

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS)
FIFTH SEMESTER EXAM
Model Question Paper
MG5DSCCHE300 - ORGANIC CHEMISTRY 3
(2024 ADMISSION ONWARDS)

Duration: 1 hour 30 minutes

Maximum Marks: 50

Part A

Multiple Choice Questions, Answer all Question

Each question carries 1 mark

1. Nitroalkanes containing an α -hydrogen exhibit which type of tautomerism? [K, CO1]
A. Keto-enol tautomerism
B. Nitro-acid-nitro tautomerism
C. Aldo-keto tautomerism
D. Amine-imine tautomerism
2. The complete reduction of phenyl isocyanide ($\text{C}_6\text{H}_5\text{-N}\equiv\text{C}$) gives which of the following compound? [U, CO1]
A. Aniline
B. Benzylamine
C. N-Methylaniline
D. N,N-Dimethylaniline
3. Which of the following cannot be made by using Williamson's Ether Synthesis [U, CO2]
A. Methoxybenzene
B. Benzyl-*p*-nitrophenyl ether
C. *tert*-butyl methyl ether
D. Di-*tert* butyl ether
4. In pyrrole, the lone pair of electrons on nitrogen is located in which type of orbital? [K, CO3]
A. sp orbital
B. sp^2 orbital
C. sp^3 orbital
D. unhybridized p orbital
5. Which pair consists exclusively of pyrimidine bases found in DNA? [U, CO3]
A. Adenine and guanine
B. Cytosine and thymine
C. Adenine and thymine
D. Guanine and cytosine
6. The heating of phenyl methyl ethers with HI produces [U, CO2]
A. Methanol
B. Iodobenzene
C. Phenol
D. Toluene
7. Which of the following represents the correct order of aromatic character among the five-membered heterocycles? [A,CO3]
A. Pyrrole > Furan > Thiophene
B. Thiophene > Pyrrole > Furan
C. Furan > Pyrrole > Thiophene
D. Pyrrole > Thiophene > Furan
8. Which of the following is a fused heterocyclic compound? [K, CO3]
A. Pyridine
B. Pyrimidine
C. Indole
D. Furan
9. When diethylmalonate is hydrolysed followed by heating, the product formed is.... [U, CO4]
A. Acetic Acid
B. Propanoic Acid
C. Butyric Acid
D. Formic Acid

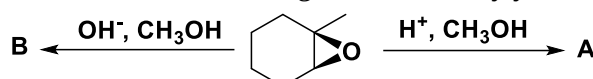
10. The radiationless transition between two electronic states of the same multiplicity is known as.... [U, CO5]
- A. Intersystem crossing B. Internal conversion
C. Fluorescence D. Phosphorescence

[1 × 10 = 10]

Part B

Short Answer Type Questions, Answer any four Questions Each question carries 5 marks

11. a) Explain the mechanism of Hoffmann Bromamide reaction
b) Write one advantage and disadvantage of Gabriel's phthalimide synthesis. [U, CO1]
12. Predict the structure of A and B in the following reaction. Justify your answer. [U, CO2]



13. Suggest one method for the synthesis of Indole. Predict the product of the reaction of indole with the following reagents [K, CO3]
- a) Acetyl chloride in presence of SnCl_4 b) Reduction with Sn/HCl
b) Reduction with H_2 in presence of Raney Nickel
14. Starting from acetoacetic ester, how will you synthesize [U, CO4]
- a) Succinic acid b) Crotonic acid c) Acetic acid
15. Discuss the important differences between photochemical and thermal reactions, with suitable examples. [U, CO5]
16. Explain the molecular events involved in the photochemical process of vision. [U, CO5]

[4 × 5 = 20]

Part C

Long Essay Type Questions, Answer any Two Questions Each question carries 10 marks

17. a) How is benzene diazonium chloride prepared? Give the mechanism of diazotization.
b) How will you prepare the following [A, CO1]
- i) o-Bromophenol from nitrobenzene ii) p-Dinitro benzene from Aniline
18. What is Hinsberg's reagent? Explain the Hinsberg's method for the identification of primary, secondary, and tertiary amines. [U, CO1]
19. a) Explain the principle and procedure of Zeisel's method for the estimation of alkoxy groups.
b) Explain briefly on Claisen rearrangement [U, CO2]
20. Outline the mechanism of [U, CO4]
- a) Paterno-Buchi reaction
b) Photo-Fries reaction
c) Barton Reaction

[2 × 10 = 20]

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS)
FIFTH SEMESTER EXAMINATION
MG5DSCCHE301 - PHYSICAL CHEMISTRY – 2
MODEL QUESTION PAPER
(2024 ADMISSION ONWARDS)

Duration: 2 Hours

Maximum Marks: 70

***Remember(K), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C), Skill(S),
Interest(I) and Appreciation(Ap)***

Students should attempt at least one question from each course outcome to enhance their overall outcome attainability.

Part A

Multiple Choice Questions, Answer all Questions.
Each question carries 1 mark.

1. Crystalline solids generally exhibit [U, CO= 1]
 - A. Isotropy
 - B. Anisotropy
 - C. No definite geometry
 - D. Irregular cleavage
2. A plane cuts the crystallographic axis at 2a, 3b and 6c. The Miller indices of the plane are [U, CO= 1]
 - A. (236)
 - B. (632)
 - C. (321)
 - D. (123)
3. In the CsCl structure, the coordination number of Cs^+ and Cl^- ions is [U, CO= 1]
 - A. 4:4
 - B. 6:6
 - C. 8:8
 - D. 12:12
4. According to the Stark–Einstein law, absorption of one photon by a molecule generally results in: [K, CO= 2]
 - A. Excitation of one molecule
 - B. Excitation of two molecules
 - C. Ionization of all molecules
 - D. Emission of two photons
5. Fluorescence generally involves emission from: [U, CO= 2]
 - A. $S_0 \rightarrow S_1$
 - B. $S_1 \rightarrow S_0$
 - C. $T_1 \rightarrow S_0$
 - D. $T_1 \rightarrow T_2$

6. Which of the following is a typical example of a photochemical reaction having a high quantum yield? [U, CO= 2]
- Photochemical decomposition of HBr
 - Fluorescence of an aromatic molecule
 - Internal conversion
 - Phosphorescence
7. The relation between enthalpy and internal energy is [U, CO= 3]
- $H=U-PV$
 - $H=U+PV$
 - $H=PV-U$
 - $H=U/PV$
8. A spontaneous process at constant temperature and pressure is characterized by [U, CO= 3]
- $\Delta G > 0$
 - $\Delta G < 0$
 - $\Delta G = 0$
 - $\Delta H = 0$
9. Chemical potential is defined as the change in Gibbs free energy with respect to [U, CO= 3]
- Temperature
 - Pressure
 - Volume
 - Number of moles
10. The efficiency of a Carnot engine depends on [U, CO= 3]
- Working substance
 - Pressure only
 - Temperature of source and sink
 - volume only

[1 × 10 = 10]

Part B

Short Answer Type Questions, Answer any four Questions
Each question carries 5 marks

11. Derive the Bragg's equation. [U, CO= 1]
12. Discuss the phenomenon of superconductivity. Discuss its characteristic properties and applications. [U, CO= 1]
13. Give examples of photochemical reactions with high quantum yield and low quantum yield. [U, CO= 2]
14. Illustrate the statement, "Chemiluminescence is regarded as the reverse of a photochemical reaction." [U, CO= 2]
15. State and explain the different statements of the second law of thermodynamics. [U, CO= 3]
16. Derive the expression for entropy as a function of volume and temperature. [A, CO= 3]

[4 × 5 = 20]

Part C

Long Essay Type Questions, Answer any Two Questions

Each question carries 10 marks

17. Explain the different types of stoichiometric defects found in crystals. [U, CO= 1]

18. Define entropy and explain its physical significance. Derive the entropy change of an ideal gas as a function of volume and temperature, and as a function of pressure and temperature. [U, CO= 3]

19. Derive expressions for work done during reversible isothermal and adiabatic expansion of an ideal gas. [U, CO= 3]

20. Define heat capacities at constant volume and constant pressure and derive their relationship for an ideal gas. [U, CO= 3]

[2 × 10 = 20]

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS)
FIFTH SEMESTER EXAMINATION
Discipline Specific Elective (DSE) –MG5DSECHE300- QUANTUM MECHANICS,
SPECTROSCOPY & GROUP THEORY
MODEL QUESTION PAPER
(2024 ADMISSION ONWARDS)

Duration: 2 Hours

Maximum Marks: 70

*Remember(K), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C), Skill(S),
Interest(I) and Appreciation(Ap)*

**Students should attempt at least one question from each course outcome to enhance their
overall outcome attainability.**

Part A

Very Short Answer Questions

Answer any 10 questions

Each question carries 2 marks

1. What would be the wavelength of a moving particle if its velocity is doubled?
(CO-1,A)
2. Which of the following is an eigen function of d/dx a) x^2 b) e^{ax} . Why? (CO-1,An)
3. Give time independent Schrodinger equation for a particle in one-dimensional box of infinite potential wall. (CO-1, U)
4. Explain different regions of electromagnetic radiation used in spectroscopy (CO-2,U)
5. What is meant by a rigid rotor ? (CO-2,K)
6. Define zero-point energy in vibrational spectroscopy. (CO-2,K)
7. Show how many spin states are possible for Carbon-13? (CO-3, U)
8. Define chemical shift. (CO-3, K)
9. State the Laporte selection rule for electronic transitions. (CO-3, K)
10. Distinguish between C_{nv} and C_{nh} point groups. (CO-4, U)
11. Explain the term classes in group theory with an example. (CO-4, U)
12. Give an example of a molecule belonging to D_{3h} point group and identify its symmetry Elements. (CO-4, U)

[10 × 2 = 20]

Part B

Short Answer Questions

Answer any 6 questions

Each question carries 5 marks

13. Discuss the limitations of classical mechanics with reference to any two of the following phenomena a) Blackbody radiation b) Photoelectric effect c) Compton effect. (CO-1, U)
14. What is meant by separation of variables in solving Hydrogen atom wave equation?

15. Distinguish between natural line broadening and Doppler broadening. (CO-1, A)
(CO-2, U)
16. Compare an overtone band with a fundamental vibrational band. (CO-2, U)
17. A molecule contains a carbonyl group (C=O). Identify the molecular orbitals and molecular transitions involved. (CO-3, A)
18. Write a short note on coupling constant. (CO-3, U)
19. Write a note on point groups to which molecules of high symmetry (MHS) belong. (CO-4, U)
20. Write down the matrix representation for centre of symmetry(i)and identity (E). (CO-4, U)
- [6 × 5 = 30]**

Part C

Short Essay Questions

Answer any 2 questions

Each question carries 10 marks

21. Discuss the radial probability distribution curves of electrons in hydrogen atom. (CO-1, U)
22. Explain the concept of anharmonicity in a diatomic molecule and explain the morse potential represents its anharmonic vibrational behaviour. (CO-2,U)
23. Outline briefly the factors affecting chemical shift. (CO-3, U)
24. S_n operation generates n distinct operations when n is even and 2n operations when n is odd. Justify the statement with respect to S_3 and S_6 operations. (CO-4, A)
- [2 × 10 = 20]**

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS)
FIFTH SEMESTER EXAMINATION
Discipline Specific Elective (DSE) –MG5DSECHE301: GREEN CHEMISTRY FOR
SUSTAINABLE DEVELOPMENT
MODEL QUESTION PAPER

Duration: 2 hours

Maximum Marks: 70

*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S),
Interest (I) and Appreciation (Ap)*

Students should attempt at least one question from each course outcome to enhance their overall outcome attainability.

Part A
Very Short Answer Questions
Answer any ten questions
Each question carries 2 marks

1. What is the significance of Kyoto protocol? (K, CO-1)
2. How is the percentage yield of a reaction determined? (K, CO-1)
3. Name any two techniques used for waste minimization in chemical industries. (K, CO-2)
4. What is Atom Economy? (K, CO-1)
5. What is meant by Inherently Safer Design (ISD)? (K, CO-2)
6. What is MCPBA? List any one applications of MCPBA. (K, CO-3)
7. Compare the homogeneous and heterogeneous catalysis. (U, CO-2)
8. What is a supercritical fluid? Give one example used in Green Chemistry. (K, CO-3)
9. What are polymer-supported reagents? Mention their advantages. (K, CO-3)
10. Identify one environmental problem associated with the textile industry and suggest one green solution. (A, CO-4)
11. Explain the advantages of phase transfer catalysts. (U, CO-4)
12. Explain any one green method to synthesize adipic acid (U, CO-4)

[10 × 2 = 20]

Part B
Short Answer Questions
Answer any six questions
Each question carries 5 marks

13. Explain with examples why rearrangement reactions are considered to be 100 % atom economical. (U, CO-1)

14. Explain the Bhopal Gas tragedy and describe how inherently safer design (ISD) principles could have helped to reduce the associated hazards. (U, CO-2)
15. Illustrate the mechanism of photocatalysis with a neat and labeled diagram. (U, CO-2)
16. Explain the role of hydrogen peroxide as a green oxidant with suitable examples. (U, CO-3)
17. Explain the importance of the Rio, Montreal and Kyoto protocols in promoting environmental protection and sustainable development. (U, CO-1)
18. Write notes on Eco-friendly pesticides. (U, CO-4)
19. Apply the principles of green chemistry to select suitable green alternative to traditional solvents. (A, CO-3)
20. Apply the appropriate green wastewater treatment technologies to treat industrial wastewater and explain their advantages in terms of environmental sustainability. (A, CO-4).

[6 × 5 = 30]

Part C
Short Essay Questions
Answer any two questions
Each question carries 10 marks

21. Explain the principles of phase transfer catalysis to the synthesis of nitriles, alcohols, azides and alkyl fluorides from alkyl halides. Illustrate each transformation with suitable example (U, CO-4)
22. Explain the twelve principles of Green Chemistry. (U, CO-1)
23. Apply conventional heating, microwave heating and ultrasonic irradiation in chemical reactions. Compare their advantages and disadvantages in green synthesis. (A, CO-2)
24. Explain the use of oxygen, singlet oxygen, ozone, hydrogen peroxide and peroxy acids as green reagents. Compare their oxidation characteristics, and environmental advantages with suitable examples. (U, CO-3)

[2 × 10 = 20]

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS)
FIFTH SEMESTER EXAMINATION
Discipline Specific Elective (DSE) –MG5DSECHE302 - ENVIRONMENTAL
CHEMISTRY
MODEL QUESTION PAPER
(2024 ADMISSION ONWARDS)

Duration: 2 hours

Maximum Marks: 70

***Remember(K), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C), Skill(S),
Interest(I) and Appreciation(Ap)***

Students should attempt at least one question from each course outcome to enhance their overall outcome attainability.

Part A

Very Short Answer Questions

Answer any 10 questions

Each question carries 2 marks

- | | |
|--|-------------|
| 1. Define environmental pollution. | [K] / [CO1] |
| 2. Explain the impact of toxic chemicals on enzymes. | [U] / [CO1] |
| 3. What are the biochemical effects of carbon monoxide (CO). | [U] / [CO1] |
| 4. How will you measure the alkalinity of water. | [K] / [CO2] |
| 5. How would you determine the presence of fluoride in water sample? | [U] / [CO2] |
| 6. Name the methods used for the determination of Lead and Mercury in water. | [K] / [CO2] |
| 7. Describe the method used for the analysis of SO ₂ in air . | [U] / [CO3] |
| 8. Explain the basic components of soil. | [U] / [CO4] |
| 9. What is meant by solid waste management? | [U] / [CO4] |
| 10. What is meant by effluent? | [K] / [CO5] |
| 11. Name any two microorganisms used in effluent treatment. | [U] / [CO5] |
| 12. Explain the term phytoremediation. | [U] / [CO5] |
| [10 x 2 = 20] | |

Part B

Short Answer Questions

Answer any 6 questions

Each question carries 5 marks

- | | |
|---|-------------|
| 13. Briefly explain about solar energy and the applications of solar energy. | [A] / [CO1] |
| 14. Define environmental management system. | [K] / [CO1] |
| 15. Briefly explain the determination of Biochemical Oxygen Demand (BOD) of water sample. | [U] / [CO2] |
| 16. Discuss about water sampling techniques. | [U] / [CO2] |
| 17. Explain ozone layer depletion and describe its major consequences. | [U] / [CO3] |
| 18. Explain the Chernobyl disaster and discuss its major consequences. | [U] / [CO3] |

19. State and explain the three R's of waste management. [U] / [CO5]
20. Describe the different methods used for the management of toxic waste. [A] / [CO5]
[6 x 5 = 30]

Part C

Short Essay

Answer any 2 questions

Each question carries 10 marks

21. Describe briefly on the sources and biochemical effects of the pollution caused by PAN, cyanides(CN), Pesticides and carcinogenic substances. [U] / [CO1]
22. Explain the sources and effects of water pollution. [U] / [CO2]
23. Explain the analysis of following parameters in soil
a) Nitrogen b) Phosphorous c) Calcium d) Magnesium [An] / [CO4]
24. Illustrate the methods used for wastewater treatment. [A] / [CO5]
[2 × 10 = 20]
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MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS)
FIFTH SEMESTER EXAMINATION
Discipline Specific Elective (DSE) – MG5DSECHE303 – NANOTECHNOLOGY FOR ENERGY APPLICATIONS
MODEL QUESTION PAPER
(2024 ADMISSION ONWARDS)

Time: 2 Hours

Maximum Marks: 70

Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)

Students should attempt at least one question from each course outcome to enhance their overall outcome attainability.

Part A

Very Short Answer Questions

Answer any 10 questions

Each question carries 2 marks

- | | | |
|-----|---|------------|
| 1. | What is meant by global energy consumption? Mention one factor affecting it. | [U CO1] |
| 2. | Distinguish between renewable and non-renewable energy sources with one example each. | [An CO1] |
| 3. | State one advantage and one limitation of conventional energy sources. | [U CO1] |
| 4. | What is meant by intermittency in renewable energy systems? | [K CO1] |
| 5. | What is a photovoltaic cell? | [K CO2] |
| 6. | Mention one important component of a dye-sensitized solar cell (DSSC). | [U CO2] |
| 7. | What is meant by a bulk heterojunction solar cell? | [U CO2] |
| 8. | What is the function of the cathode in a lithium-ion battery? | [U CO3] |
| 9. | What is an electrical double layer in a capacitor? | [U CO3] |
| 10. | Mention two materials used for hydrogen storage. | [K CO3] |

11. What are metal–organic frameworks (MOFs)? [U | CO4]
12. Name two 2D materials used in energy-related applications. [K | CO4]

(2 × 10 = 20)

Part B

Short Answer Questions

Answer any 6 questions

Each question carries 5 marks

13. Analyse the major advantages and limitations of conventional energy sources with suitable examples. [An | CO1]
14. Discuss the major technological and economic challenges involved in the large-scale implementation of renewable energy technologies. [An | CO1]
15. Explain the process of tidal, geothermal and biomass energy conversion. [U | CO1]
16. Explain the principle and architecture of a photovoltaic cell. How is solar energy converted into electrical energy? [U | CO2]
17. Compare DSSC and quantum-dot solar cells based on their operating principles and materials. [An | CO2]
18. Explain the working principle and architecture of a lithium-ion battery. Mention the functions of its major components. [U | CO3]
19. Differentiate between EDLCs and pseudocapacitors based on their charge-storage mechanisms. [U | CO3]
20. Explain the important materials and methods used for hydrogen storage, with special reference to MOFs and metal hydrides. [U | CO3]

(5 × 6 = 30)

Part C

Essay Questions

Answer any 2 questions

Each question carries 10 marks

21. Analyse the present global energy scenario with reference to:
a) global energy requirements and consumption [An | CO1]
b) challenges in renewable-energy implementation,

22. Explain the different photovoltaic technologies, including:
a) perovskite solar cells [U | CO2]
b) silicon solar cells.
23. Discuss the principles and materials of energy-storage technologies with reference to:
a) primary and secondary batteries [U | CO3]
b) lithium-ion batteries and electrode materials
c) hydrogen-storage materials.
24. Discuss the role of advanced nanostructured materials in energy storage and conversion, with reference to:
a) MOFs and COFs [An | CO4]
b) graphene, boron nitride and carbon nitride
c) two-dimensional metal chalcogenides such as MoS₂ and MoSe₂.

(10 × 2 = 20)

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS)
FIFTH SEMESTER EXAMINATION
Discipline Specific Elective (DSE) –MG5DSECHE304 - MEDICINAL CHEMISTRY
MODEL QUESTION PAPER
(2024 ADMISSION ONWARDS)

Duration: 2 Hours

Maximum Marks: 70

*Remember(K), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C), Skill(S),
Interest(I) and Appreciation(Ap)*

**Students should attempt at least one question from each course outcome to enhance
their overall outcome attainability.**

Part A

Very Short Answer Questions

Answer any 10 questions

Each question carries 2 marks

1. Mention any two domains that fall under the scope of medicinal chemistry. (CO-1, U)
 2. Define the terms pharmacology and toxicology (CO-1, K)
 3. Analyze how the drug selectivity influences the numerical value of a therapeutic index. (CO-1, An)
 4. Outline type I and type II drug receptors? (CO-2, U)
 5. Define bioavailability of a drug and mention any two factors that can affect the bioavailability of a drug (CO-2, U)
 6. A protein is associated with a disease but inhibition of the protein produces no therapeutic effect. What does this suggest about the target? (CO-1, An)
 7. Explain the basic idea of the induced fit theory of drug action. (CO-2, U)
 8. Outline the difference between cholinergic stimulants and cholinergic blockers. (CO-3, U)
 9. Explain anaesthetics with an example. (CO-3, U)
 10. Explain what is meant by an antimalarial drug, with one example (CO-3, U)
 11. Explain the concept of gene therapy (CO-5, U)
 12. Write a short note on sustained and controlled release drug formulations. (CO-5, U)
- [10 × 2 = 20]

Part B

Short Answer Questions

Answer any 6 questions

Each question carries 5 marks

13. Once a promising molecule is identified as a lead compound, it moves into the lead optimization phase. Distinguish between the goals of identifying a lead compound and optimizing a lead compound. (CO-1, An)
14. Glutathione exhibits less than 10% systemic bioavailability when administered orally. Suggest an alternative route of administration where it can achieve maximum bioavailability, providing reasons for your choice. (CO-1, A)
15. Categorize Prodrugs based on their site of bioactivation with suitable examples.

- (CO-2, A)
16. A metabolite contains a suitable functional group for conjugation. Suggest a possible Phase II reaction and state its likely effect on excretion. (CO-2, A)
17. Define antibiotics and explain the use of chloramphenicol as an example. (CO-3, U)
18. Illustrate tranquilizers and summarize their uses. (CO-3, U)
19. Explain the concept and importance of pharmacovigilance in ensuring drug safety. (CO-4, U)
20. Briefly discuss the chemistry behind the application of liposomes as the drug delivery agents (CO-5, U)
- [6 × 5 = 30]

Part C

Short Essay Questions

Answer any 2 questions

Each question carries 10 marks

21. You are the Chief Scientific Officer in charge of clinical trials of a novel drug for hypertension. Develop a brief plan for the clinical trials. (CO-1, A)
22. Explain adsorption, absorption, distribution, metabolism and elimination (ADME) of the drug in detail. (CO-2, U)
23. Compare the therapeutic outcomes of mimicking the adrenergic system versus inhibiting it. (CO-3, U)
24. Classify adverse drug reactions according to their type and severity. Explain each category with suitable examples. (CO-4, U)
- [2 × 10 = 20]

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS)
FIFTH SEMESTER EXAMINATION
Discipline Specific Elective (DSE) –MG5DSECHE305 - MAIN GROUP ELEMENTS
MODEL QUESTION PAPER
(2024 ADMISSION ONWARDS)

Duration: 2 hours

Maximum Marks: 70

*Remember(K), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C), Skill(S),
Interest(I) and Appreciation(Ap)*

Students should attempt at least one question from each course outcome to enhance their overall outcome attainability.

Part A

Very Short Answer Questions

Answer any **10** questions

Each question carries **2** marks

1. Which alkali metal reacts least vigorously with water? Explain the reason [K] / [CO-1].
2. Name a suitable crown ether that selectively complex with K^+ ion [K] / [CO-1]
3. Sodium dissolves in liquid Ammonia to give blue colour solution because of
[A] / [CO-1]
4. Name one Calcium complex which is used in analytical applications. [K] / [CO-2]
5. State the inert pair effect and identify two heavy p-block elements that exhibit this phenomenon. [U] / [CO-2]
6. Describe graphite conduct electricity while diamond is an insulator. [U] / [CO-2]
7. Why are Zeolites known as molecular sieves? [U] / [CO -3]
8. How can you distinguish between boranes and carboranes using their composition? Give examples. [A] / [CO -3]
9. State the diagonal relationship? Give one pair of elements from Group 13 and Group 14 that exhibits it. [U] / [CO-3]
10. Point out any two important properties of halogens. [An] / [CO - 4]
11. Illustrate any one method for the preparation of XeF_2 and XeF_4 . [An] / [CO - 4]
12. What are clathrates of noble gases? [An] / [CO - 4]

[10 x 2 = 20]

Part B

Short Answer Questions

Answer any **6** questions

Each question carries **5** marks

13. Discuss the origin of the characteristic flame colours exhibited by S-block elements, giving suitable examples. [K] / [CO-1]
14. Describe the behavior of alkali metals dissolved in liquid ammonia. [K] / [CO-1]
15. Outline the structure of basic beryllium acetate with a labelled diagram. [U] / [CO-2]
16. Discuss the two structural modifications of Polymeric Boron Nitride. [U] / [CO-2]
17. Explain the structure and bonding in diborane using hybridization and molecular orbital concepts. [An] / [CO-3]
18. Determine the STYX code and structural formula for pentaborane-9 (B₅H₉). [A] / [CO-3]
19. Classify interhalogen compounds and explain the general methods of their preparation with suitable examples. [An] / [CO - 4]
20. Explain the VBT of structure and bonding of XeF₂ molecule. [An] / [CO - 4]

[6 x 5 = 30]

Part C

Short Essay Questions

Answer any **2** questions

Each question carries **10** marks

21. Discuss the diagonal relationship between lithium and magnesium, highlighting their similarities in chemical properties and supporting your answer with suitable examples. [K] / [CO-1]
22. Classifies the various allotropes of sulfur into distinct structural and thermodynamic categories based on their molecular geometry, phase stability, and ring strain characteristics. [An] / [CO-2]
23. Analyse the preparation methods and properties of silicon rubbers, and explain how their structure influences their characteristic properties. [An] / [CO-3]
24. Discuss the structures of ClF and ClF₃ type interhalogen compounds. Explain the preparation, structure, and reactivity with suitable reactions. [An] / [CO - 4]

[2 x 10 = 20]

QNSMARTI:H:QPCODE

Reg.No :

Name :

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS) QNSMARTI:H:EXTYPE
EXAMINATION QNSMARTI:H:Y:MONTH QNSMARTI:H:Y:YEAR
QNSMARTI:H:S: V SEMESTER
QNSMARTI:H:C:DSE
QNSMARTI:H:C:CODE – MG5DSECHEA01
QNSMARTI:H:C:NAME – FORENSIC CHEMISTRY
(QNSMARTI:H:C:REYYEAR ADMISSION ONWARDS)

Duration: 2hrs

Maximum Marks: 70marks

Remember(K), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C), Skill(S), Interest(I) and Appreciation(Ap)

Students should attempt at least one question from each course outcome to enhance their overall outcome attainability.

Part A

Multiple Choice Questions

Answer all questions

Each question carries 1 marks

1. Arson refers to:
a) Natural fire b) Industrial fire c) Intentional setting of fire d) Forest fire
2. Smoke patterns are useful in determining:
a) Blood group b) Direction of fire spread c) Fingerprints d) DNA profile
3. The term "fatal dose" refers to:
a) The smallest detectable dose of a poison b) The maximum safe dose of a poison
c) The amount of poison likely to cause death d) The therapeutic dose of a poison
4. Which parameter indicates whether sufficient oxygen is present for complete combustion?
a) Flash point b) Vapour pressure c) Oxygen balance d) Ignition temperature
5. Pipe bombs are examples of:
a) Military explosives b) Improvised Explosive Devices c) Commercial explosives
d) Industrial explosives

6. The Biological Passport is mainly used in:
a) Crime investigation b) Anti-doping programmes c) Drug trafficking d) Toxicology
7. The interval between administration of a poison and death is called the:
a) Incubation period b) Fatal period c) Latent period d) Elimination period
8. Which agency primarily enforces the NDPS Act?
a) WHO b) NCB c) UNESCO d) RBI
9. Which alcohol causes permanent blindness?
a) Ethanol b) Methanol c) Propanol d) Butanol
10. Which of the following is the most common basis for the classification of poisons?
a) Colour of the poison b) Taste of the poison c) Mode of action on the body
d) Cost of the poison
11. Which specimen is most suitable for detecting recently ingested poison?
a) Bone marrow b) Stomach wash/vomitus c) Fingernails d) Teeth

[1x11=11]

Part B

Short Answer

Answer any **8** questions

Each question carries **3** marks

12. What are liquid incendiaries? Give examples.
13. Mention four environmental effects of explosions.
14. Define controlled drugs and controlled substances.
15. What are designer drugs? Mention four examples.
16. Differentiate alcoholic and non-alcoholic beverages.
17. Classify poisons based on their mode of action, giving one example for each class.
18. What are antidotes? Classify antidotes and give one example of each type.
19. Write a short note on the post-mortem findings in cases of poisoning.
20. Describe the common signs and symptoms of corrosive poisoning.
21. Why is interpretation of toxicological findings important in forensic investigations?

[3x8=24]

Part C

Short Essay

Answer any **3** questions

Each question carries **5** marks

22. Discuss the effects of explosion on the human body, buildings.
23. Explain designer drugs. Discuss their classification.
24. Classify poisons based on their mode of action, giving one example for each class.
25. What are antidotes? Classify antidotes and give one example of each type.
26. Write a short note on the post-mortem findings in cases of poisoning.

[5x3=15]

Part D

Essay

Answer any **2** questions

Each question carries **10** marks

27. Explain the mechanism of explosion with suitable diagrams.
28. Describe the post-mortem findings commonly observed in cases of poisoning. Explain their forensic significance.
29. Describe the preparation of a toxicological report and discuss its essential components.

[10x2=20]

MAHATMA GANDHI UNIVERSITY, KOTTAYAM
MGU-UGP (HONOURS)
FIFTH SEMESTER EXAMINATION
MG5SECCE300 - Analytical Techniques and Chemistry of Cosmetics
MODEL QUESTION PAPER
(2024 ADMISSION ONWARDS)

Duration: 1 Hour 30 minutes

Maximum Marks: 50

*Remember(K), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C), Skill(S),
Interest(I) and Appreciation(Ap)*

Students should attempt at least one question from each course outcome to enhance their overall outcome attainability.

Part – A

Short answer type question

Answer any 10 questions. Each carry 2 marks

1. What are chelating agents? Give two examples. (K, CO1)
2. What are the major sources of water contamination? (K, CO1)
3. Define sampling. Explain its importance in analytical chemistry. (U, CO1)
4. How can a chemist test if a soil sample is acidic? Name one method and what result shows acidity. (A, CO1)
5. State the principle of adsorption chromatography. (K, CO2)
6. Why is an inert gas used as the mobile phase in Gas chromatography? (U, CO2)
7. Define reverse phase HPLC. (K, CO2)
8. A student removes a TLC plate from the chamber. What should the student mark immediately to determine the R_f value? (A, CO2)
9. List any four examples of cosmetics. (K, CO3)
10. Give the classification of cosmetics based on their use. (K, CO3)
11. Mention any four categories of cosmetic products. (K, CO3)
12. What is the significance of cosmetics? (U, CO3)

(10 x 2 = 20)

Essay type question

Answer any 6 questions. Each carry 5 marks

13. A student gets analytical results that are close to one another but far from the true value. Identify whether the results show good accuracy or precision and justify your answer. (A, CO1)

14. Explain any two methods used for the purification of water. (U, CO1)
15. Explain the method used for the estimation of calcium and magnesium ions in soil. (U, CO1)
16. A laboratory needs to separate volatile compounds using gas chromatography. Based on the nature of the stationary phase, identify whether gas-liquid chromatography or gas-solid chromatography would be appropriate and differentiate the two techniques. (A, CO2)
17. Explain the step-by-step procedure of TLC with the help of a labelled diagram. (U, CO2)
18. Describe the various quality-control tests carried out on cosmetics. (U, CO3)
19. Explain the physical, chemical and microbiological quality-control tests of cosmetics. (U, CO3)
20. Explain the classification of cosmetics based on their area of application, with examples. (U, CO3)
- (6 x 5 = 30)**
