

Full Marks: 30

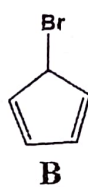
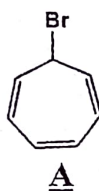
Time: 2 Hrs.

*Answer all questions*

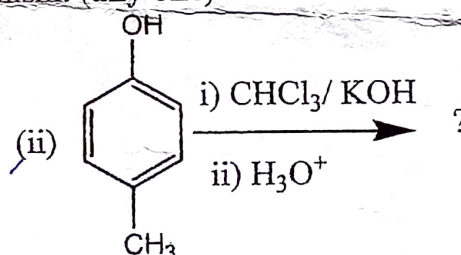
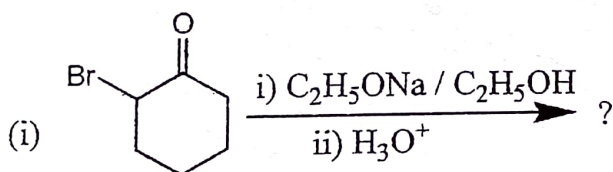
1. (a) Give explanations for the following observations: (any two)

- (i) Guanidine  $[\text{HN}=\text{C}(\text{NH}_2)_2]$  is an extremely strong base
- (ii) 2, 4, 6-trinitrophenol (picric acid) behave as a strong acid
- (iii) The ethanolic solution of *p*-nitrophenol shows  $\lambda_{\text{max}}$  313 nm but on addition of dilute NaOH to the solution, the  $\lambda_{\text{max}}$  is shifted to 400 nm.

(b) Explain why A gives immediate precipitation of AgBr on aqueous ethanolic  $\text{AgNO}_3$  solution but B does not response even in boiling condition.



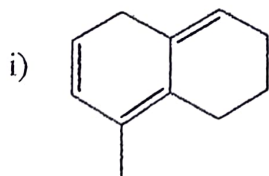
(c) Predict the product with a reasonable mechanism: (any one)



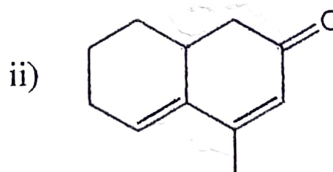
(d) State Lambert-Beer's law of absorption of light and hence prove:  $A = \epsilon cl$  where  $A$  = absorbance,  $\epsilon$  = molar extinction co-efficient,  $c$  = molar concentration,  $l$  = path length

OR

(e) Calculate the  $\lambda_{\text{max}}$  in nm each of the following compounds.



and



$$[(1\frac{1}{2} \times 2) + 2 + 2 + 3]$$

2. (a) Discuss, with examples, two classifications of the essential elements in biology based on their concentrations and based on their types of function.

(b) **Answer any two**

- (i) Give the factors which determine the essentiality.  
(ii) Write down the structure of chelating agents that are used for the removal of toxicity of any two of the following:  
copper,  $\text{CH}_3\text{Hg}^+$  and iron.  
(iii) Discuss the basic Principles of MRI technology and draw a structure of an MRI contrast agent.  
(iv) What are the essential criteria that a radioisotope must satisfy to be considered for the radiotherapeutic use? Give examples one each of radionucleotide widely used for diagnostic and therapeutic purposes.

[4+[(3×2)]]

3. (a) For the given first-order opposing reaction,  $A \xrightleftharpoons[k_{-1}]{k_1} B$ , determine the concentration of the reactant and product with time (considering the reactant is only present at initial condition). What do you expect for the above scheme when  $k_1 \gg k_{-1}$ ? Justify.

(b) For the formation of phosgene ( $\text{COCl}_2$ ) write down the probable steps for the reactions and obtain the rate expression for these processes.

(c) For an enzyme-substrate kinetics model, what information do you obtain from the expression of the Michaelis-Menten constant ( $K_M$ )?

[4+4+2]