44

RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Special) Degree in Chemistry
Third Year - Semester II Examination – February/March 2019

CHE 3222 – Electronics and IT for Chemists

Time: Two (2) hours

Answer all **Four Questions**

---

1. Microsoft Excel is a spreadsheet developed by Microsoft for Windows, macOS, Android and iOS. It features calculation, graphing tools, pivot tables, and a macro programming language called Visual Basic for Applications.

   a) A user wishes to remove a spreadsheet from a workbook. Write the correct sequence of events that will do this? (10 Marks)

   b) Explain the following terms as used in MS-Excel:

      i. Wrap Text.
      ii. Function
      iii. Merge Cells
      iv. Cell Reference
      v. Workbook (50 Marks)

   c) Discuss any four advantages of electronic spreadsheets over paper spreadsheets. (25 Marks)

   d) Briefly explain how to draw newman projection of organic molecules in Chemdraw 7.0 software? (15 Marks)

2.

a)

i. Write down a short account about effective online search strategies (30 Marks)

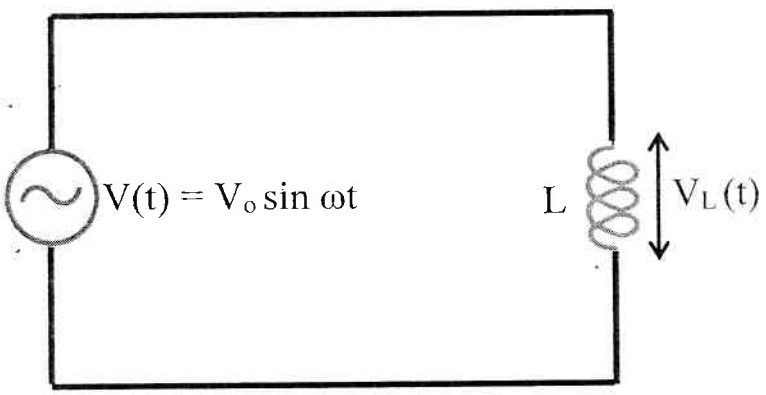
ii. What is a "subject directory"? Briefly explain with examples (20 Marks)

b) RasMol/Raswin is a visualization program created by Roger Sayle and used to display small molecules, properties and nucleic acids. Assume that you have a protein pdb file called 1m2z.pdb and it located on "C:\rasmol\" . Write a rasmol script file that open the pdb file, change background color as white, restrict the view to residues 12-25 in blue color and display the possible hydrogen bonds. (25 Marks)

c) Write rasmol commands for each of the following criteria

i. To measure the distance of the two atoms
ii. To measure the angle
iii. To measure the torsion angle
iv. To color the structure according to the secondary structure properties
v. To delete a molecules prior to loading another use the RasMol (25 Marks)

3. Consider a purely inductive circuit with an inductor connected to an AC generator as shown in the figure below.



a) By applying the modified Kirchhoff's rule for the circuit we can write

$$V(t) - V_L(t) = 0.$$

Using this obtain an equation for the instantaneous current in the inductor ($I_L(t)$).

(20 Marks)

b) What is the maximum current in the circuit (I_{RO})?

(10 Marks)

c) Plot the $V_L(t)$ and $I_L(t)$ as a function of time on the same graph.

(20 Marks)

d) Draw the phase diagram for the above circuit and discuss the phase relationship between the current and the voltage.

(20 Marks)

e) If the inductor is replaced with a **capacitor** the instantaneous current in the capacitor can be written as $I_C(t) = \omega C V_{co} \cos \omega t$, where terms have their usual meanings.

Discuss the phase relationship between the current and the voltage in the new circuit.

(20 Marks)

f) Explain the behavior of an inductor and a capacitor when connected to a **DC** source.

(10 Marks)

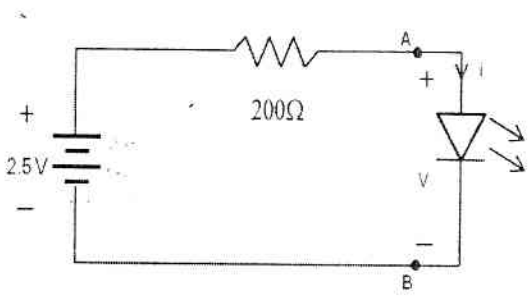
4. Diodes are active electronic devices with p-type and n-type semiconductors.

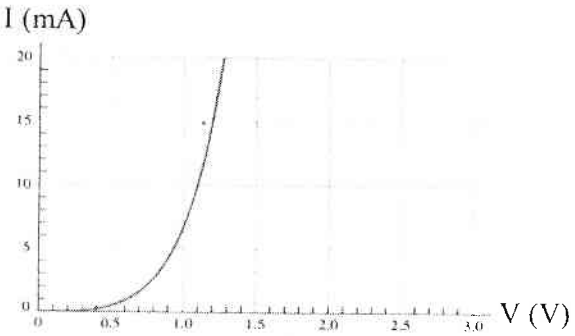
a) Draw the characteristic curve of a diode and mark forward bias region, reverse bias region, thresholds voltage and breakdown voltage on it. (20 Marks)

b) Explain why the current can flow through the depletion layer in forward bias but not in reverse bias. (20 Marks)

c) Explain why the depletion layer doesn't extend throughout the diode. (10 Marks)

d) Following diagram shows a light emitting diode (LED) connected to a 2.5 V DC voltage source through a 200 Ω resistor and its current-voltage characteristics.





i. Draw the load line for the circuit. (30 Marks)

ii. Estimate the current and voltage across the LED. (20 Marks)

-END-

Useful Equations

$$V_L = L\frac{di}{dt}$$

$$V_c = \frac{q}{C}$$