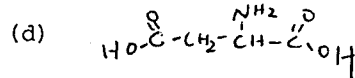
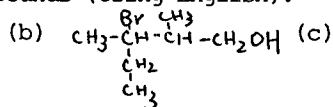
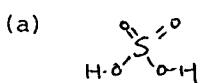
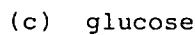
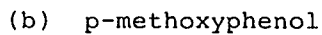
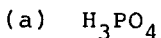


1. Name the following compounds (Using English). (8%)

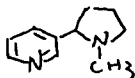


2. Draw the structures of the following compounds. (6%)



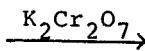
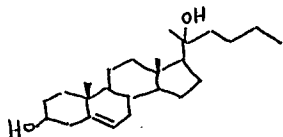
3. Physiological saline solution has a concentration of 0.9% (w/w) NaCl. What would happen, crenation or hemolysis, if a red blood cell was placed in 0.5% (w/w) NaCl solution? (3%)

4. Give the protonated form of nicotine when 1 eq. of acid is added. (3%)



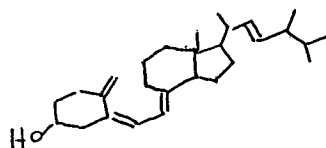
5. Although CO is a well-known compound, SiO doesn't exist under ordinary condition. Explain. (3%)

6. Predict the major product of the reaction:



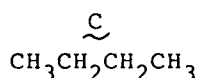
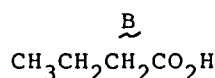
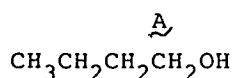
(3%)

7. The structure of Vitamin D<sub>2</sub> is as follows:



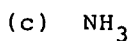
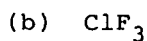
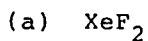
Put an asterisk (\*) by each of the chiral carbons in this structure. (3%)

8. Give the following compounds in their order of increasing solubility in water. (3%)



(3%)

9. Give the molecular shapes of the following molecules. (3%)



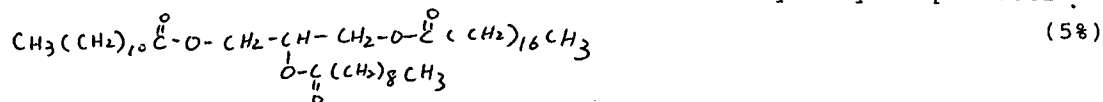
10. Describe J. J. Thomson's experiment for determining the charge to mass (e/m) ratio of electron. (3%)

11. Write the structures of the dipeptide that could be hydrolyzed to give alanine ( $\text{CH}_3\text{CHNH}_2\text{COOH}$ ) and phenylalanine. (5%)

12. Tritium, T, is a  $\beta^-$  emitter ( $t_{1/2} = 12.26$  yr). What is the activity in Ci of a 0.82 ml sample of tritium gas ( $\text{T}_2$ ) at 25 °C and 0.010 atm? (5%)

13. Describe how the molecular orbital (MO) theory explain the bonding and magnetic properties in the oxygen molecule. (5%)
14. Explain why octahedral cobalt (II) complexes are easily oxidized to cobalt (III) complexes. (Using Crystal Field Theory) (5%)
15. Iodine-123 ( $t_{1/2} = 13.3$  hours) decays by electron capture and gamma radiation. However iodine-131 ( $t_{1/2} = 8$  days) emits both beta particles and gamma radiation
- (a) Write the equation for the decay of iodine-123. (2%)
- (b) Why do these properties make iodine-123 better than iodine-131 for diagnostic work in assessing thyroid function? (3%)

16. The digestion of fats and oils involves the complete hydrolysis of molecules such as the following. What are the structures of its hydrolyzed products? (5%)

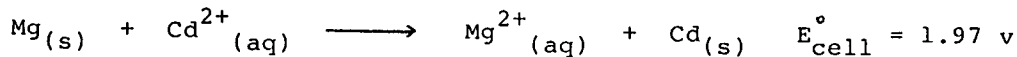


17. An exothermic, enzyme-catalyzed reaction carried out in aqueous solution with the mechanism:
- |            |   |            |                                     |
|------------|---|------------|-------------------------------------|
| S + E      | → | ES complex | $\Delta H = 4200$ Kcal/mol          |
| ES complex | → | EP complex | $\Delta H = -9000$ Kcal/mol         |
|            |   |            | $\Delta G^\ddagger = 6100$ Kcal/mol |
| EP complex | → | E + P      | $\Delta H = 1200$ Kcal/mol          |

Where S, E and P are substrate, enzyme and product respectively.

- (a) Draw the potential energy profile for this reaction. (3%)
- (b) How much is the activation energy for the backward reaction? (2%)
18. Sugar solution, with concentration  $2.5 \text{ gdm}^{-3}$ , gave an osmotic pressure of  $8.3 \times 10^{-4}$  atm at  $25^\circ\text{C}$ . Calculate the relative molecular mass of the solute. (5%)

19. A cell was set up having the following reaction:



The magnesium electrode was dipping into a 1.00 M solution of  $\text{MgSO}_4$  and the Cadmium was dipping into a solution of unknown  $\text{Cd}^{2+}$  concentration. The potential of the cell was measured to be 1.67 v. What was the concentration of  $\text{Cd}^{2+}$  solution? (5%)

20. A biochemist needs 750 ml of acetic acid-acetate buffer with  $\text{pH} = 5.00$ .<sup>(a)</sup> How many grams of sodium acetate dihydrate would have to be dissolved if the buffer is to be 0.30 M in acetic acid ( $\text{CH}_3\text{COOH}$   $K_a = 1.8 \times 10^{-5}$ )? (5%)

(b) What is the function of buffer solution. (2%) ( $N_A = 23$ )

21. The percentage of zinc in an ore was estimated as follows: 3.20 g of the ore, P, was boiled with excess hydrochloric acid and filtered. To the filtrate, F, excess sodium hydrogen carbonate solution was added and the white precipitate, Q, formed, filtered. Q was washed and then heated strongly. The final residue R, weight 1.25 g. (a) Write the formula of the zinc ion in the filtrate F. (b) The ionic equation for the formation of the white precipitate Q. (c) Calculate the percentage of zinc in the sample of the ore P. (10%) ( $Z_n = 65$ )