl (ஈ) NaCl

Which of the following is a salt of strong acid strong base?

- (a) KCN (b) NaNO₃
(c) NH₄Cl (d) NaCl

6. _____ ஒரு லூயிஸ் காரம்

- (அ) AlCl₃ (ஆ) BF₃
(இ) BH₃ (ஈ) NH₃

_____ is a Lewis base.

- (a) AlCl₃ (b) BF₃
(c) BH₃ (d) NH₃

7. சல்ஃபர் அமைப்பு _____ நிலைகளை கொண்டது.

- (அ) ஒன்று (ஆ) இரண்டு
(இ) மூன்று (ஈ) நான்கு

Sulphur system has _____ phases.

- (a) one (b) two
(c) three (d) four

8. N_2 , O_2 மற்றும் H_2 ல் உள்ள நிலைமைகளின் எண்ணிக்கை

(அ) 0 (ஆ) 1

(இ) 2 (ஈ) 3

The number of phases in a mixture of N_2 , O_2 and H_2 will be

(a) 0 (b) 1

(c) 2 (d) 3

9. $1 \text{ nm} = \text{_____}$.

(அ) 10^{-9} m (ஆ) 10^{-10} m

(இ) 10^{-10} cm (ஈ) 10^{-11} m

$1 \text{ nm} = \text{_____}$.

(a) 10^{-9} m (b) 10^{-10} m

(c) 10^{-10} cm (d) 10^{-11} m

10. பின்வருவனவற்றுள் எது 1D நானோ அமைப்பு?

(அ) குவாண்டம் வெல்

(ஆ) குவாண்டம் வயர்

(இ) குவாண்டம் புள்ளி

(ஈ) மேற்கூறிய அனைத்தும்

Which of the following is a 1D nano structure?

(a) quantum well (b) quantum wire

(c) quantum dot (d) all the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (அ) IR மற்றும் ராமன் நிறமாலையியல்களின் இடையே உள்ள வேறுபாடுகளை எழுதுக.
Write the differences between IR and Raman Spectroscopy.

Or

- (ஆ) வேதி நகர்வினை பாதிக்கும் காரணிகள் எவை?
What are the factors affecting chemical shift?

12. (அ) ஒரு மூலக்கூறு வினைக்கான லின்ட்மேன் கொள்கையை விளக்குக.
Discuss the Lindemann theory of unimolecular reaction.

Or

- (ஆ) ஒரு வினையின் வினைபடியைக் கண்டறிய ஏதாவது ஒரு முறையை எழுதுக.
Write any one method to determine the order of a reaction.

13. (அ) தாங்கல் கரைசலின் pHஐ எவ்வாறு கணக்கிடுவாய்?
How will calculate pH of a buffer solution?

Or

- (ஆ) குறிப்பு வரைக : அமில – காரம் தரம்பார்த்தல்.
Write a note on : acid-base titration.

14. (அ) சல்ஃபரின் நிலைமை வரைபடத்தை வரைந்து விளக்குக.
Draw and explain the phase diagram of sulphur.

Or

- (ஆ) நிலைமை விதிக்கான சமன்பாட்டை வருவி.
Derive the equation of phase rule.

15. (அ) ஃபுல்லரீன்கள் என்றால் என்ன? அதன் பண்புகளைத் தருக.
What are fullerenes? Give their properties.

Or

- (ஆ) நானோத் துகள்களின் மின் பண்புகளை எழுதுக.
Write the electrical property of nanoparticles.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (அ) (i) பரஸ்பர விலக்கல் விதியைத் தருக.
(ii) NMR நிறமாலையின் கொள்கையை விளக்குக.
(i) State mutual exclusion principle. (4)
(ii) Discuss the theory of NMR spectra. (4)

Or

(ஆ) வரையறு :

- (i) மூலக்கூறு உச்சம்
- (ii) அடிப்படை உச்சம்
- (iii) ஐசோடோப் உச்சம்
- (iv) சிற்றுறுதியான உச்சம்.

Define :

- (i) Molecular peak (2)
- (ii) Base peak (2)
- (iii) Isotopic peak (2)
- (iv) Metastable peak. (2)

17. (அ) பூஜ்ய வினைபடி வினை என்றால் என்ன? அதன் பண்புகளைத் தருக. பூஜ்ய வினைபடி வினைக்கு ஒரு உதாரணம் தருக.

What is zero-order reaction? Give its characteristics. Give an example for zero order reaction.

Or

- (ஆ) மோதல் கொள்கையின் படி வினையின் வேகத்தையும் அந்தக் கொள்கையின் எல்லைகளையும் விளக்குக.

Explain collision theory of reaction rates and its limitations.

18. (அ) தாங்கல் கரைசல் என்றால் என்ன? அதன் வகைப்படுத்தலை எடுத்துக்காட்டுடன் விளக்குக.

What is buffer solution? Explain its classification with example.

Or

(ஆ) பல்வேறு உப்புக்களின் நிராற்பகுத்தலை விவரி.

Describe the hydrolysis of different salts.

19. (அ) Mg-Zn அமைப்பின் நிலைமை வரைபடத்தை விளக்குக.

Explain the phase diagram of Mg-Zn system.

Or

(ஆ) பங்கீட்டு விதியைத் எழுதுக. அதன் பயன்பாடுகளைத் தருக.

State distribution law? Give it's applications.

20. (அ) நானோத் துகள்கள் என்றால் என்ன? அதன் காந்த பண்புகளைத் தருக. ஏதாவது இரண்டு பயன்களை எழுதுக.

What are Nano particles? Give its magnetic properties. Write any two uses.

Or

(ஆ) பின்வருவனவற்றை விளக்குக.

(i) கார்பன் நானோநூல் இழை

(ii) நானோ கலவைகள்.

Explain the following :

(i) Carbon nanofibre. (4)

(ii) Nanocomposites. (4)

3. The specific rate constant of a first order reaction depends on the
- (a) concentration of the reactant
 - (b) time
 - (c) temperature
 - (d) concentration of the product
4. Unit of first order rate constant is _____.
- (a) mole lit⁻¹ s⁻¹
 - (b) s⁻¹
 - (c) lit sec⁻¹
 - (d) lit mole⁻¹
5. Which of the following is a salt of strong acid strong base?
- (a) KCN
 - (b) NaNO₃
 - (c) NH₄Cl
 - (d) NaCl
6. _____ is a Lewis base.
- (a) AlCl₃
 - (b) BF₃
 - (c) BH₃
 - (d) NH₃
7. Sulphur system has _____ phases.
- (a) one
 - (b) two
 - (c) three
 - (d) four

12. (a) Discuss the Lindemann theory of unimolecular reaction.

Or

(b) Write any one method to determine the order of a reaction.

13. (a) How will calculate pH of a buffer solution?

Or

(b) Write a note on : acid-base titration.

14. (a) Draw and explain the phase diagram of sulphur.

Or

(b) Derive the equation of phase rule.

15. (a) What are fullerenes? Give their properties.

Or

(b) Write the electrical property of nanoparticles.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) (i) State mutual exclusion principle. (4)
(ii) Discuss the theory of NMR spectra. (4)

Or

- (b) Define :
(i) Molecular peak (2)
(ii) Base peak (2)
(iii) Isotopic peak (2)
(iv) Metastable peak. (2)

17. (a) What is zero-order reaction? Give its characteristics. Give an example for zero order reaction.

Or

- (b) Explain collision theory of reaction rates and its limitations.

18. (a) What is buffer solution? Explain its classification with example.

Or

- (b) Describe the hydrolysis of different salts.

19. (a) Explain the phase diagram of Mg-Zn system.

Or

(b) State distribution law? Give its applications.

20. (a) What are Nano particles? Give its magnetic properties. Write any two uses.

Or

(b) Explain the following :

(i) Carbon nanofibre. (4)

(ii) Nanocomposites. (4)

(6 pages)

Reg. No. :

Code No. : 30302 E Sub. Code : JMCH 6 A/
SECH 6 A

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester
Chemistry – Main

Major Elective – III — GREEN CHEMISTRY

(For those who joined in July 2016 onwards)

Time : Three hours

Maximum : 75 marks


PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. Mass productivity =
- (a) $\frac{\text{Mass of product}}{\text{Total mass in process}}$
 - (b) $\frac{\text{Mass of product}}{\text{Mass of reactant}}$
 - (c) $\frac{\text{Mass of reactant}}{\text{Mass of product}}$
 - (d) $\frac{\text{Mass of reactant}}{\text{Total mass in process}}$

2. In addition reaction the atom economy is
- (a) 100% (b) 50%
(c) 36.4% (d) 0%
3. _____ is used for the removal of caffeine.
- (a) CO₂ (b) Water
(c) CH₂Cl₂ (d) DMSO
4. _____ property of ionic liquid make them safe to use in lab and industry.
- (a) high vapour pressure
(b) no vapour pressure
(c) low vapour pressure
(d) high melting point
5. Which acid catalyst is used in Petrochemical Industry?
- (a) Zeolite (b) HPA
(c) Pt (d) Ni
6. "Quick - Vinegar Process" is
- (a) C₂H₅OH to CH₃CHO
(b) C₂H₅OH to CH₃COOH
(c) CH₃OH to CH₃COOH
(d) CH₃OH to CH₃CHO

7. Adipic Acid is manufactured from
(a) CH_4 (b) C_6H_{12}
(c)  (d) C_2H_6
8. Benzyl bromide is prepared through _____ mechanism.
(a) radical (b) cationic
(c) anionic (d) carbene
9. Wood contains about _____ polysaccharides and _____ lignin
(a) 70% , 30% (b) 50% , 50%
(c) 20% , 10% (d) 98% , 2%
10. Best dry cleaning agent is
(a) liq. CO_2 (b) liq. N_2
(c) Benzene (d) ether

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What is yield? Explain with an example.

Or

- (b) Write note on diastereoselectivity.

12. (a) Write note on “CO₂ as supercritical fluid”.

Or

(b) How to prepare imidazolium based ionic liquids?

13. (a) Write note on green oxidation catalyst.

Or

(b) What are the advantage of biocatalytic reaction?

14. (a) Write note on microwave assisted Esterification and Claisen rearrangement.

Or

(b) Write note on ultrasound assisted Esterification and Saponification reaction.

15. (a) Write note on Versatile bleaching agents.

Or

(b) Write note on combinatorial green chemistry.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the substitution and rearrangement reaction.

Or

- (b) Explain the chemoselectivity and regioselectivity with an example.

17. (a) Explain the applications of supercritical fluid extraction.

Or

- (b) Explain the ionic liquid in organic synthesis.

18. (a) Explain the green polymer supported catalysts.

Or

- (b) Explain the enzymes catalysed hydrolytic process.

19. (a) Explain the microwave assisted Diels–Alder reaction and de-carboxylation reaction.

Or

- (b) Explain the ultrasound assisted oxidation and reduction process with example.

20. (a) Explain the twelve principles of green chemistry.

Or

(b) Explain the Biomimetic multifunctional reagents.

Reg. No. :

Code No. : 30303 B Sub. Code : JMCH 6 B/
SECH 6 B

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester

Chemistry – Main

Major Elective – III — NANO CHEMISTRY

(For those who joined in July 2016 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. 1 நானோமீட்டர் = _____.

(அ) 1×10^{-9} m

(ஆ) 1×10^{-10} m

(இ) 1×10^{-9} cm

(ஈ) 1×10^{-10} cm

1 nanometre = _____.

- (a) 1×10^{-9} m (b) 1×10^{-10} m
(c) 1×10^{-9} cm (d) 1×10^{-10} cm

2. குவாண்டம் புள்ளியின் அளவு _____.

- (அ) 2 – 10 cm (ஆ) 2 – 10 mm
(இ) 2 – 10 m (ஈ) 2 – 10 nm

The size of quantum dot is _____.

- (a) 2 – 10 cm (b) 2 – 10 mm
(c) 2 – 10 m (d) 2 – 10 nm

3. பின்வருவனவற்றுள் எது நானோத் துகள்கள் தயாரித்தலுக்கான இயற்பியல் முறை

- (அ) லேசர் அரிமானத் தேய்வு
(ஆ) வெப்ப உடைப்பு
(இ) சோனோ வேதியியல் முறை
(ஈ) ஒடுக்க முறைகள்

Which of the following is a physical method for the synthesis of nanoparticles?

- (a) laser ablation
(b) thermolysis
(c) sonochemical methods
(d) reduction methods

4. சால்-ஜெல் முறை என்பது ————— அணுகுமுறை.

(அ) கீழிருந்து-மேல் (ஆ) மேலிருந்து-கீழ்

(இ) ஆக்ஸிஜனேற்றம் (ஈ) ஒடுக்க

Sol-gel method is ————— approaches.

(a) bottom-up (b) top-down

(c) oxidation (d) reduction

5. புல்லரீன் ————— கார்பன் அணுக்களால் ஆனது.

(அ) 2 (ஆ) 6

(இ) 16 (ஈ) 60

Fullerene is made up of ————— carbon atom.

(a) 2 (b) 6

(c) 16 (d) 60

6. ————— ஒரு நல்ல மின் கடத்தி அல்ல,

(அ) கிராஃபைட்

(ஆ) டையமன்ட்

(இ) சாதாரண உப்பு

(ஈ) பொட்டாசியம் குளோரைடு

_____ is a not a good conductor of electricity.

- (a) graphite (b) diamond
(c) NaCl (d) KCl

7. பின்வருவனவற்றுள் எது நூலிலைகளுடன் இணைந்து நானோ கலவையினைத் தராது?

- (அ) உலோகம் (ஆ) செராமிக்ஸ்
(இ) அலோகம் (ஈ) பலபடிகள்

Which of the following does not combine with fibre to give nano composites?

- (a) metals (b) ceramics
(c) non-metals (d) polymers

8. கார்பன் நானோகுழாய்கள் _____ தடிமனால் ஆன கிராஃபைட் தாளினால் ஆனவை.

- (அ) 0.4 cm (ஆ) 0.4 mm
(இ) 0.4 nm (ஈ) 40 nm

Carbon nanotubes are the sheets of graphite about _____ in thickness.

- (a) 0.4 cm (b) 0.4 mm
(c) 0.4 nm (d) 40 nm

9. இரும்பு மற்றும் பெல்லடியத்தில் இருந்து பெறப்படும் நானோ துகள்கள் _____ உருவாக்கப் பயன்படுகிறது.

(அ) காந்தம்

(ஆ) காந்த லென்ஸ்

(இ) காந்த மீட்டர்கள்

(ஈ) காந்த சேமிப்புக் கருவிகள்

The nano particles from iron and pallodium are used to produce

(a) Magnets

(b) Magnetic lens

(c) Magneto meters

(d) Magnetic storage devices

10. நானோத் துகள்கள் இரத்தத்தில் உள்ள _____ உருவாக்கும் செல்களை அழிக்கின்றன.

(அ) கட்டிகள்

(ஆ) காய்ச்சல்

(இ) தொற்று

(ஈ) சளி

Nano particles target the _____ causing cells and remove them from blood.

(a) tumour

(b) fever

(c) infection

(d) blood

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (அ) நானோ தொழில் நுட்பம் என்றால் என்ன? நானோ அளவுகளின் முக்கியத்துவத்தை தருக.

What is nanotechnology? Give the significance of nanoscale.

Or

- (ஆ) வரையறு : குவாண்டம் கம்பிகள் மற்றும் குவாண்டம் புள்ளிகள்

Define : Quantum wires and quantum dots.

12. (அ) நானோத் துகள்கள் தயாரித்தலில் சால்-ஜெல் முறையை விளக்குக.

Explain Sol-gel method for the synthesis of nano particles.

Or

- (ஆ) நானோ அளவுள்ள குறைக் கடத்தியை எவ்வாறு தயாரிப்பாய்?

How will you synthesis nanosized semiconductor?

13. (அ) பரப்புக் கவர்ச்சி கொள்கையை விளக்குக.

Explain the theory of adsorption.

Or

(ஆ) நானோ வினையூக்கிகள் தயாரிக்கும் ஏதாவது ஒரு முறையை விளக்குக.

Discuss any one method for the preparation of nano catalyst.

14. (அ) நானோ கலவையின் பல்வேறு வகைகளை எடுத்துக்காட்டுகளுடன் எழுதுக.

Write different types of nanocomposite materials with example.

Or

(ஆ) நானோ குழாய்களின் பயன்பாடுகளைத் தருக.

Give the applications of nanotubes.

15. (அ) நானோ துகள்களின் படிப்பினையில் IR நிறமாலையின் பயன்பாடுகளை எழுதுக.

Write the application of IR spectra in the study of nanoparticles.

Or

(ஆ) சிறு குறிப்பு வரைக : எரிபொருள் கலன்கள் மற்றும் நானோ பேட்டரிகள்.

Write note on : Fuel cells and nano batteries.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (அ) பல்வேறு வகையான நானோ பொருட்களின் வடிவமைப்பைத் தருக.

Give the structure of different types of nanomaterials.

Or

(ஆ) நானோத் துகள்கள் தயாரிப்பில் கீழிலிருந்து மேலாகச் செல்லும் முறை பற்றி விவரி.

Describe bottom-up approach for the synthesis of nano particles.

17. (அ) நானோத் துகள்கள் தயாரித்தலில் ஏதேனும் இரண்டு வேதியியல் முறைகளை விளக்குக.

Explain any two chemical methods for the synthesis of nano particles.

Or

(ஆ) சிறு குறிப்பு வரைக :

(i) வாயு சுருக்கு முறை

(ii) PVD முறை

Write note on :

(i) Gas condensation method

(ii) PVD method

18. (அ) ஃபுல்லீன்கள் என்றால் என்ன? அவைகளின் வடிவமைப்பு மற்றும் பண்புகளைத் தருக.

What are Fulleres? Give their structure and properties.

Or

(ஆ) கிராஃபைட் மற்றும் டையமன்டின் வடிவமைப்பை விளக்குக.

Explain the structure of graphite and diamond.

19. (அ) நானோ கலவைகளின் வேதியியல் மற்றும் மின்னாற் பண்புகளை எழுதுக.

Write the chemical and electrical properties of nanocomposites.

Or

(ஆ) சிறு குறிப்பு வரைக :

(i) இயற்கையான நானோ கலவைகள்

(ii) கார்பன் நூலிலைகள்

Write note on :

(i) Natural nano composites

(ii) Carbon fibres

20. (அ) நானோத் துகள்களின் பண்புகளை கண்டறிவதில் TEM-ன் பயன்பாடுகளை விவரி.

Describe the application of TEM in characterisation of nanoparticles.

Or

(ஆ) நானோத் துகள்களின் தற்போதைய பயன்பாடுகளைத் தருக.

Give the current applications of nanoparticles.

2. The size of quantum dot is _____.
- (a) 2 – 10 cm (b) 2 – 10 mm
(c) 2 – 10 m (d) 2 – 10 nm
3. Which of the following is a physical method for the synthesis of nanoparticles?
- (a) laser ablation
(b) thermolysis
(c) sonochemical methods
(d) reduction methods
4. Sol-gel method is _____ approaches.
- (a) bottom-up (b) top-down
(c) oxidation (d) reduction
5. Fullerene is made up of _____ carbon atom.
- (a) 2 (b) 6
(c) 16 (d) 60
6. _____ is a not a good conductor of electricity.
- (a) graphite (b) diamond
(c) NaCl (d) KCl

7. Which of the following does not combine with fibre to give nano composites?
- (a) metals (b) ceramics
(c) non-metals (d) polymers
8. Carbon nanotubes are the sheets of graphite about _____ in thickness.
- (a) 0.4 cm (b) 0.4 mm
(c) 0.4 nm (d) 40 nm
9. The nano particles from iron and pallodium are used to produce
- (a) Magnets
(b) Magnetic lens
(c) Magneto meters
(d) Magnetic storage devices
10. Nano particles target the _____ causing cells and remove them from blood.
- (a) tumour (b) fever
(c) infection (d) blood

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What is nanotechnology? Give the significance of nanoscale.

Or

- (b) Define : Quantum wires and quantum dots.

12. (a) Explain Sol-gel method for the synthesis of nano particles.

Or

- (b) How will you synthesis nanosized semiconductor?

13. (a) Explain the theory of adsorption.

Or

- (b) Discuss any one method for the preparation of nano catalyst.

14. (a) Write different types of nanocomposite materials with example.

Or

- (b) Give the applications of nanotubes.

15. (a) Write the application of IR spectra in the study of nanoparticles.

Or

- (b) Write note on : Fuel cells and nano batteries.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Give the structure of different types of nanomaterials.

Or

- (b) Describe bottom-up approach for the synthesis of nano particles.

17. (a) Explain any two chemical methods for the synthesis of nano particles.

Or

- (b) Write note on :
- (i) Gas condensation method
 - (ii) PVD method

18. (a) What are Fulleres? Give their structure and properties.

Or

(b) Explain the structure of graphite and diamond.

19. (a) Write the chemical and electrical properties of nanocomposites.

Or

(b) Write note on :

(i) Natural nano composites

(ii) Carbon fibres

20. (a) Describe the application of TEM in characterisation of nanoparticles.

Or

(b) Give the current applications of nanoparticles.

(8 pages)

Reg. No. :

Code No. : 5123

Sub. Code :HCHM 42

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Fourth Semester

Chemistry

INORGANIC CHEMISTRY – IV

(For those who joined in July 2012 – 2015)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The number of micro states possible for Cr(III) is
 - (a) 45
 - (b) 90
 - (c) 120
 - (d) 15

2. The PES of N_2 was studied with the He resonance line at 58.4 nm. The ejected photoelectron energy was 5.63 eV. What is the energy of the orbital from which this electron is ejected?
- (a) 35.12 eV (b) 9.35 eV
(c) 15.59 eV (d) 11.86 eV
3. A substance when dissolved in water at 10^{-4} M concentration absorbs 10% of an incident radiation in a path of 1 cm length. What is the molar extinction coefficient?
- (a) 1000 (b) 10000
(c) 437 (d) 100000
4. Which of the following structural features in a molecule may make it fluorescent?
- (a) The presence of benzene ring
(b) Fused ring system
(c) Rigidity in the molecule
(d) All of the above
5. The structure of fulleride, K_6C_{60} is
- (a) Body-centred cubic
(b) Face centered cubic
(c) Hexagonal
(d) None of these

12. (a) Compare turbidimetry with nephelometry. Outline the use of these techniques with an example for each.

Or

- (b) Discuss the principles and applications of atomic absorbance spectroscopy.

13. (a) Write a note on insertion compounds of metal oxides.

Or

- (b) Describe fullerenes and fullerides.

14. (a) What are the different types of excited states? Mention types of reactions taking place from them.

Or

- (b) Discuss the two principal mechanisms of energy transfer in excited states.

15. (a) With suitable examples explain how metal complexes act as probes of nucleic acid.

Or

- (b) How are the following chelating agents can be used therapeutically?

(i) D-penicillamine and

(ii) cis- diamminedichloroplatinum(II)

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) With a help of Orgel diagram discuss the electronic spectrum of octahedral V(III) complexes. The electronic spectrum of an octahedral V(III) complex has the following spectral bands: 17200 cm^{-1} , 25700 cm^{-1} and 36000 cm^{-1} . Assign these transitions. Evaluate 10Dq, B' and nephelauxetic ratio. (For free metal ion B = 861 cm^{-1}).

Or

- (b) State Koopman's theorem and explain its significance in PES using N_2 as an example. What are the drawbacks of the theorem?
17. (a) (i) Explain direct and indirect methods of analysis in fluorometry. How is F^- ions estimated fluorometrically?
- (ii) Sketch and explain the TGA curve of calcium oxalate monohydrate. 100 mg of calcium oxalate monohydrate was subjected to TGA. Calculate the weight loss in various temperature region $100\text{ }^\circ\text{C} - 950\text{ }^\circ\text{C}$.

Or

- (b) (i) Discuss inductively coupled Argon plasma source used in atomic emission spectroscopy.
- (ii) Describe spectral and chemical interferences in atomic absorption spectroscopic analysis.
18. (a) Discuss the intercalation compounds of graphite and transition metal disulphides.

Or

- (b) Explain the chemical precipitation, solution, sol-gel and hydrothermal methods for the synthesis of inorganic materials with suitable examples.
19. (a) Mention the essential conditions for a photochemical reaction to be used in the storage of solar energy. Discuss the applications of different types of reaction in it.

Or

- (b) Write in detail about the photophysical and photochemical properties of $[\text{Ru}(\text{bpy})_3]^{2+}$.

20. (a) Explain the structure and role of carbonic anhydrase.

Or

(b) (i) Discuss the structure and role of superoxide dismutase.

(ii) Discuss the mechanism of action of carboxypeptidase A.

(6 pages)

Reg. No. :

Code No. : 5881

Sub. Code : PCHM 32

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2020.

Third Semester

Chemistry — Core

INORGANIC CHEMISTRY — III

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Among the following the unstable carbonyl species is
 - (a) $\text{Mn}(\text{CO})_5\text{Cl}$
 - (b) $[\text{Mn}(\text{CO})_{15}]^-$
 - (c) $\text{Mn}_2(\text{CO})_{10}$
 - (d) $\text{Mn}(\text{CO})_5$

2. CO bond order is lowest in
- (a) uncoordinated CO
 - (b) cobonded to one metal
 - (c) CO bridging two metals
 - (d) ν CO bridging three metals
3. Which of the following obey 18 electron rule?
- (a) $\text{Mn}(\text{CO})_3$
 - (b) $\text{Fe}(\text{CO})_5$
 - (c) $\text{V}(\text{CO})_6$
 - (d) $\text{Fe}(\text{CO})_4$
4. Vaska's complex is
- (a) $\text{IrCl}(\text{CO})(\text{PPh}_3)_2$
 - (b) $(\text{Ph}_3\text{P})_2\text{Rh}(\text{CO})\text{Cl}$
 - (c) $\text{IrCl}(\text{CO})_2(\text{PPh}_3)_2$
 - (d) $(\text{Ph}_3\text{P})_3\text{RhCl}$
5. Among the following diatomic molecules the one that shows EPR signal is
- (a) Li_2
 - (b) B_2
 - (c) C_2
 - (d) O_2
6. The ^1H NMR spectrum of $(\eta^5\text{-C}_5\text{H}_5)_2\text{Fe}$ recorded at room temperature has
- (a) One singlet
 - (b) One multiplet
 - (c) Two singlets
 - (d) Two multiplets

7. In the application of DTA and DSC which of the following parameters is measured for the glasses?
- (a) Concentration of the glass
 - (b) Solubility of the glass
 - (c) Cooling temperature
 - (d) Transition temperature
8. Absorbed wavelengths in atomic absorption spectrum appear as
- (a) dark background (b) dark lines
 - (c) light background (d) light lines
9. Give the example for Molecular photosensitizers
- (a) Mercury (b) Cadmium
 - (c) Zinc (d) Sulphur dioxide
10. When a substance absorbs radiation of higher frequency the emission of radiation is continuous for some time even after the incident light is cut off
- (a) Phosphorescence
 - (b) Sensitized fluorescence
 - (c) Resonance fluorescence
 - (d) None of these above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) State 18 e-rule with example.

Or

- (b) Write a short note on properties of ferrocene.

12. (a) Give a brief note on synthetic gasoline.

Or

- (b) Write a note on Monsanto processes.

13. (a) Explain how NMR technique used in the study of fluxionality of inorganic compounds.

Or

- (b) State the factors affecting the magnitude of g-values.

14. (a) Write a note on thermometric titration.

Or

- (b) State the factors affecting the TGA curves.

15. (a) Write a note on photochemical properties of $[\text{Ru}(\text{bpy})_3]^{2+}$ complex.

Or

- (b) State and explain Frank Condon principle.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Account on the substitution reactions of metal carbonyls.

Or

- (b) Write an essay on structural features and bonding of dinitrogen complexes.

17. (a) Write an essay on cyclometallation reactions.

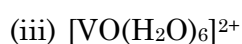
Or

- (b) Write a note on heterogeneous catalysis with an example.

18. (a) Sketch and explain the NMR of SF_4 , P_4S_3 , HPF_2 , $[\text{HNi}(\text{PPh}_3)_4]^+$.

Or

- (b) Sketch and explain EPR of



19. (a) Discuss the applications of DTA.

Or

(b) Account on AAS.

20. (a) Write an essay on electron transfer reactions.

Or

(b) Account on application of inorganic photochemistry in solar energy.

(6 pages)

Reg. No.:.....

Code No. : 5124

Sub. Code : HCHM 43

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Fourth Semester

Chemistry

PHYSICAL CHEMISTRY – IV

(For those who joined in July 2012-2015)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer

- The moment inertia (I) of a molecule is defined as
 - $I = m_i^2 r_i^2$
 - $I < m_i^2 r_i^2$
 - $I > m_i^2 r_i^2$
 - None of these
- The best example for microwave inactive molecule is
 - CO
 - HCl
 - N₂
 - H₂O

3. Carbon dioxide molecule and acetylene molecule have fundamental vibrational frequency of _____
- (a) 3,7 (b) 4,6
(c) 4,4 (d) 4,7
4. Parallel band of symmetric top molecules has _____
- (a) $\Delta J = 0, \pm 1$ & $\Delta K \neq 0$
(b) $\Delta J = \pm 1$ & $\Delta K = 0$
(c) $\Delta J = 0, \pm 1$ & $\Delta K = 1$
(d) $\Delta J = 0, \pm 1$ & $\Delta K = 0$
5. Franck-Condon Principle is related to
- (a) Electronic spectroscopy
(b) IR spectroscopy
(c) UV spectroscopy
(d) Raman spectroscopy
6. Electron binding energy of each emitted electron can be determined by
- (a) Photoelectron spectroscopy
(b) Auger electron spectroscopy
(c) ESCA
(d) X-ray analyzer

7. Naphthalene has ESR spectrum of _____ lines
(a) 25 (b) 75
(c) 15 (d) 85
8. Mc Connel equation is used to calculate
(a) Electron density (b) Proton density
(c) Degenerate density (d) All of above
9. Zeeman splitting in Mössbauer spectroscopy of ^{57}Fe gives _____ lines.
(a) 1 (b) 6
(c) 7 (d) 9
10. Doppler shift is related to
(a) NQR spectra (b) Mass spectra
(c) Mössbauer spectra (d) ESR spectra

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain various regions of spectrum.

Or

- (b) How will you classify the molecules based on their moment of inertia.

12. (a) Explain about simple harmonic oscillator by handling HCl molecule.

Or

- (b) What are the advantageous of Raman spectroscopy over IR spectroscopy?

13. (a) Write notes on vibrational coarse structure.

Or

- (b) Explain predissociation.

14. (a) Discuss the ESR spectrum of transition metal complexes.

Or

- (b) State the Principle and applications of FT-NMR.

15. (a) The Mössbauer spectrum of $K_4[Fe(CN)_6]$ consists of one line whereas that of $K_3[Fe(CN)_5NO]$ consists of two lines. Explain.

Or

- (b) NQR spectra is suitable for studying H-bonding. Explain

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) (i) Describe the non-rigid rotator model in rotational spectra.
- (ii) State and explain stark effect.
Or
- (b) Describe the non-linear molecule of polyatomic molecules with suitable examples.
17. (a) Explain in detail about the anharmonic oscillator model in vibrational spectroscopy.
Or
- (b) Write notes on
- (i) Overtone and combination frequencies
- (ii) Fermi resonance and Group Frequencies
18. (a) Write the Principle, Instrumentation and application of UV-PES.
Or
- (b) Discuss the Principle, instrumentation and applications of X-ray analyzer.

19. (a) Write notes on ^{31}P NMR spectroscopy.

Or

(b) Explain the 'g'-factor and hyperfine splitting in ESR spectroscopy.

20. (a) Explain briefly about the Zeeman effect in NQR spectroscopy.

Or

(b) Define with reference to Mössbauer spectroscopy

(i) Isomer shift

(ii) Nuclear Quadrupole splitting

(iii) Magnetic hyperfine interaction

(iv) Doppler shift

Code No: 5885

Reg. No.....

Sub. Code: PCHM42

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2020

FOURTH SEMESTER

CHEMISTRY

INORGANIC CHEMISTRY - IV

(for those who joined in July 2017 onwards)

Time : Three hours

Maximum: 75 marks

Part - A (10 X 1 = 10 marks)

Answer all question, choose the correct answer

1. In Mossbauer spectroscopy the number of peaks obtained is related to the ----- of the compound
a) polarity b) valency c) symmetry d) velocity
2. The plane polarized light passing through a dissymmetric medium becomes elliptically polarized is -----
(a) Doppler effect b) circular dichorism c) Raman effect d) none of these
3. All elements except ----- produce Auger peaks.
a) He & Ne b) H₂ & He c) H₂ & Li d) chlorine and flourine
4. In NQR spectroscopy, a nucleus with $I = 3/2$ in axially symmetric field in the spectrum gives -----
a) Two lines b) three lines c) one line d) zero line
5. In the reduction of ribose ----- functions as reducing agent.
(a) vitamin B₁₂ b) ferritin c) cytochrome oxidase d) carboxy peptidase
6. The affinity of hemoglobin for O₂ decreases with decrease in pH. This effect is known as --
(a) Cooperrative effect b) Bohr effect c) Template effect d) none of these
7. Calcification of tissues and formation of stones is caused due to the presence of excess --
(a) Zn b) Ca c) Cu d) Na
8. Fe deficiency leads to -----
a) Bone detoriation b) anemia c) growth retardation d) none of these
9. The materials prepared by treating graphite with a strong oxidant or a strong reducing agent are called-----
(a) graphite insertion compounds b) fullerenes
c) graphite intercalation compounds d) corborandum
10. ----- is the process of growing crystal of a particular orientation on the top of another cyrstal.
(a) Epitaxy b) zone melting c) Verneuil d) none of these

PART - B (5 x 5 = 25 MARKS)
ANSWER ALL QUESTIONS
BY CHOOSING (a) or (b)
EACH ANSWER SHOULD NOT
EXCEED 250 WORDS

PART B = (5X5=25 marks)

Answer ALL questions, choosing either (a) or (b).

11.(a) How is Moss Bauer spectroscopy useful in finding out the structure of catalase.

Or

(b) Explain the MB spectra of iron compounds.

12. (a) Draw and explain the vibrational fine structure of CO molecule.

Or

(b) Illustrate how NQR spectroscopy helpful in finding the hydrogen bonding of molecules .

13.(a) Compile about the *invitro* nitrogen fixation.

Or

(b) Discuss the structure and functions of transferrins.

14.(a) Discuss the inhibition of Xanthine oxidase.

Or

(b) Illustrate metal complexes as drugs.

15. (a) Give an account on intercalation compounds of graphite.

Or

(b) Describe the structure and properties of fullerides.

PART C - (5X8=40 marks)

**PART - C (5 x 8 = 40 MARKS)
ANSWER ALL QUESTIONS
BY CHOOSING (a) or (b)
EACH ANSWER SHOULD NOT
EXCEED 600 WORDS**

Answer ALL questions, choosing either (a) or (b).

16. (a) Summarise the theory of Mossbauer spectroscopy.

Or

(b) Explain the optical isomerism in octahedral complexes.

17. (a) Draw and explain the ESCA spectrum of $C_2H_5COOCF_3$. Elaborate on shakeup and shake off process.

Or

(b) Derive the electronic structure and phase transition of molecule by NQR spectroscopy.

18. (a) Write the structure of vitamin B_{12} and explain the biological function of it.

Or

(b) Explain the structure of chlorophyll.

19. (a) Explain the structure and mechanism of super oxide dismutase.

Or

(b) Discuss the structure and function of hemocyanin and ascorbic oxidase.

20. (a) Write the structure and properties of Zeolites.

Or

(b) Describe the synthesis of inorganic materials by precipitation, sol gel and hydrothermal methods.

9

(7 Pages)

Reg. No. :

Code No. : 5578

Sub. Code : KCHM 41

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Fourth Semester

Chemistry

ORGANIC CHEMISTRY — IV

(For those who joined in July 2016 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

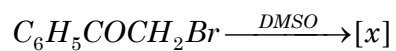
Answer ALL the questions.

Choose the correct answer :

1. Wittig reaction is given by
 - (a) only 1°-halide
 - (b) only 2°-halide
 - (c) only 3°-halide
 - (d) 1° and 2°-halides
2. In stobbe condensation diester is always
 - (a) 1, 4 - diester
 - (b) 1, 5 - diester
 - (c) 1, 3 - diester
 - (d) 1, 2 - diester

3. The trans -1, 2 - dimethylcyclohexane prefers to exist only in the _____ form
- (a) Diaxial (b) Diequatorial
(c) 1*e*, 2*a*, (d) 1*a*, 2*e*
4. Neomenthyl tosylate undergoes solvolysis _____ times faster than menthyltosylate
- (a) 20 (b) 40
(c) 80 (d) 170
5. Ketal is a common protecting group for _____ and _____
- (a) Alcohol, amine
(b) Ester, carboxylic acid
(c) Aldehyde, ketone
(d) Primary amine, secondary amine
6. A combination of Mannich, Michael and the aldol reactions together known as _____ sequence
- (a) Gomberg - pechmann
(b) Robinson annulation
(c) Umpolung
(d) Bamford-stevens

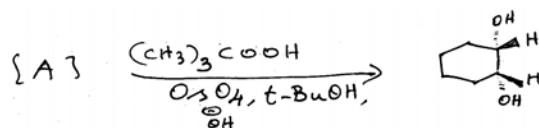
7. In the reaction sequence



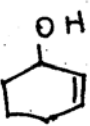


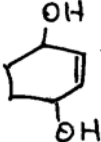
[x] will be

- (a) C_6H_5COOH (b) C_6H_5CHO
(c) C_6H_5COCHO (d) $C_6H_5COCOCH_3$

8. In the reaction sequence



[A] will be

- (a)  (b) 
(c)  (d) 

9. The positions of the hydroxyl groups in the bile acids have been determined by means of _____
- (a) Oxidative degradation
 - (b) Reductive degradation
 - (c) Addition reaction
 - (d) Heating process
10. When equilenin is treated with sodium and ethanol _____ is produced
- (a) Isoxazole (b) Oestrone
 - (c) Oestradiol (d) Testosterone

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Narrate the mechanism of Bamford-Stevens reaction. Give any one synthetic application.

Or

- (b) Discuss the mechanism of acyloin condensation.

12. (a) Cis-1,2-dimethylcyclohexane exists as a pair of non-resolvable conformational enantiomers, but the trans-isomer exists as a pair of configurational enantiomers capable of resolution. Justify.

Or

- (b) Describe the conformation of cyclohexane.

13. (a) Write an account of Robinson annulations reaction.

Or

- (b) Write a short account of functional group interconversions.

14. (a) Explain the importance of R_uO_2 in organic reactions.

Or

- (b) Write brief notes on Suzuki coupling.

15. (a) Discuss the nature and position of side chain in cholesterol.

Or

- (b) (i) Give the partial synthesis of androsterone from cholesterol.

- (ii) How is oestane converted to oestriol?

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss the mechanism of the following reactions.
- (i) Julia olefination
 - (ii) McMurray coupling.

Or

- (b) Write notes on:
- (i) Shapiro reaction
 - (ii) Baeyer - villiger oxidation
 - (iii) Pschorr reaction.

17. (a) Give an account of the correlation of the conformation of reactivity in acyclic and cyclic systems each with an example.

Or

- (b) Describe the impact of the conformations of cis and trans-decalins on their stability.

18. (a) (i) Indicate the uses of activating and protecting groups in organic synthesis.
- (ii) Define synthon and synthetic equivalent.

Or

- (b) Write the Retro-synthetic scheme for Cis-Jasmone.

19. (a) Discuss the use of the following reagents in organic synthesis.

(i) 9-BBN, (ii) Wilkinson's catalyst.

Or

(b) Give an account of synthetic utility of

(i) DDQ (ii) S_mI_2 . (4+4)

20. (a) (i) How is cholesterol converted to 5β -cholanic acid?

(ii) Explain the conformational structure of cholestane.

Or

(b) (i) Give a brief account on bile acids.

(ii) How will you convert cholesterol into testosterone?

(7 pages)

Reg. No. :

Code No. : 5579

Sub. Code : KCHM 42

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Fourth Semester

Chemistry

INORGANIC CHEMISTRY — IV

(For those who joined in July 2016 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The correct order of the isomeric shift in Mossbauer spectra (^{57}Fe source) of iron compounds is :
 - (a) $\text{Fe(II)} > \text{Fe(III)} > \text{Fe(IV)}$
 - (b) $\text{Fe(III)} > \text{Fe(II)} > \text{Fe(IV)}$
 - (c) $\text{Fe(IV)} > \text{Fe(III)} > \text{Fe(II)}$
 - (d) $\text{Fe(IV)} > \text{Fe(II)} > \text{Fe(III)}$

2. How many Mossbauer lines are obtained for $\text{FeC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ at 20K?
- (a) One (b) Two
(c) Four (d) Six
3. The first band in PES spectrum of O_2 shows vibrational progression with an interval of 0.22 eV. If the vibrational frequency of O_2 is 1568 cm^{-1} , deduce the nature of molecular orbital. ($1 \text{ eV} = 8065.5 \text{ cm}^{-1}$)
- (a) Bonding molecular orbital
(b) Anti-bonding molecular orbital
(c) Non-bonding molecular orbital
(d) None of the above
4. The PES of N_2 was studied with the He resonance line at 58.4 nm. The ejected photoelectron energy was 5.63 eV. What is the energy of the orbital from which this electron is ejected?
- (a) 35.12 eV (b) 9.35 eV
(c) 15.59 eV (d) 11.86 eV
5. In biological systems, a reaction of type, $\text{R-H} + \text{O}_2 + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{R-OH} + \text{H}_2\text{O}$ is catalyzed by an enzyme called _____
- (a) Nitrogenase (b) Reductase
(c) Cytochrome P450 (d) Transferase

6. The mechanism by which the Fe-loaded transferrin receptor complex entering the cell is _____
- (a) exocytosis (b) endocytosis
(c) lock and key (d) none of these
7. Which of the following is used in reversible binding of dioxygen?
- (a) Hemocyanin (b) Hemerythrin
(c) Hemoglobin (d) All of these
8. Which of the following is not an anti-arthritis drug?
- (a) Myochrisin (b) Solganol
(c) Satraplatin (d) Auranofin
9. The structure of fulleride, K_6C_{60} is
- (a) Body-centred cubic
(b) Face centered cubic
(c) Hexagonal
(d) None of these
10. In the preparation of TaS_2 by chemical vapour transport method (CVT), the CVT agent used is
- (a) S^{2-} (b) I_2
(c) NO_3^- (d) Cl_2

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Mossbauer spectroscopy is a useful tool in the determination of spin state crossover. Prove the statement with suitable examples.

Or

- (b) Describe the application of Mossbauer spectroscopy in determination of oxidation states and π -bonding.

12. (a) The He(I) resonance line UPES spectrum of NH_3 molecule has two peaks, one at 11 eV with extensive vibrational structure and the other at 16 eV with less vibrational structure. Using MO diagram, explain these features.

Or

- (b) Describe the applications of NQR spectroscopy in determining the ionic character of a bond.

13. (a) What are siderophores? Discuss the structures any two siderophores.

Or

- (b) What is meant by iron-sulphur proteins? Discuss briefly on ferridoxins and rubredoxins.

14. (a) How is the copper proteins classified based on the active site and how do they differ from each other?

Or

- (b) Discuss briefly about the chemistry of anticancer platinum complexes in chelation therapy.

15. (a) Write a note on insertion compounds of metal oxides.

Or

- (b) Describe fullerenes and fullerides.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Describe the application of Mossbauer spectroscopy in confirming the structures of $\text{Fe}_4^{\text{III}}[\text{Fe}^{\text{II}}(\text{CN})_6]_3$,

Ferridoxin ($\text{Fe}_4\text{S}_4(\text{SCys})_4$) and $\text{Fe}_3(\text{CO})_{12}$.

Or

- (b) Explain the following with reference to Mossbauer spectroscopy :

(i) Isomer shift

(ii) Quadrupole splitting and

(iii) Magnetic splitting.

17. (a) What is the origin of vibrational fine structures in PES? With examples illustrate its usefulness in identifying the nature of the molecular orbitals, predissociation and Jahn-Teller distortion.

Or

- (b) Explain the following :
- (i) The UV photoelectron spectrum of CO, when 21 eV radiation is used, consists of a strong singlet at 15.5 eV, a structured band around 17 eV and a singlet at 18.8 eV.
 - (ii) The XPS spectrum of ethyl trifluoroacetate ($C_2H_5COOCF_3$) shows four peaks corresponding to carbon 1s electrons.

18. (a) What are nitrogenases? Explain the structural features of the active site in nitrogenase.

Or

- (b) Discuss the binding of O_2 to hemoglobin and the structural changes accompanying the binding of oxygen.

19. (a) Write a brief account of the following :
- (i) Inhibition and poisoning of enzyme action
 - (ii) Blue copper proteins.

Or

- (b) (i) Discuss the structure and role of superoxide dismutase.
- (ii) Discuss the mechanism of action of carboxypeptidase A.

20. (a) Discuss the intercalation compounds of graphite and transition metal disulphides.

Or

- (b) Explain the chemical precipitation, solution, sol-gel and hydrothermal methods for the synthesis of inorganic materials with suitable examples.

Reg. No. :

Code No. : 5580

Sub. Code : KCHM43

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Fourth Semester

Chemistry

PHYSICAL CHEMISTRY — IV

(For those who joined in July 2016 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. In any unimolecular reaction —————
 - (a) only one reacting species is involved in the rate determining step
 - (b) The order and the molecularity of slowest step are equal to one
 - (c) The molecularity of the reaction is one and order is zero
 - (d) Both (a) and (b)

2. During decomposition of an activated complex
- (a) Energy is always released and reactants may be formed
 - (b) Energy is always absorbed and reactants may be formed
 - (c) Energy does not change
 - (d) Energy does not change and reactants may be formed
3. In which of the following techniques, the sample material is exposed to a beam of highly accelerated electrons to study fast reactions occurring on a timescale faster than approximately one hundred microseconds?
- (a) Pulse radiolysis
 - (b) Flash photolysis
 - (c) Temperature flow method
 - (d) Pressure flow method

4. The relaxation time for the system $A \xrightleftharpoons[k_{-1}]{k_1} B$ is
- $1/\{k_1 + k_{-1} (x_e + y_e)\}$
 - $1/\{1/2k_1 + 2k_{-1} x_e\}$
 - $1/\{k_1 + k_{-1}\}$
 - $1/\{4k_1 a_e + k_{-1}\}$
5. In Lanmuir's model of adsorption
- The adsorption at a single site on the surface may involve multiple molecules at the same time
 - The mass of gas striking a given area of surface is proportional to the pressure of the gas
 - The mass of gas striking a given area of surface is independent of the pressure of the gas
 - The rate of dissociation of adsorbed molecules from the surface does not depend on the surface covered

6. The Michaelis-Menton equation relates the rate of an enzyme-catalysed reaction to which of the following?
- (a) Substrate concentration
 - (b) Product concentration
 - (c) Activation energy
 - (d) Inhibitor concentration
7. In free radical polymerization, the extent of conversion increases with
- (a) Increase in temperature
 - (b) Increase in polymerization time
 - (c) Increase in monomer concentration
 - (d) All the above
8. Light scattering and ultracentrifugation are used to determine
- (a) Weight-average molecular weight
 - (b) Number-average molecular weight
 - (c) Sedimentation-average molecular weight
 - (d) To get dynamic equilibrium dynamic

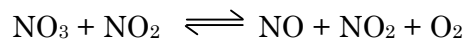
9. High quantum yields of photochemical reactions are due to
- (a) Lowering of activation energy
 - (b) High frequency of collision
 - (c) Accompanying side reaction
 - (d) Formation of free radicals
10. The radiationless processes to include is
- (a) Vibrational relaxation
 - (b) Absorption
 - (c) Fluorescence
 - (d) Phosphorescence

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) (i) What is steady state approximation?
(ii) The mechanism of decomposition of gaseous N_2O_5 is



Show that $d[\text{O}_2]/dt = k[\text{N}_2\text{O}_5]$

Or

- (b) Outline the Hinshelwood treatment of unimolecular reaction.

12. (a) (i) Mention the factors determining reaction rates in solution.

(ii) Write notes on cage effect.

Or

(b) Write a short account of relaxation methods for the study of fast reactions.

13. (a) Derive expressions for the fractions θ_A and θ_B of a surface covered by adsorbed molecules A and B, assuming the molecules compete for the same site.

Or

(b) Calculate the adsorption of a dye on activated carbon at 25°C, where $k = 0.025$, $n = 0.5$ and $C = 0.04$.

14. (a) Calculate the number average and weight average molecular weight of a mixture of equal amounts of two polymers, one having $M = 62 \text{ kg mol}^{-1}$ and the other $M = 78 \text{ kg mol}^{-1}$.

Or

(b) The $(\pi/C)_0$ value for a sample of polystyrene in toluene was obtained from the osmotic pressure of a series of solution as $1.77 \times 10^2 \text{ cm}^4\text{g}^{-1}$ at 25°C. The osmotic pressure is expressed in height of toluene solution in centimetres and concentration in g cm^{-3} . Calculate the number average molecular weight of this sample of polystyrene. Densities of mercury and toluene are 13.6 g cm^{-3} and 0.861 g cm^{-3} respectively.

15. (a) What are radiative and non-radiative processes? Explain the conditions under which such processes occur.

Or

- (b) What is Photosensitization? Explain how mercury acts as a Photosensitizer.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) (i) Show that the theory of absolute reaction rate yields the simple collision theory expression when it is applied to the reaction between two rigid spherical molecules.
- (ii) The rate constant of a reaction is $6.0 \times 10^{-3} \text{s}^{-1}$ at 27°C . If the energy of activation for the reaction is $16.7 \text{ k cal mol}^{-1}$, calculate the frequency factor of the reaction.

Or

- (b) Explain the salient features of RRK theory of unimolecular reaction and obtain an expression for k_1 .

17. (a) (i) Sketch the experimental set up for stopped flow method and explain the technique.

(ii) Write notes on Flash Photolysis.

Or

(b) (i) Define volume of activation. How does it influence reaction rate?

(ii) What is acidity function? How is the rate of a reaction related to the acidity function?

18. (a) (i) Express the qualitative relationship which takes into account the existence of multimolecular layers of adsorbed gas on an adsorbent. How is this relation used to determine the surface area of an adsorbent?

(ii) When the Langmuir adsorption isotherm is simplified to Freundlich adsorption isotherm?

Or

- (b) (i) The slope and intercept of a B.E.T. Plot of adsorption of nitrogen on a solid (1 g) were found to be 0.22 and 0.03 respectively numerically. Estimate the surface area of the solid. The area occupied by nitrogen molecule over the solid is $1.6 \times 10^{-16} \text{ cm}^2$.
- (ii) What are Gibb's adsorption isotherm's applications? How it is tested?
19. (a) (i) Under which $\bar{M}_n = \bar{M}_w$
- (ii) Calculate \bar{M}_w for a system containing equal number of particles with molecular weights 10,000 to 20,000.

Or

- (b) At 25° C , the density of glucose is 1.55 g cm^{-3} , Its diffusion coefficient is $6.8 \times 10^{-6} \text{ cm}^2\text{s}^{-1}$ and the coefficient of viscosity of water is $8.937 \times 10^{-3} \text{ Poise}$. Assuming that the Glucose molecule is spherical, estimate its molar mass.

20. (a) (i) What is delayed Fluorescence? How will you differentiate it from prompt fluorescence?
- (ii) Derive Stern-Volmer equation and discuss its applications.

Or

- (b) (i) Define G value.
- (ii) What is dosimetry? With a neat sketch explain the principle, function and application of a dosimeter.
-

(8 pages)

Reg. No. :

Code No. : 5884

Sub. Code : PCHM41

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Fourth Semester

Chemistry — Core

ORGANIC CHEMISTRY — IV

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

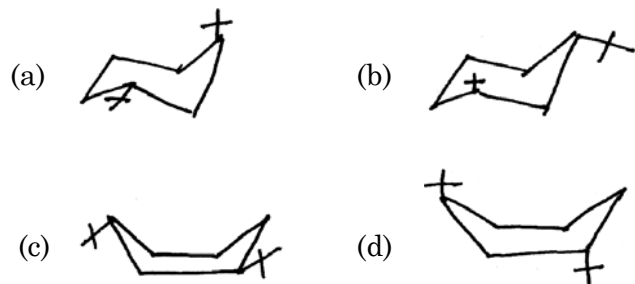
PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- In Reimer-Tiemann reaction product formation takes place by which reaction/s :
 - $A_r SE$
 - SN reaction
 - Elimination
 - All of these
- Wittig reaction is given by
 - Only 1°-halide
 - Only 2°-halide
 - Only 3°-halide
 - 1° and 2° halides

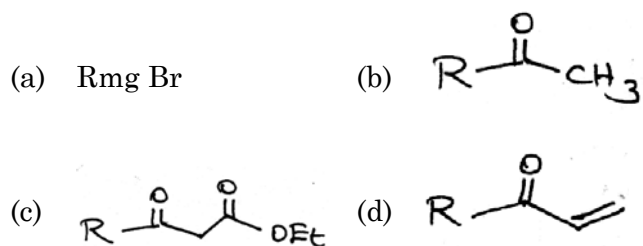
3. The more stable conformation of trans-1, 3-di-t-butylcyclohexane is



4. The number of butane gauche interaction in Cis-decalin is

- (a) 2 (b) 3
(c) 4 (d) 5

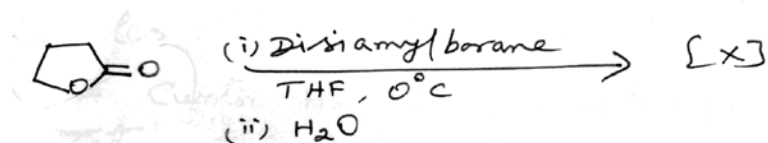
5. The synthetic equivalent for R^{\ominus} is



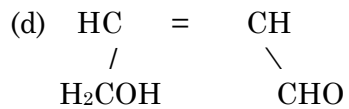
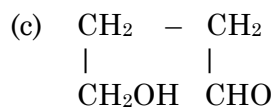
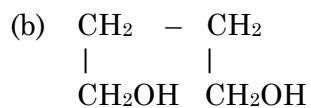
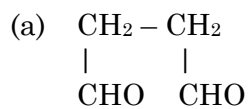
6. Which one of the following compounds act as blocking group for amines?

- (a) Benzyloxy carbonyl chloride
- (b) 9-Fluorenyl methoxy carbonyl chloride
- (c) Benzoyl chloride
- (d) All of these

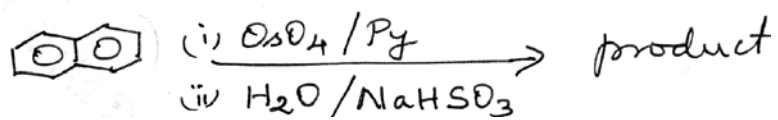
7. In the reaction sequence



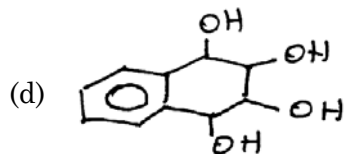
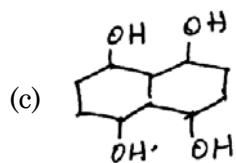
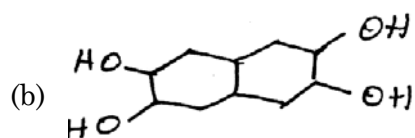
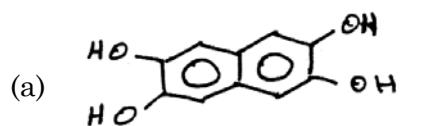
[X] will be



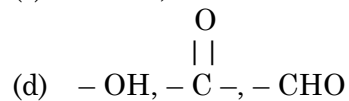
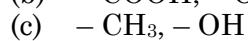
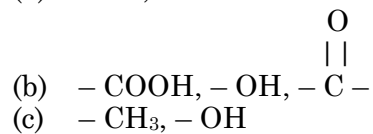
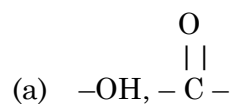
8. In the reaction sequence



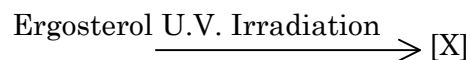
Product will be



9. The functional groups present in oestrone are



10. In the given reaction



[X] will be

- (a) 7-Dehydrocholesterol
- (b) Ergocalciferol
- (c) Vitamin D₅
- (d) Vitamin D₃

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Discuss the mechanism of
- (i) Julia olefination
 - (ii) Mc Murry coupling

Or

- (b) Illustrate Bamford-Stevens reaction with suitable examples.

12. (a) (i) State Curtin-Hammett principle. Give its limitations.
(ii) What is conformational free energy of difference?

Or

- (b) Discuss the stability of Cis and Trans decalins.
13. (a) Discuss the role of activating groups in organic synthesis.

Or

- (b) Give an account of functional group interconversion.
14. (a) Reaction with OsO_4 is the best method for Cis-perhydroxylation of alkenes. Explain with mechanism.

Or

- (b) Narrate the mechanism of Suzuki coupling.
15. (a) Give an account on prostoglandins.

Or

- (b) Bring out the relationship between oestrone, oestradiol and oestriol and also state how they are interconvertible.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Write short notes on :
- (i) Acyloin condensation
 - (ii) Baeyer-Villiger oxidation
 - (iii) Pschorr reaction

Or

- (b) Describe the reaction mechanism for halolactonisation and Gomberg-Bechmann reactions.
17. (a) Explain how conformational features affect the reactivity of cyclohexyl systems in the following reactions :
- (i) Oxidation of alcohols
 - (ii) Elimination of reactions

Or

- (b) (i) Give the preferred conformation of trans-syn-trans, cis-anti-cis and trans-anti-trans perhydrophenanthrenes.
- (ii) Trans 4-t-butylcyclohexane carboxylic esters hydrolyse faster than the corresponding cis-esters. Explain.

18. (a) (i) Analyse the synthetic plan for preparing 2, 4-dimethyl-2-hydroxypentanoic acid.
(ii) Bring out the importance of protecting groups in organic synthesis.
Or
(b) (i) Give an account on Robinson annulations reaction.
(ii) Write about the Retro-synthetic scheme for Cis-Jasmone.
19. (a) Indicate the applications of the following reagents in organic synthesis :
(i) DDQ,
(ii) 9-BBN
Or
(b) Describe any four synthetic uses of RuO_2 .
20. (a) How will you confirm the following in the structure of cholesterol?
(i) Presence of – OH group.
(ii) Nature and position of side chain.
Or
(b) (i) Formulate the conversion of cholesterol into progesterone.
(ii) Discuss the conformational structure of coprostane.

(6 pages)

Reg. No. :

Code No. : 5885

Sub. Code : PCHM 42

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Fourth Semester

Chemistry — Core

INORGANIC CHEMISTRY — IV

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Negative isomer shift is obtained for _____ complexes.
(a) σ bonded (b) π bonded
(c) non bonded (d) none of these
2. In SnX_4 compounds, as the electro negativity of halogens increased δ _____.
(a) decreases (b) remains constant
(c) increases (d) none of these

3. In NQR spectroscopy, a nucleus with $I = 0$ in an axially symmetric field _____ is expected in the spectrum.
- (a) two lines (b) three lines
(c) one line (d) zero line
4. The K-shell spectrum of carbon in ethyl trifluoroacetate ($C_2H_5COOCF_3$) consist of _____ lines.
- (a) one (b) two
(c) four (d) three
5. Transferrin is a _____
- (a) enzyme
(b) non protein
(c) transport and storage protein
(d) hormones
6. Cytochromes are _____ proteins.
- (a) O_2 carrier (b) electron transfer
(c) methyl transfer (d) metal transfer
7. Which one of the following enzyme converts CO_2 to carbonates?
- (a) Carboxy peptidase
(b) Super oxide dismutase
(c) Carbonic anhydrase
(d) Ascorbic oxidase

8. Cis platin is _____
(a) $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$ (b) $\text{Pt}(\text{NH}_3)_4\text{Cl}_4$
(c) $\text{Pt}(\text{NH}_3)_2\text{Br}_2$ (d) $\text{Pt}(\text{NH}_3)_2\text{I}_2$
9. The temperature of the high temperature reactions can be moderated by the addition of _____
(a) zeolite (b) inert salt
(c) metal oxides (d) graphite
10. Buckminster fullerene with sixty carbon atoms is arranged in a _____ shape.
(a) rod (b) cubical
(c) spherical (d) none of these

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Account on spin state cross over determination.

Or

- (b) Write notes on isomer shift.

12. (a) State and explain Koopman's theorem.

Or

(b) Explain the theory of photoelectron spectroscopy.

13. (a) Describe the structure of cytochromes.

Or

(b) Write notes on rubredoxin.

14. (a) Explain the mechanism of action of ascorbic oxidase.

Or

(b) Give an account on metal complexes as probes of nucleic acids.

15. (a) Write the synthesis of inorganic materials by low temperature method.

Or

(b) Write notes on intercalation compounds of transition metal disulphides.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss in detail the application of Mossbauer spectra in the structural determination of oxy and deoxy hemeerthrin and catalase.

Or

- (b) Elucidate the absolute configuration of chelate complexes with the help of ORD and CD.

17. (a) Explain the theory and applications of Auger electron spectroscopy.

Or

- (b) Explain how the ionic character and hybridization of bonds and structure of charge transfer complexes are determined by NQR spectroscopy.

18. (a) Explain the structure of vitamin B₁₂ and its biological functions.

Or

- (b) List and explain the functions of metals in the biological system.

19. (a) Explain the structure, function and mechanism of action of carboxy peptidase.

Or

- (b) Describe the inhibition and poisoning mechanism of xanthine oxidase and aldehyde oxidase.

20. (a) Describe the structure and properties of fullerenes and fullerides.

Or

- (b) Discuss in detail the about insertion compounds of metal oxides.
-

(7 pages)

Reg. No. :

Code No. : 5886

Sub. Code : PCHM 43

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2020.

Fourth Semester

Chemistry — Core

PHYSICAL CHEMISTRY — IV

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. What is the relation between restoring force, f to the displacement q in Hooke's law?
(a) $f = -kq$ (b) $f = kq$
(c) $f = -kq^2$ (d) $f = kq^2$
2. Which of the following molecules will not display an infrared spectrum?
(a) CO_2 (b) N_2
(c) Benzene (d) $\text{H-C}\equiv\text{C-H}$

3. In Raman spectroscopy, energy of change comes from
- (a) Photon (b) Electron
(c) Ion (d) Molecule
4. In Raman spectrum, if λ is the wavelength of incident radiation, then the Stoke's lines will have wavelength equal to
- (a) λ (b) $\lambda + \Delta\lambda$
(c) $\lambda + \Delta\lambda$ (d) λ^2
5. The factor introduced to make collision theory a more generalized one is called
- (a) Steric Factor (b) Hammett Factor
(c) Collision Factor (d) Arrhenius Factor
6. The minimum energy, above the internal energy, which the reacting molecule must possess so that their collision results in a reaction is known as
- (a) Threshold energy
(b) Average Potential Energy
(c) Average Kinetic energy
(d) Activation energy

7. Effect of ionic strength is
- (a) Ionic effect
 - (b) Electrophoretic effect
 - (c) Salt effect
 - (d) Solvent effect
8. Explosive reactions are the type of
- (a) Fast reactions
 - (b) Chain reactions
 - (c) Slow reactions
 - (d) Surface reactions
9. Adsorption of acetic acid on charcoal is an example for
- (a) Absorption (b) Physisorption
 - (c) Chemisorption (d) Both (b) and (c)
10. The transition of ions to micelle is
- (a) Reversible
 - (b) Irreversible
 - (c) Both (a) and (b)
 - (d) Neither (a) nor (b)

PART B — (5 × 5 = 25 marks)

Answer ALL questions by choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Homonuclear diatomic molecules do not show vibrational spectra. Explain why?

Or

- (b) Explain the effect of anharmonicity on the vibrational spectra of diatomic molecules.

12. (a) Consider the molecular vibrations of carbon dioxide and determine whether they are Raman active (or) not.

Or

- (b) What are the advantages of Raman spectroscopy over IR?

13. (a) Discuss the simple collision theory.

Or

- (b) How will you study Fast reaction by temperature jump method?

14. (a) Give the significance of volume of activation.

Or

- (b) Account for the first and second explosion limits in H₂-O₂ reaction.

15. (a) Derive Langmuir isotherm equation.

Or

(b) Write a brief note on heterogeneous catalysis.

PART C — (5 × 8 = 40 marks)

Answer ALL questions by choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the terms :

- (i) Overtones
- (ii) Combination of bands
- (iii) Selection rules for IR spectra
- (iv) Born-Oppenheimer approximation.

Or

(b) How many normal modes of vibration are possible for the following molecules?

- (i) HBr
- (ii) O₂
- (iii) OCS (linear)
- (iv) SO₂ (bent)

17. (a) Explain:
- (i) Q-switching
 - (ii) Types of Lasers.

Or

- (b) Discuss the classical theory of Raman spectroscopy.
18. (a) Discuss the salient features of ARR Theory and write its thermodynamic formulation.

Or

- (b) State the limitations of Langmuir theory of unimolecular reaction and discuss Hinshelwood theory of unimolecular reaction.
19. (a) Discuss the Factors influencing reaction rates in solution.

Or

- (b) Using the Rice-Herzfeld mechanism for the formation of HBr in the reaction $\text{H}_2 + \text{Br}_2 \rightarrow 2\text{HBr}$, and steady state treatment for [H] and [Br], derive the rate law and expression for the formation of HBr.

20. (a) Derive B.E.T. adsorption isotherm.

Or

(b) Discuss Michaelis-Menten Kinetics.

(6 pages)

Reg. No. :

Code No. : 5122

Sub. Code : HCHM 41

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Fourth Semester

Chemistry

ORGANIC CHEMISTRY – IV

(For those who joined in July 2012-2015)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Ylide is the intermediate formed in _____
reaction.
(a) Pschorr (b) Shapiro
(c) Wittig (d) Claisen
2. The intermediate formed in oxymercuration is
_____.
(a) Carbonium ion (b) Carbanion
(c) Radical (d) Aryne

7. Which among the following is a _____ superhydride?
(a) DDQ (b) NaBH_4
(c) $\text{Li}(\text{C}_2\text{H}_5)_3\text{BH}$ (d) LiAlH_4
8. Samarium (II) iodide is a _____ agent.
(a) oxidising (b) reducing
(c) hydroxylation (d) dehydrogenation
9. Which among the following is a male sex hormone?
(a) androsterrone (b) oestrone
(c) oestriol (d) oestradiol
10. Which among the following is the irradiated product of ergosterol?
(a) calciferol (b) 5α -cholestane
(c) coprastane (d) lumisterol

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What is Darzen condensation? Give its mechanism.

Or

- (b) Write notes on Mc Murray coupling reaction.

12. (a) Trans decalin is rigid while cis decalin is flexible. Give explanation.

Or

- (b) Discuss the stability of cis and trans 1,2-dimethyl cyclohexane.

13. (a) How is aldehyde group protected and deprotected during organic synthesis by taking camphor as an example?

Or

- (b) Explain the role of key intermediate in organic synthesis by taking Camphor as an example.

14. (a) What are organoboranes? Give their application in organic synthesis.

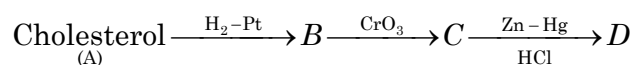
Or

- (b) Explain the utility of crown –ethers in organic reactions.

15. (a) How will you convert cholesterol into testosterone?

Or

- (b) Complete the following reaction and give structural formula for the letters A to D.



PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) What are Stobbe and acyloin condensation reactions? Give their mechanism.

Or

- (b) Give an account on Peterson olefination and Bamford – Steven reactions.

17. (a) Discuss the stability of various conformers of perhydrophenanthrene.

Or

- (b) Discuss the reactivity of conformers in acyclic compound with two examples.

18. (a) What do you mean by Target molecule and disconnection approach? Write down the various disconnection approach and total synthesis of trihexyl phenidyl.

Or

- (b) Explain the uses of Robinson annulation reaction and FGI in organic synthesis each with two examples.

19. (a) What is DDQ? Write any five of its applications.

Or

(b) Write down the application of Dess- Martine Periodinane reagent and DMSO.

20. (a) How will you convert cholesterol into Progesterone and Oestrone into oestriol?

Or

(b) How will you confirm the position of double bond at C₅ – C₆ and secondary alcoholic group at C – 3 in cholesterol?
