

GU-RET 2016

GAUHATI UNIVERSITY RESEARCH ELIGIBILITY TEST

CHEMICAL SCIENCE

Booklet Series :

A

Invigilator's Name and Signature

BOOKLET NO.

OMR SHEET NO.

ROLL NO.

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TIME : 2 HOURS 20 MINUTES

TOTAL MARKS : 80

Number of Pages in this Booklet : 18

Instructions for Candidates

1. Write your Roll No. and OMR Sheet No. in the boxes provided above.
2. This paper consists of two sections : **Section B** with 50 (fifty) multiple choice questions (MCQ) and **Section C** with 7 (seven) descriptive questions. Each MCQ has 4 (four) answers, out of which **ONLY** one is correct. You have to darken the circle (on the OMR Sheet) for the correct answer corresponding to the question given in this booklet.

Example : (A) (B) (C) (D)

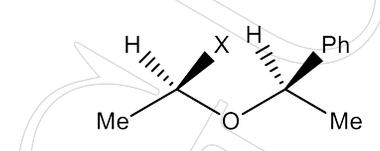
where (C) is the correct answer. No marks will be given for markings made in this booklet. The descriptive questions in **Section C**, **MUST** be answered in the space provided in this booklet. **No extra pages will be provided in any case.**

3. Use a **BLACK** ball point pen in your OMR Sheet.
4. Read the instructions given inside this booklet before attempting to answer any questions.
5. **DO NOT** write your name, roll no, phone no, or anything, or put any marks anywhere in this booklet, otherwise your candidature will be disqualified.
6. If you are found to resort to any kind of unfair means such as carrying extra material other than pen, pencil, watch, eraser, and scale, or copying from somebody or from external material, your candidature will be disqualified.
7. Mobile phones, programmable calculators, log tables or any other tables, wearable smart devices such as smart Android watches or objects of similar nature **CAN NOT** be used inside the examination hall.
8. At the end of the examination, you have to return this booklet and the OMR Sheet back to the invigilator.
9. There is no negative marks for incorrect answer.

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Section B (50 Marks)

1. The plot that follows Arrhenius equation showing the variation of the rate constant (k) with temperature (T)
 - (A) increases exponentially with temperature
 - (B) decreases exponentially with temperature
 - (C) increases with temperature in a straight line
 - (D) decreases with temperature in a straight line
2. If C-C bond energy is 348 kJ/mol, the bond energy in kcal mol⁻¹ of a C-C single bond is approximately
 - (A) 1
 - (B) 10
 - (C) 100
 - (D) 1000
3. The species which by definition has **ZERO** standard molar enthalpy of formation at 298 K is:
 - (A) Br₂ (g)
 - (B) Cl₂ (g)
 - (C) H₂O (g)
 - (D) CH₄ (g)
4. Among the following : (i) molar conductivity, (ii) electromotive force, (iii) resistance, (iv) heat capacity, the intensive properties are
 - (A) (i) and (ii)
 - (B) (ii) and (iii)
 - (C) (iii) and (iv)
 - (D) (i) and (iv)
5. The reagent which is not used for softening the temporary hardness of water is:
 - (A) Ca₃(PO₄)₂
 - (B) Ca(OH)₂
 - (C) Na₂CO₃
 - (D) NaOCl
6. The pair of solutions which form a buffer upon mixing is
 - (A) HNO₃ and CH₃COOH
 - (B) KOH and CH₃COONa
 - (C) HNO₂ and CH₃COONa
 - (D) CH₃COOH and CH₃COONa
7. Iron is removed from chalcopyrite as
 - (A) FeO
 - (B) FeS
 - (C) Fe₂O₃
 - (D) FeSiO₃
8. In self-reduction, $\text{Cu}_2\text{S} + 2\text{Cu}_2\text{O} \rightarrow 6\text{Cu} + \text{SO}_2$, the reducing species is
 - (A) S
 - (B) O²⁻
 - (C) S²⁻
 - (D) SO₂
9. The J value for *trans*-1,2-disubstituted ethylenes is
 - (A) 7-14 Hz
 - (B) 12-19 Hz
 - (C) 0-3 Hz
 - (D) None of the above
10. The typical chemical shift value of C=O in ¹³C – NMR spectrum of a ketone is
 - (A) 205-220
 - (B) 190-200
 - (C) 125-150
 - (D) 115-140
11. Which of the following is NMR inactive?
 - (A) ¹⁴N
 - (B) ³²S
 - (C) ²H
 - (D) ¹³C

12. Which of the following is omega fatty acid?
- (A) Arachidic acid
(B) Lactic acid
(C) Linoleic acid
(D) Palmitic acid
13. Which of the vitamin acts as an antioxidant?
- (A) Vitamin A
(B) Vitamin C
(C) Vitamin D₁
(D) Vitamin E
14. Which of the following coenzymes are used to oxidise substrates?
- (A) Coenzyme A
(B) Thiamine pyrophosphate
(C) Pyridoxal phosphate
(D) Flavin adenine dinucleotide
15. Which vitamin is responsible for clotting of blood?
- (A) Vitamin B
(B) Vitamin H
(C) Vitamin D
(D) Vitamin K
16. Which of the following compound is used as a catalyst in olefin metathesis?
- (A) 18-Crown-6
(B) Grubb's catalyst
(C) DABCO
(D) Triethylamine
17. How many NMR signals would be observed for the following organic molecule?
- 
- (A) 5
(B) 6
(C) 7
(D) 4
18. What is calciferol commonly known as?
- (A) Vitamin A
(B) Vitamin K
(C) Vitamin D₁
(D) Vitamin E
19. A theory which includes the concept of discrete energy levels in atoms was postulated by:
- (A) Hund
(B) Bohr
(C) Pauli
(D) Schrödinger
20. The best example of a non-polar molecule containing polar bonds is
- (A) F₂
(B) NH₃
(C) CCl₄
(D) CH₂Cl₂
21. The molecule with highest bond order amongst the following is
- (A) CO
(B) NO
(C) He₂
(D) Ne₂
22. The molecule POCl₃ belongs to the point group
- (A) T_d
(B) C_{3v}
(C) D_{3h}
(D) C_s
23. Zeigler-Natta catalyst is
- (A) Diethyl aluminium chloride in combination with titanium chloride
(B) Diphenyl aluminium chloride in combination with titanium chloride
(C) Diethyl aluminium chloride in combination with platinum chloride
(D) Diphenyl aluminium chloride in combination with platinum chloride

24. Atmospheric oxygen is a good inhibitor due to
- (A) Carbocation nature
 - (B) Radical Nature
 - (C) Biradical Nature
 - (D) Carbanion nature
25. Glass transition temperature of a polymer is in between
- (A) Glassy state-Viscofluid state
 - (B) Glassy state-Viscoelastic state
 - (C) Viscoelastic state -Viscofluid state
 - (D) Rubbery state-Viscoelastic state
26. The number of neutrons emitted when $^{235}\text{U}_{92}$ undergoes controlled nuclear fission to $^{142}\text{Xe}_{54}$ and $^{90}\text{Sr}_{38}$ is
- (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
27. 'Novlak Resins' formed from monomers
- (A) Urea and formaldehyde
 - (B) Melamine and formaldehyde
 - (C) Phenol and formaldehyde
 - (D) Melamine and phenol
28. With increase in frequency of the field the resolution between the peaks in NMR spectra
- (A) does not make any difference
 - (B) decreases
 - (C) may increase or decrease
 - (D) increases
29. Methyl protons of acetonitrile appears at 1.97 ppm while methyl protons of methyl chloride appears at 3.05 ppm. This is due to
- (A) Electronegative effect
 - (B) Resonance effect
 - (C) Anisotropic effect
 - (D) None of the above
30. Chemically, waxes are
- (A) Long chain fatty acids
 - (B) A triacylglycerol
 - (C) Esters of long-chain carboxylic acid and alcohol
 - (D) Phosphoglycerides
31. Why lecithins are used?
- (A) Disinfectant
 - (B) Emulsifying agent
 - (C) Detergent
 - (D) Explosive
32. What is the role of Prostaglandins in human body?
- (A) Useful in digestion
 - (B) Regulates pain and inflammation
 - (C) Releases toxins
 - (D) Fights against bacteria
33. Which vitamin is produced by bacteria that live in our intestine?
- (A) Vitamin B
 - (B) Vitamin H
 - (C) Vitamin D
 - (D) Vitamin K
34. Identify the steroidal drug that is for reducing pain and inflammation.
- (A) Ibuprofen
 - (B) Cortisone
 - (C) Naproxen
 - (D) Diclofenac
35. Which one is cholesterol reducing drug?
- (A) Atorvastatin
 - (B) Atenolol
 - (C) Lisinopril
 - (D) Furosemide
36. Cisplatin
- (A) Is an anticancer drug
 - (B) Is used in treating coccidiosis
 - (C) Transports iron in blood
 - (D) Is therapeutic drug for Wilson disease

37. Which of the following is used as antiviral drug
- (A) Acyclovir
 - (B) Cytarabine
 - (C) Idoxuridine
 - (D) All of the above
38. Which amino acid has hydrophobic side chain?
- (A) Isoleucine
 - (B) Aspartic acid
 - (C) Lysine
 - (D) Phenylalanine
39. Amongst the following, the compound that is not soluble in aqueous NaOH is
- (A) Benzoic acid
 - (B) Phenol
 - (C) Nitro Benzene
 - (D) Chlorobenzoic acid
40. Based on VSEPR theory, the number of 90 degree F-Br-F angles in BrF_5 is
- (A) 0
 - (B) 1
 - (C) 4
 - (D) 5
41. Amongst the following, the compound whose aqueous solution turns red litmus paper blue is
- (A) $\text{Zn}(\text{NO}_3)_2$
 - (B) NH_4NO_3
 - (C) FeCl_3
 - (D) KCN
42. The number of significant figures in an average titre value of 29.1 mL is/are
- (A) 0
 - (B) 1
 - (C) 2
 - (D) 3
43. The total number of cyclic isomers possible for a hydrocarbon with the molecular formula C_4H_6 is
- (A) 4
 - (B) 5
 - (C) 6
 - (D) 7
44. Teflon is
- (A) Polytetra fluoro carbon
 - (B) Polytetra fluoro ethylene
 - (C) Polytetra fluoro borane
 - (D) Polytetra fluoro methylene
45. The oxidation state of iron in *met*-hemoglobin is
- (A) 3
 - (B) 4
 - (C) 0
 - (D) 2
46. The actual base pairs present in double helical structure of DNA are
- (A) AG and CT
 - (B) AC and GT
 - (C) AG and AC
 - (D) AT and GC
47. How many atoms are there in an element packed in a *fcc* structure?
- (A) 1
 - (B) 2
 - (C) 4
 - (D) 8
48. The decreasing order of dipole moment of molecules is
- (A) $\text{NF}_3 > \text{NH}_3 > \text{H}_2\text{O}$
 - (B) $\text{NH}_3 > \text{NF}_3 > \text{H}_2\text{O}$
 - (C) $\text{H}_2\text{O} > \text{NH}_3 > \text{NF}_3$
 - (D) $\text{H}_2\text{O} > \text{NF}_3 > \text{NH}_3$

49. Which disease is caused by loss of myelin sheath?

- (A) Epilepsy
- (B) Prostrate cancer
- (C) High blood pressure
- (D) Multiple sclerosis

50. Which of the following element would give sharp lines in NMR spectroscopy?

- (A) ^1H
- (B) ^{14}N
- (C) ^2H
- (D) ^{17}O

Section C (30 Marks)

Answer any 5 (five) from the following

1. Write about different types of vibrations of CO₂ using IR spectroscopy. (Marks : 6)
2. What is hardness of water? Between soap and detergent which one acts better in hard water? Give reasons. (Marks : 6)
3. What is HASB principle? Explain how do you compare acidity and basicity using this principle. (Marks : 6)
4. How can a catalyst make a reaction faster? What are homogeneous and heterogeneous catalysis? (Marks : 6)
5. What is Green House effect? Name five effective green house gases/species. (Marks : 6)
6. Describe the Role of hemoglobin in oxygen transport in human body. (Marks : 6)
7. Briefly explain the working principle of a Gas Chromatograph (Marks : 6)

Space for Answers (Section C) : for Questions 1 to 7 (10 pages)

GU-RREF 2018

Space for Answers (Section C) : for Questions 1 to 7 (10 pages)

GU-RFET 2019

Space for Answers (Section C) : for Questions 1 to 7 (10 pages)

GU-RREF 2018

Space for Answers (Section C) : for Questions 1 to 7 (10 pages)

GU-RFET 2019

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GU-RRET 2019

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GU-RREF 2018

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