

Question Booklet No.

(To be filled up by the candidate by **blue/black ball-point pen**)Roll No.

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Roll No. (Write the digits in words)

Serial No. of OMR Answer Sheet

Day and Date

(Signature of Invigilator)

INSTRUCTIONS TO CANDIDATES(Use only **blue/black ball-point pen** in the space above and on both sides of the **Answer Sheet**)

1. Within 10 minutes of the issue of the Question Booklet, Please ensure that you have got the correct booklet and it contains all the pages in correct sequence and no page/question is missing. In case of faulty Question Booklet, bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.
2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope*.
3. *A separate Answer Sheet is given. It should not be folded or mutilated. A second Answer Sheet shall not be provided.*
4. Write your Roll Number and Serial Number of the Answer Sheet by pen in the space provided above.
5. *On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.*
6. *No overwriting is allowed in the entries of Roll No., Question Booklet No. and Set No. (if any) on OMR sheet and Roll No. and OMR sheet No. on the Question Booklet.*
7. *Any changes in the aforesaid-entries is to be verified by the invigilator, otherwise it will be taken as unfair means.*
8. *This Booklet contains 40 multiple choice questions followed by 10 short answer questions. For each MCQ, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet. For answering any five short Answer Questions use five Blank pages attached at the end of this Question Booklet.*
9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.
10. *Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).*
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. Deposit *both OMR Answer Sheet and Question Booklet* at the end of the Test.
13. You are not permitted to leave the Examination Hall until the end of the Test.
14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

FOR ROUGH WORK

Research Entrance Test – 2013

No. of Questions : 50

Time : 2 Hours

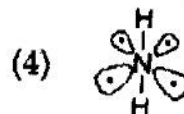
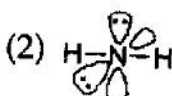
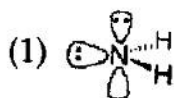
Full Marks : 200

Note : (i) This Question Booklet contains **40** Multiple Choice Questions followed by **10** Short Answer Questions.

(ii) Attempt as many MCQs as you can. Each MCQ carries **3 (Three)** marks. **1 (One)** mark will be deducted for each incorrect answer. Zero mark will be awarded for each unattempted question. If more than **one** alternative answers of MCQs seem to be approximate to the correct answer, choose the closest one.

(iii) Answer only 5 Short Answer Questions. Each question carries **16 (Sixteen)** marks and should be answered in **150-200** words. Blank **5 (Five)** pages attached with this booklet shall only be used for the purpose. Answer each question on separate page, after writing Question No.

1. Which one is used to measure length ?
 (1) Payya Mana (2) Pautava Mana (3) Druvaya Mana (4) Nishpava
2. Melting temperature of silver is ?
 (1) 232°C (2) 419°C (3) 960°C (4) 1063°C
3. Bulb of onion is modification of ?
 (1) Root (2) Stem (3) Radical (4) Plumula
4. Movement of food through oesophagus is due to ?
 (1) Lubrication of saliva (2) Peristalsis
 (3) Gravitational pull (4) External pressure
5. The breakdown of pyruvate to give carbon dioxide, water and energy takes place in ?
 (1) Cytoplasm (2) Mitochondria (3) Chloroplast (4) Nucleus
6. The autotrophic mode of nutrition requires ?
 (1) Carbon dioxide and water (2) Chlorophyll
 (3) Sunlight (4) All of above three
7. Where is bile produced ?
 (1) Gall bladder (2) Blood (3) Liver (4) Spleen
8. The correct pathway of blood in circulatory system is ?
 (1) Atria → ventricles → arteries → veins
 (2) Ventricles → atria → veins → arteries
 (3) Ventricles → veins → arteries → atria
 (4) Veins → ventricles → atria → arteries
9. How does light normally travel ?
 (1) In concentric circles (2) In a straight line
 (3) Always towards a dark area (4) In a curved line
10. Light travels fastest through which of the following material ?
 (1) Diamond (2) Water (3) Glass (4) Air
11. Which of the following best represents the 3-dimensional view of H_2N^- ?



12. If 1.45 J of heat is added to a 2.00 g sample of aluminum metal and the temperature of the metal increases by 0.798 °C, what is the specific heat of aluminum?

- (1) 0.579 J/g deg (2) 0.909 J/g deg (3) 1.68 J/g deg (4) 3.63 J/g deg

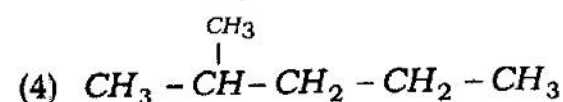
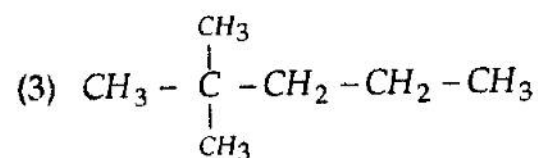
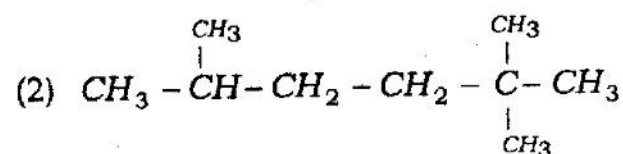
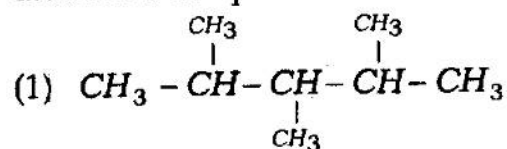
13. Which of the following compounds is the strongest Brønsted base?

- (1) NaHSO_4 (2) NaCH_3CO_2 (3) NaNO_3 (4) NaH_2PO_4

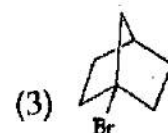
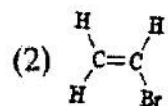
14. How many milliliters of 2 M NaCl solution are required to make 1 liter of 0.4 M NaCl solution?

- (1) 5,000 mL (2) 800 mL (3) 200 mL (4) 0.2 mL

15. The CMR spectrum of an unknown compound shows 6 absorptions and the PMR spectrum shows 5 absorptions. Which of the following compounds is the unknown compound?

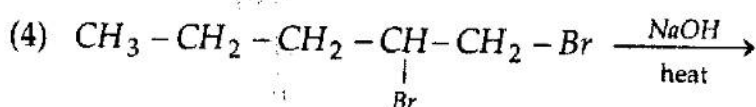
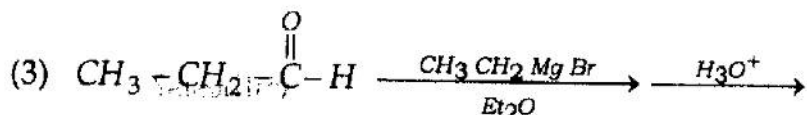
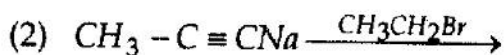
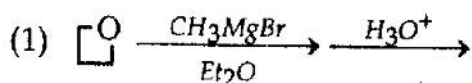
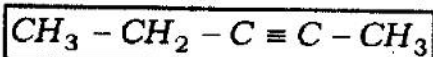


16. Which of the following compounds would react most readily by the S_N^2 mechanism?

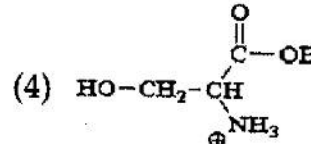
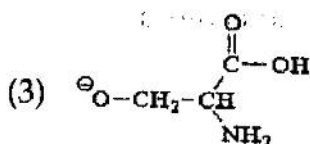
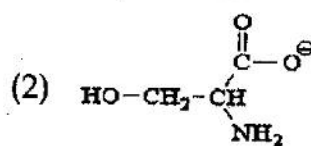
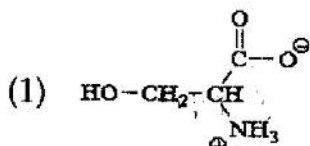


(4) None of these compounds will react by a S_N^2 mechanism.

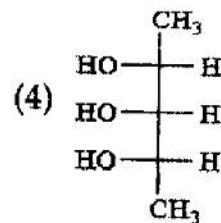
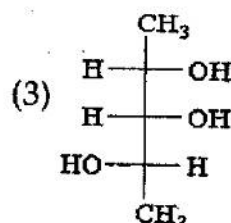
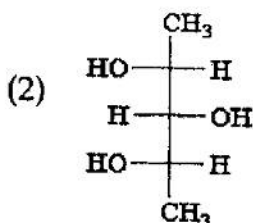
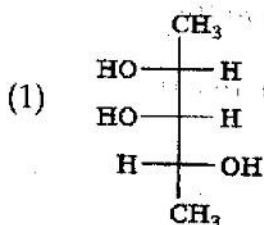
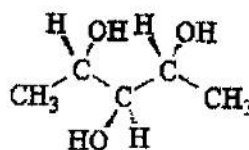
17. Which of the following reactions will produce the 2-pentyne in good yield ?



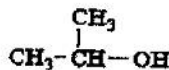
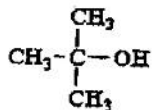
18. Which of the following represents serine at a pH = 1 ?



19. Which of the Fischer projections correctly depicts the following compound ?



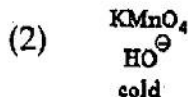
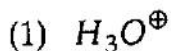
20. Which of the following reagents could be used to distinguish between the following compounds by a visible reaction one that produces either gas bubbles or a color change ?



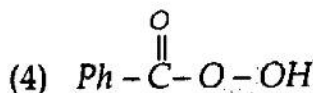
- (1) $\text{KMnO}_4, \text{H}^+, \text{cold}$
 (3) CH_3MgBr

- (2) NaOH
 (4) LiAlH_4

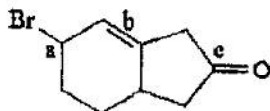
21. What reagent is needed to accomplish the following synthesis?



- (3) 1. O_3
 2. $\text{Zn} / \text{H}^{\oplus}$



22. Which of the functional groups on the following molecule are susceptible to nucleophilic attack ?



- (1) "a" and "b" (2) "a" and "c" (3) "b" and "c" (4) "a", "b" and "c"

23. Which statement below is *incorrect* ?

- (1) Pyrazine is a diazine.
 (2) Pyrimidine and pyrazine are isomers.
 (3) 4-Methylimidazole and 5-methylimidazole are tautomers.
 (4) In imidazole, each N atom contributes one electron to the π -system.

24. Which of the following statements is *incorrect* about the reaction of $[\text{Ph}_3\text{C}][\text{BF}_4]$ with 4H-pyran ?

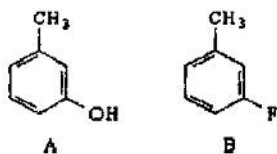
- (1) A tetrafluoroborate salt is formed
 (2) $[\text{Ph}_3\text{C}]^+$ abstracts H^- from 4H-pyran.
 (3) Pyridine is formed
 (4) An aromatic ring is formed

25. "If the adsorbate is held on a surface by weak Vander Waal's forces, the absorption process is :
- (1) Physical adsorption (2) Heat of adsorption
(3) Chemical adsorption (4) Enthalpy of adsorption
26. Synthesis of DNA occurs in :
- (1) G₁ phase (2) S phase (3) G₂ phase (4) M phase
27. Which one of the following statements is *incorrect* ?
- (1) Mass defect is related with binding energy
(2) The size of the nucleus is of the order of $10^{-12} - 10^{-13}$ cm
(3) 'Meson' was discovered by Yukawa
(4) Magnetic quantum number is a measure of 'orbital angular momentum' of the electron
28. Sulphur containing amino acid is :
- (1) Glycine (2) Valine (3) Methionine (4) Tryptophan
29. Reverberatory furnace is employed in the metallurgy of
- (1) Al (2) Ag (3) Pb (4) Fe
30. Which of the following is *true*.
- (1) Amoxicillin is an antiepileptic drug
(2) Paracetamol is an antibiotic drug
(3) Ampicillin is an antipyretic drug
(4) Chloroquine is an antimalarial drug
31. Which of the following enzyme(s) can remove or insert supercoil twists into cDNA ?
- (1) Topoisomerases (2) DNA Pol II (3) Spliceosomes (4) Helicase
32. The RNA primer is removed from the Okazaki fragment by :
- (1) DNA Pol II (2) DNA Pol I
(3) DNA Pol III (4) 4. RNA polymerase
33. Histones have an abundance of which of the following amino acids ?
- (1) Lysine and arginine (2) Alanine and glutamine
(3) Glycine and glutamine (4) Arginine and glutamine
34. Actinomycin D is an inhibitor of :
- (1) Replication (2) Transcription (3) Translation (4) Mutation
35. The p53 protein normally promotes :
- (1) DNA replication (2) Cell division
(3) Tumor formation (4) Apoptosis

36. The binding of the prokaryotic DNA dependent RNA polymerase to promoter site is :
 (1) Streptomycin (2) Puromycin (3) Rifampicin (4) Tetracycline
37. A 20 year old man was diagnosed with abnormal form of β -globin (Hemoglobin Constant Spring) which is longer than the normal protein, which of the following point mutation is consistent with the abnormality ?
 (1) UAA \rightarrow CAA (2) CGA \rightarrow UGA (3) UAA \rightarrow UAG (4) GAC \rightarrow UAC
38. All the proteins, mentioned below are metalloproteins *except* :
 (1) Carbonic anhydrase (2) Xanthine oxidase
 (3) Lactate dehydrogenase (4) Superoxide dismutase
39. Which of the following amino acids in myoglobin, globular proteins, is highly-likely to be localized within the interior of the molecule ?
 (1) Arginine (2) Valine (3) Aspartic acid (4) Lysine
40. An 8 year-old boy is treated with Ciprofloxacin for some respiratory infection. Which of the following enzyme activity is most directly affected by this drug ?
 (1) DNA polymerase (2) Topoisomerase
 (3) Reverse transcriptase (4) RNA polymerase

Attempt any five questions. Write answer in 150-200 words. Each question carries 16 marks. Answer each question on separate page, after writing Question Number.

1. Which of the following compounds will show the methyl absorption at the larger chemical shift in the proton magnetic resonance spectrum ? Explain.



2. Draw a dash-wedge structure for (1R, 3R)-1, 3-dibromo-1, 3-dimethylcyclohexane.
3. Convert malonic ester into glycine using Curtius rearrangement.
4. What do you mean by the principle and applications of chromatographic techniques ?
5. Describe some of the techniques for drying of solvents with examples.
6. What are Okazaki fragments? Explain their significance in replication.
7. Give the reason of presence of Uracil in RNA.
8. Give a brief account of the principle, procedure and applications of Polymerase chain reaction.
9. Describe the classes of enzymes and their functions with one example for each.
10. Give a brief account of Mc Lafferty rearrangement.

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FOR ROUGH WORK

