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LABORATORY ORGANISATION AND MANAGEMENT-II

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CLT-101: GOOD LABORATORY PRACTICES

LIST OF BLOCKS AND UNITS

Block 1 : Laboratory Organisation and Management–I

Unit 1 : Working in a Science Laboratory

Unit 2 : Important Components of a Science Laboratory

Unit 3 : Organisation of Laboratories: Preparation Room and Store

Unit 4 : Day-to-Day Management of the Laboratories

Block 2 : Laboratory Organisation and Management–II

Unit 5 : Stock Control and Purchase

Unit 6 : Files and Records

Unit 7 : Use of Computers in Laboratory Organisation and Management

Block 3 : Science Laboratory Safety

Unit 8 : Electricity and Gas Hazards

Unit 9 : Fire Hazards

Unit 10 : Chemical and Biological Hazards

Unit 11 : Personal Safety

Unit 12 : Accidents and First Aid

Please remember that this programme does not have any assignment component for continuous evaluation.

BLOCK 2: LABORATORY ORGANISATION AND MANAGEMENT-II

In Block 1 you have learnt about scientific temper and attitude as well as scientific reporting all of which are essential for working in a science laboratory. You have also learnt about the various components of the main science lab, preparation room and store as well as various aspects related to their organisation, maintenance and management. In this block we have discussed the methods employed for stock purchase and how to properly maintain records and files of the purchases made for the laboratory. This block also helps you become familiar with the use of a computer which will be needed for efficient organisation and management of the sciences labs.

In a laboratory, management of stock with particular emphasis on organisation of inventories is extremely important. **Unit 5** deals with procedures to be followed in the purchase of equipment/instruments, glassware, chemicals, etc. Besides this, you will learn about the Sale of Goods Act of India that lays down regulations regarding purchase of materials and record maintenance. The unit also touches upon accounting aspects of expenditure, budget, petty cash, etc.

Record keeping is another aspect of proper management of the lab. Though, it may be cumbersome, it aims at providing information about availability of stock so that laboratories operate smoothly. In **Unit 6** on 'Files and Records', we discuss various systems used for filing the purchase of equipment, chemicals, books, audio-visual aids, printed and written materials, worksheets, instruments etc. used in the lab as well as lab related correspondence and supply orders.

You may be aware that computers are gradually becoming part of every forward-looking work environment. Therefore, to provide you some training on the use of computers in organisation and management of science laboratories, in **Unit 7** we have discussed how you can work on a computerized system. You will be able to efficiently use the computer for handling and retrieving information about stocks, finance, personnel and technical data in a laboratory.

Expected Learning Outcomes

After reading this block, you should be able to:

- follow the proper procedure to purchase stock required in the laboratory as well as properly maintain the files records regarding purchase, correspondence supply order etc.; and
- use the computer for proper organisation and management of science laboratories.

STOCK CONTROL AND PURCHASE

Structure

5.1	Introduction	Inviting Quotations
	Expected Learning Outcomes	Factors Deciding Purchases
5.2	Arranging Stock	Propriety Items
	Locating and Referencing	Placing an Order
	Shelf Arrangement of Stock by Nomenclature	Value Added Tax (VAT)
5.3	Stock Control	Discounts and Bargaining
	The Two Bin System	Goods on Approval
	The Constant Cycle System	5.6 Receipt of Goods
5.4	Record Keeping	Taking Delivery
	Bin Cards	Sale of Goods Act 1930
	Order Books	Processing of Bills
	Inventory	5.7 Accounting : Records of Expenditure
	Service Register	5.8 Summary
5.5	Ordering Procedure	5.9 Terminal Questions
	Preparation of List of Requirements	5.10 Answers

5.1 INTRODUCTION

In this unit, you will study about management of stock which includes organisation of stock within the stores, inventories etc. You will study how orders are placed for purchasing equipment/instrument, glassware, chemicals etc. You will learn how the equipment to be purchased is selected. You will learn that the purchase of alcohol, poisons etc. is regulated by legislation. As a matter of fact purchasing is an important job of lab assistants or technicians because it is related to use of financial resources and effectiveness of lab functioning. It is important for a lab technician/assistant to know whether the company with which he/she is dealing with is a reliable one. Reliable companies can only supply goods of good quality at a reasonable price and without undue delay.

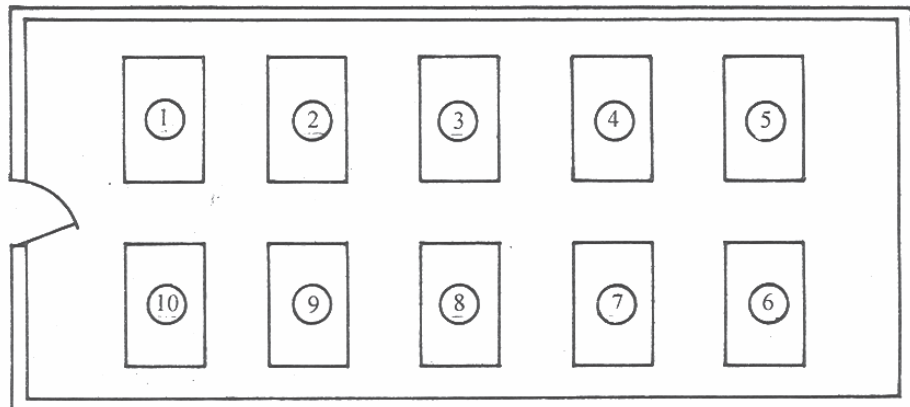
Expected Learning Outcomes

After you have read this unit you should be able to:

- ❖ state the necessity of organising stores in an orderly and systematic manner;
- ❖ describe the methods by which list of requirement of a lab can be prepared;
- ❖ outline the two methods of stock control i.e. two bin system and constant cycle system;
- ❖ explain the functions of stock control system;
- ❖ understand the use of terms such as re-order quantity and re-order levels;
- ❖ state the method of inviting quotations;
- ❖ explain the factors deciding the purchase;
- ❖ discuss the method of placement of order for purchase;
- ❖ define the terms-order books, inventory and service register;
- ❖ explain the procedure for taking delivery and processing bill;
- ❖ state the significance of Sale of Goods Act (1930);
- ❖ discuss the principles involved in accounting for major and minor expenditures;
- ❖ appreciate the necessity for record keeping in stores;
- ❖ recognise a stock control card of bin card;
- ❖ use a stock control card; and
- ❖ explain or differentiate between stock control and inventory.

5.2 ARRANGING STOCK

You would like to know the problems of organising the store and the factors affecting the running of it. A store is a place where materials and equipment are kept often for an unspecified period. Now the question arises, after having kept an item in a store, how can it be found out?



Plan

Generally, when a person is asked to place an item in store, he/she will place the item in the shelf where there is any gap. But in doing so the chances of getting it later on are not too good. Therefore, the item should be placed in a known position so that it can be located easily.

Generally, when a person is asked to place an item in store, he/she will place the item in the shelf where there is any gap. But in doing so the chances of getting it later on are not too good. Therefore, the item should be placed in a known position so that it can be located easily.

5.2.1 Locating and Referencing

Most of the stores are provided with racks of shelving units: (i) Usually a number is allocated to each rack; (ii) A letter is assigned to each shelf; and (iii) The shelves are in turn sub-divided using numbers as shown in Fig. 5.1. In practice the chosen arrangement should be such that the stores can be managed easily.

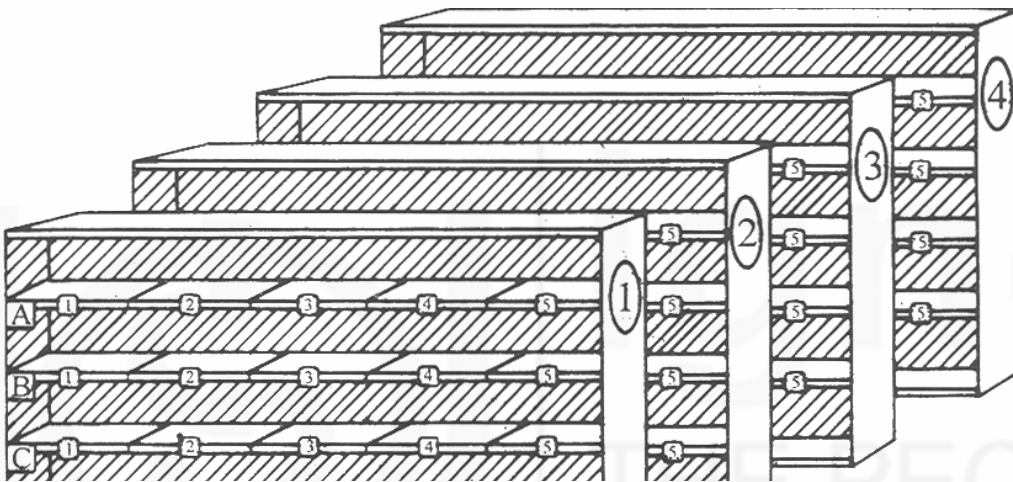


Fig. 5.1: Sub-division and referencing of shelving units.

5.2.2 Shelf Arrangement of Stock by Nomenclature

After having developed a method of classifying storage space, there arises the problem of arranging items on a shelf in a store. In practice, there are more than one ways to do it.

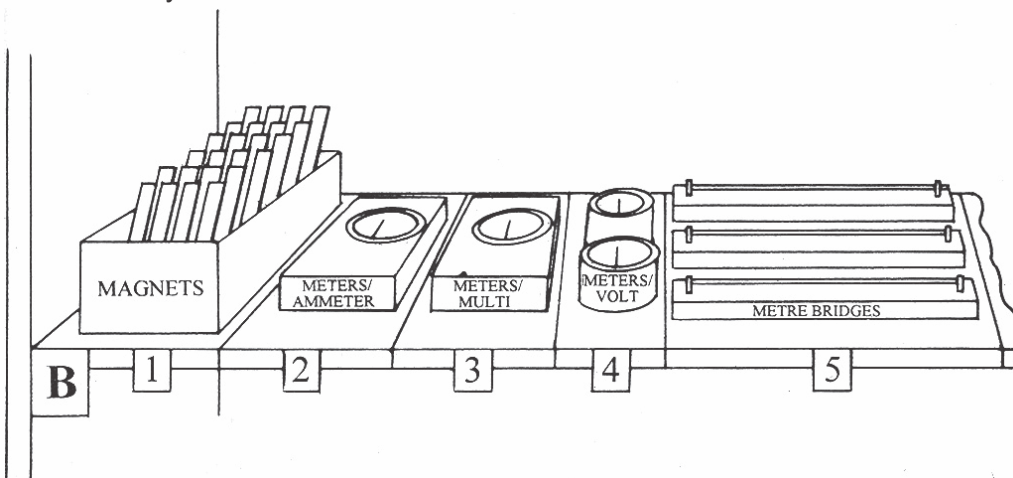


Fig. 5.2: Stock arranged alphabetically.

In Fig. 5.2 an example of a shelf from a physics store is shown to demonstrate the use of alphabetical system. This system seems to be easy to understand as it shows that various items starting with the letter 'M' are arranged in a shelf of a store. There is a possibility that this shelf is full and then problem arises as to where you will store a new item such as digital Meters? In that case the shelf needs to be rearranged and, if still space is insufficient, adjacent shelves would be occupied for arranging the new items. In a nut shell this is how items are arranged on a shelf in a store.

SAQ 1

Mr. Lallan has taken delivery of equipment for a physics lab. After moving around the store, he has managed to squeeze the items into various spaces on a shelf. Comment on whether Mr. Lallan has been logical in his approach. If not, how he could have tackled the arrangement?

5.3 STOCK CONTROL

In the previous section, you have studied how items should be arranged within a store. In this section, you will study about the supply of goods. Besides, you will deal with ordering quantities of materials. Here we will only discuss consumable items rather than the purchase of specific pieces of equipment. Factors that influence the purchase of equipment will also be discussed in section 5.5. There are two main systems used for stock control mentioned as under:

1. The two-bin system and
2. The constant cycle system.

Of above two which system is to be used depends on the circumstances and arrangements in a particular store. Both the systems or a hybrid of the two may be found useful in the store. The system chosen should be convenient to operate and be capable of being easily understood. A sophisticated system may be useless if staff does not use it. A stock control system should make it clear as to

1. How much to order
2. When to order

5.3.1 The Two Bin System

In Fig. 5.3 two bin system is shown diagrammatically. Starting with both containers **A** and **B** full, you can draw items from container **A** until it is empty. Then an order can be placed with the supplier or company to fill both containers. Container **B** should have sufficient item so that its stocks are exhausted as and when the order is delivered to the supplier or company, returning stocks to their original level in both containers.

The technical term used for the time taken to receive the order is the **lead time**. While the quantity ordered is called **re-order quantity** (ROQ) and the quantity of stock in container **B** is called the **re-order level** (ROL).

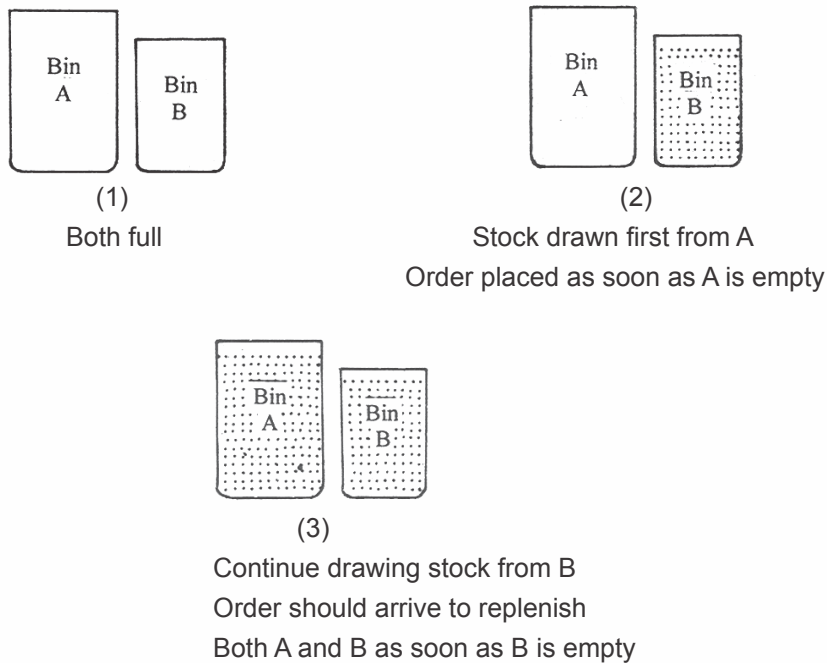


Fig. 5.3: Two Bin Stock Control System.

In practice it is not necessary to have two containers. A simple container with a mark on the side will be as ideal for liquids whereas the ROL marked on the container will be ideal for solid items such as nuts and bolts. At the same time ROL information should appear on a stock card or bin card and this should serve the purpose of reordering.

The relative size of **A** and **B** will depend on the lead time as shown in Fig. 5.3. If the lead time is short, the capacity of B will be small and vice versa. A small additional stock what you call buffer stock should be maintained to safeguard against fluctuation in both supply and demand. In this system stock itself is used to trigger the placing of an order. In the other system of stock control – the constant cycle system-time rather than stock is used to control the system.

5.3.2 The Constant Cycle System

There is a second system called the constant cycle system. This system is generally practiced in Indian laboratories. This system requires regular inspection of the store, checking of stocks and appropriate placing of orders. The frequency of checking depends on both convenience and rate of usage. According to the role of use and lead times, once again ROLs and ROQs have to be set up for each stock item. The system has the advantage of self rectification and consequently stocks are frequently checked. It could be either every Monday morning or the first Monday of the month, the third Friday of the month or it could be on any appropriate day.

Where a lot of different stock items are carried out by a technician, laboratory assistant computerised stock control systems can help him/her keep track of stock movements and purchasing. In places where specialist stock control software is not appropriate such as in small labs etc. it is possible to

use a simple spreadsheet to 'flagup' the requirement for reordering in the desired amounts. Computer stock records can easily be accessed whenever you would like to check them. However, like any other system they rely on accurate, up-to-date input of information.

The re-order quantity should be within the economical amount. This should not be too small causing orders to be placed frequently. At the same time the stock should not be excessive with ordering at long intervals. This involves money and technician/laboratory assistant should use his/her common sense or judgement or experience. For example, in some cases such as conical flasks, it could be more appropriate to make purchases for a year's supply. Whereas in other cases such as chemicals, regular order would be more appropriate.

SAQ 2

- a) The two-bin system and the constant cycle system are the two stock control systems. Which system uses the stock itself to indicate as to when an order should be placed?
 - b) Tick mark the correct answers. Which of the following functions does a stock control system provide?
 - i) A way of organizing the store
 - ii) Order quantity information
 - iii) A means of ensuring that masses of each stock item is held
 - iv) When an order should be placed
 - v) How goods should be ordered
 - vi) Training for staff to operate the system.
-

5.4 RECORD KEEPING

Whatever system is used in any lab, you will find that maintenance or records of the stock held and quantities ordered are necessary. We will discuss here the manual system. However, the computerised systems are based on similar principles.

In the Indian system record keeping is done through registers or computerised system for

- i) Consumable items
- ii) Non-consumable items (burners, burette stand)
- iii) Equipment
- iv) Hazardous materials
- v) Radiocative materials etc.

5.4.1 Bin Cards

In common practice, bin cards are used for recording information for consumable stocks held and on order. Specially printed cards can be used

for this purpose. Index cards are also quite satisfactory or else the desired information can be stored in computer. An example of a bin card is illustrated in Fig. 5.4.

Item	Beaker 500 ml		ROL	14	ROQ 30
Date	Ordered	Order No.	Received	Issued	In hand
13.5.16	Stock	Take			40
27.5.16				14	26
01.6.16				10	16
02.6.16	30	SOS 109			
04.6.16				10	06
06.6.16			30		36

Fig. 5.4: Bin card for stock control.

Bin cards can be used in the following way:

- i) You must enter the initial stock in hand either when stock-taking or when continuing into a fresh card. You should remember to enter any outstanding orders. All entries must be dated.
- ii) You must enter any quantity ordered, the order number and the date of the order.
- iii) An order for fresh supply should always be placed when the ROL is reached (two-bin system) or when performing the regular stock control check (constant cycle system).
- iv) Quantities should be ordered as per ROQ.
- v) You must enter all quantities removed (at the time they are removed) together with the date.
- vi) At the time of arrival all the new supplies must be entered.

By following the above steps, it will be easy for you to know:

- a) What stock is in hand.
- b) What has been ordered and
- c) The rate at which items are being used.

The points mentioned above are important as what it is. Find out re-order quantity (ROQ) and set the re-order level (ROL). Say for example, if an item is being used 10 per month and the delivery time is three months. Then the ROL must permit for enough stock to be held until new supplies are made, besides a little extra is required in case of delay. So you could fix the ROL of four months supply instead of three. In a similar condition with a long, delivery time, an order can be placed for a year's supply at a time. It can be borne in mind that placing an order costs money and so small orders can be avoided. After all it is a question of balance.

5.4.2 Order Books

To trace the progress of purchase orders, an order book is quite useful. In an order book order for items of equipment as well as consumables are recorded. Entries are kept of the amount of money committed with orders. This can be done by any one who controls budget for lab. In Fig. 5.5 an extract from a typical order book is illustrated for you to know how an order book is maintained. Same data can be maintained on computer system, as and when required it can be retrieved.

Date	Order No.	Supplier	Item(s)	Estimate Price	Delivery Note No.	Remarks
27.5.16	SOS09	Borosil Ltd.	200 Watch glasses	Rs. 500/-	54	Order complete
27.5.16	SOS10	BDH	30 × 250 m Beakers 5 Kg Nacl 50 g AgNO ₃ 3 × 500 ml HCl	Rs. 400/-	72	9.6.2015 Nacl returned as damaged Rest Ok

Fig. 5.5: Showing an extract from an Order Book.

The principle of recording the progress of orders is required to be done through a book. You may have special forms for purchasing or requisitioning items and copies of these forms can act as an 'Order Book'. However, this information also can be maintained on the computer.

It has to be kept in mind that official purchase order forms must be completed and authorised by a designated person. All staff should be aware of procedures adopted for purchasing.

5.4.3 Inventory

After having gone through the record keeping you should know the requirement for keeping an inventory. An inventory is a record of all items, both materials and equipment, stocked at a particular time, in a lab and a store. In other words an inventory is a list of all non-consumable items. In common practice, official inventory books are issued by the institutional authorities and, other employees are supposed to follow these practices. In the absence of an official inventory book, a loose-leaf ledger with numbered pages will be adequate for the purpose. An inventory book is shown in Fig. 5.6. Inventory of all items are done in alphabetical order.

Name of the institution:

Name of lab:

Division:

Section:

Serial No.	Details of Item	Balance on	Addition	Discard	Balance on 31.3.2016	Initial of checking officer

Fig. 5.6: The Extract of an Inventory Book.

The inventory book needs to be kept upto date all the time. Updating will take place when stock taking occurs. A complete stock taking must take place at least once in a year when a complete accounting of all items of equipment (major or minor) is made. Account of all items used or disposed of has to be made.

Inventories of non-consumable items are of considerable importance. In all institutions, it is a set practice to stamp all such items with an inventory number to help the identification of equipment in the light of inventory. While auditing, the stock auditors demand to see an inventory so that appropriate checks can be made against each item (equipment).

5.4.4 Service Register

A service register is not part of a stock control system, but we would like to mention here that much of the equipment logged in the register is kept in the store. Some equipment will require regular servicing under contract whereas other equipment will need occasional service and repairs. A record of the work carried out must be maintained and, for such purpose a service register is required. Similar entries can be made on a computer generated system for service record.

The service register contains the names of equipment, inventory numbers, serial numbers, details of servicing of repairs and the name of the person or contract who carries out-repairs. In Fig. 5.7, an example of service register is illustrated.

Name of Instrument:		Serial No. Inventory No.
Date	Service/repair details	By which agency

Fig. 5.7: Extract of a Service Register.

Now you can try some SAQs and check your answer at the end of the unit.

SAQ 3

- What information is entered on a bin card?
- Where are entries of equipment held in a lab?

5.5 ORDERING PROCEDURE

We shall discuss here various procedures adopted for ordering or placing an order towards acquiring non-consumable and consumable items for the lab.

5.5.1 Preparation of List of Requirements

For making purchases for your laboratory you are supposed to know the requirements and the prices of various items you want to buy. First of all you have to prepare a list of consumable (chemicals, soaps, detergents etc) and non-consumable (instruments/equipment items). For knowing your requirements you have to see the stock register regularly so that you are aware of your current stock position. Some time some new items are required by the persons working in the lab. For this you have to ask these persons periodically to update the list of requirements.

5.5.2 Inviting Quotations

After you have prepared the list of items required for your laboratory you work to enquire the prices of these items for placing an order towards purchase with the suppliers/firms/manufacturing agencies. You would write the various firms (not less than three) to quote the prices of the items which you want to buy from them. For doing this institutions have their own printed forms (proforma for inviting quotations). Below is given an example of a quotation form (Fig. 5.8) required for obtaining quotations of the prices of the items.

INDIRA GANDHI NATIONAL OPEN UNIVERSITY Maidan Garhi, New Delhi-110 068		
To	No.:	

_____	Date:	

Sub: IGNOU-INVITATION FOR QUOTATION FOR SUPPLY OF.....		
Dear M/s,		
Please quote your lowest rates for supply of following items:		
Sl. No.	Description of Items	Remarks
1. You are requested to attach samples of the items wherever required. Please furnish the following information also: <ol style="list-style-type: none"> a) Validity of the quotation. b) Your Sales Tax Registration No. c) Are you a manufacturer or a supplier. d) Delivery period. 		
2. The quotation in double sealed cover with superscription "Quotation for supply of" against Tender Enquiry No. should reach the and shall be received upto 3.00 p.m. on The same will be opened at 4.00 p.m. on the same day in the presence of the tenderers whomsoever are present. Late tenders will not be considered.		

3. Specifications: stores offered should strictly conform to your specifications. Deviations, if any, should be clearly indicated by tenderers in their quotation. The tenderer should also indicate the Make/Type, number of the stores offered and provide catalogues, technical literature and samples, wherever necessary alongwith the quotations. Test certificates wherever necessary should be forwarded alongwith supplies. Wherever options are called for in respect of specifications, the tenderer should induct all such options. Wherever specifically mentioned by us the tenderer could suggest changes to specifications with appropriate response for the same.
4. Corrections, if any, must be attested. All amounts shall be indicated both in words as well as in figure. Where there is a difference between amount quoted in words and figures, the amount quoted in words shall prevail.
5. If the supplies are not made within the stipulated period and the time is not extended, the supplier will be liable to pay compensation equal to one percent or such small amount of the total amount of contract as the Registrar may decide for every day that the quantity remains incomplete, provided that the entire amount of compensation shall not exceed 10% of the total amount of the contract. In addition, the Registrar reserves the right to cancel the order at the supplier's risk and cost.
6. The purchaser shall be under no obligation to accept the lowest or any tender and reserves the right of acceptance of the whole or any part of the tender or portion of the quantity offered and the tenderers shall supply the same at the rates quoted.

Yours sincerely
Deputy Registrar/Asstt. Registrar (CPU)

Fig. 5.8: An extract of the quotation format.

You would fill up the forms with the list of your requirements and post them to the firms. A definite time is given by which you want them to submit the price list of items you require because these quotations are to be placed on a fixed date before a committee called Purchase Committee competent authority. These quotations are only opened before the committee members. After opening the envelope these quotations are signed by the members of the committee. Once these quotations are signed, a comparative chart of various quotations of the prices is prepared by which you can make out which firm/supplier/agency has quoted the lowest price for a particular item. After the chart is ready, you would place it once again before the purchase committee competent authority for getting approval for making the purchase against the lowest price quoted items.

5.5.3 Factors Deciding Purchases

Before deciding what specific type of equipment needs to be purchased, various factors are taken into consideration. Common sense should be applied which equipment is most important for a particular occasion.

Factors that influence purchasing of equipment are:

- i) Cost
- ii) Duplication – availability of a similar kind of equipment in the lab.
- iii) Specifications
- iv) Quality
- v) Servicing
- vi) Availability of spares
- vii) References – experiences of others
- viii) Competition between suppliers
- ix) Training and other staff implications

For purchasing of consumable items, the factors are:

- i) Cost
- ii) Minimum order size – standard packages
- iii) Delivery time
- iv) Quality
- v) Delivery Service/collection of containers, etc.

5.5.4 Propriety Items

Propriety items means goods/equipments/instruments/chemicals/glassware that are particularly manufactured by a particular firm which has the sole propriety of the items to sell either through their approved agencies or by themselves. For making purchases of the propriety items you need not invite quotations and what you have to do you have to ask the firm which manufactures the propriety items to furnish the price of the same. This step is taken only when you want to buy a standard quality items of a firm. For example, if you want to buy an Olympus microscope for your laboratory, you have to buy it only from Ms. Darbara Singh & Co. because this is the only firm which manufactures it.

A committee is formed to facilitate, regulate and monitor the purchases of an organisation/institution/department/lab. The purchase committee members are nominated by the head of an organisation/institution/lab for the fixed tenure of 2-3 years and after the expiry of the term either the same members may be renominated or they may be replaced by the new members. There are no fixed numbers for the purchase committee. As per practice, the senior most member becomes the convenor of the meeting or as decided by the Head of an organisation.

Different functions are assigned to the committee:

1. To formalise the purchases
2. To monitor the discrepancy if any in inviting quotations

3. To sign the quotations on a specified date
4. To grant approval for the purchase

Besides the above said functions the purchase committee from time to time formulates procedures for the purchases to be made by the organisation. If some irregularities are committed the committee itself sorts out the problem or refers the matter to the notice of competent authority for its resolution.

Rectified spirit is 90% alcohol.

Alcohol/rectified spirit is a controlled item as such it is not sold in the open market. The sale of alcohol/rectified spirit is controlled by the permit issued by excise department of district/city. If you want to buy alcohol for your lab you will have to make a written request through your head of the department to the excise department.

5.5.5 Placing an Order

Procedure adopted for placing an order varies from one organisation to another. In most of the organisations the order for the supply of equipment is placed on an official order form. In many organisations the copies of orders are required for supplying information regarding purchase to different sections as follows.

- i) Original copy – to the supplier
- ii) First copy – to the accounts section
- iii) Second copy – to the lab file.

The order to be placed must contain full details of items being purchased as shown in Fig. 5.9. Besides, it must contain certain information that are legally required. For example, a limited company must give its company details. Autonomous bodies like educational institutions will have official order forms showing different details. Whatever the case may be, only an authorised person can sign an order form and this sort of form can serve as the basis for a contract.

You are supposed to know how to prepare an order form for making purchases from the supplier. While doing so you should keep following two points in your mind.

- a) You should never use 'home-made' order forms as you would make your employer legally liable.
- b) You should ensure that whoever signs order forms is an authorised signatory. It should also be ensured that the form is checked occasionally.

You have to keep in mind that importing goods from overseas might be a complicated and time consuming process and it will be better to utilise the services of an agency which deals with importing goods.

A model format of order form is given on the next page.

INDIRA GANDHI NATIONAL OPEN UNIVERSITY
Maidan Garhi, New Delhi-110068

P.O. No.....

Dated.....

DVN Code.....

To,

Sub: Supply of goods

Dear M/s,

With reference to your quotation No. dated
 please supply the following articles on or before

S. No.	Description/Specification	Qty.	Rate	Cost
1	2	3	4	5

The above purchase is subjected to the following terms and conditions:

TERMS AND CONDITIONS

1. The material may be supplied to the, New Delhi by All correspondence regarding the order should be addressed to the consignee.
2. 100% payment will be made when the material/goods have been received by the University and have been inspected by its inspection unit and accepted by it.

OR

90% payment will be made through Punjab National Bank, New Delhi, if the documents are received through a bank.

3. Balance payment of 10% will be made on receipt of material/goods and their inspection by the University inspection Unit. This payment is subject to the acceptance of goods by the inspection Unit.
4. The goods which are not according to specification and are thus not accepted shall be lifted by the Supplier at his own cost.
5. If the supplies are not made within the stipulated period and the time is not extended the supplier will be liable to pay compensation equal to one percent or such small amount of the total amount of contract as the Registrar may decide for every day that the quantity remains incomplete, provided that the entire amount of compensation shall not exceed 10% of the total amount of contract. In addition, the Registrar/Head of the institution reserves the right to cancel the order at the supplier's risk and cost.
6. In case the supplier backs out of his contract, his earnest money if any, shall be forfeited and such other action will be taken as deemed proper.

7. The supply shall be increased/decreased within day of placement of this supply order.
8. The bill in triplicate may be sent to the Registrar, Indira Gandhi National Open University, New Delhi/Academic Institution, for payment.
9. An extra amount as Sales Tax/Excise Duty will be paid as applicable under Government Rules if so quoted by the supplier/contractor in the tender/quotation subject to the certificate in the bill of costs as follow. Certified that the Sales Tax/Excise duty charges in this bill is leviable under Government Rules.
10. Other material should be packed in a strong case so as to avoid any damage, theft or pilferage in transit, in which case the responsibility shall be that of the supplier.
11. Other terms and conditions are as per terms and conditions specified in the notice inviting tenders.
12. All disparities/disputes arising out of the order are subject to the jurisdiction of courts at Delhi.
13. Every packing case should contain a packing note mentioning details of the material packed with complete reference to our order. Our address must be superscribed on the side of the packages.
14. The claim for freight charges if admissible in terms of your quotation should be made in your bill.
15. Prices are fixed and are not subject to any variation.

Yours sincerely,

C.C.: Finance & Accounts Div.
 Indentor
 PS to VC
 MF
 OF
 Deputy Registrar/Asstt. Registrar (CPU) / Head of the Institution

Fig. 5.9: An extract official order for purchase.

5.5.6 Value Added Tax (VAT)

Educational and research establishments and some companies are zero rated for value added tax (VAT). Therefore, these establishments can reclaim any VAT if they have been charged either for goods or service. It is essential to find out whether VAT has been charged. On checking if it is found that VAT has been charged, then the finance and accounts office of your establishment should be informed as it will be their duty to reclaim VAT. For your information VAT is paid to custom and excise departments and reclaimed from them on quaterly basis.

5.5.7 Discounts and Bargaining

While making purchases, the job of a lab assistant or technician is to obtain the best value for the money. Bargaining with the suppliers is one such way through which it is possible to buy goods at a lower price. On limited occasions, bargaining and playing one supplier against another is an exercise that can be practiced. Certainly one can not bargain everytime when a purchase is made. Usually one can bargain when a supplier is new or if another supplier is found who charges less.

Quite often suppliers offer 15% an educational discount typically 5 –15% to educational and research institutions. Sometimes, suppliers offer large discounts e.g, on supplying consumables or service contracts. If you work in an educational laboratory you can enquire whether an educational discount is available. By doing so there is everything to be gained.

5.5.8 Goods on Approval

There is a keen competition amongst some suppliers and in some sectors of the market e.g., the market of microcomputer. A request to a supplier to retain equipment on approval to judge its performance can often be arranged. Many suppliers will be willing to do so. In some cases it is good to avail of this facility.

SAQ 4

- a) Discuss briefly as to why it is necessary to use both official order forms and an order book.
 - b) List the factors you would consider before placing an order for equipment costing rupees 1 lakh.
-

5.6 RECEIPT OF GOODS

In section 5.5, we have discussed the purchase of goods and the various problems related to it. Now we will discuss the procedure to be adopted when goods arrive from a supplier.

5.6.1 Taking Delivery

After the supplies have been made, you have to carry out the following jobs:

- 1) Check the condition of all items to see that none of them are damaged.
- 2) Check the items received against the delivery note. If any difference is found, note it.
- 3) Check the list of goods on the delivery note against your order to ensure that the goods received have actually been ordered.
- 4) Enter details of receipts in the order book or purchase records.
- 5) Inform the supplier against any discrepancies or damages. Keep in mind that there is often a time limit for notifying deficiencies to the supplier. This time limit is in fact printed on the delivery note.

- 6) Therefore, endorse the delivery note with the condition and accuracy of the goods received and then, send it to the Accounts department to make for payment, and
- 7) Repack the goods and place them in store in bulk, if not required for immediate use.

5.6.2 Sale of Goods Act 1930

The present Indian Act is entitled as the Sale of Goods Act, 1930. This Act contains all rules and regulations relating to various types of contracts of sale of goods.

A brief guide to the Act is given below:

i) Specific goods in a deliverable state

Where there is an unconditional contract for the sale of specific goods and the goods are in deliverable state, the property in the goods passes to the buyers when the contract is made. You have to remember that it is immaterial whether the time of payment of the price or the time of delivery of goods or both, are postponed.

Another point to be noted in this section is that the goods must be in a deliverable state. Now the question arises as to when goods can be said to be in a deliverable state. According to section 2(3) of the Act, goods are said to be in a deliverable state when they are in such state that the buyer would, under the contract, be bound to take delivery of them. In other words the goods are in such a condition that the buyer can take away the goods then and there.

ii) Specific goods not in a deliverable state

Another situation may arise when goods are not in a deliverable state at the time of making the contract. In that case the seller has to do something to the goods to put them in a deliverable state. For example, cutting the goods, or packing or sealing or leading or filling them in a container etc.

iii) If the goods are bought by description

The goods supplied must correspond to the description of the buyer. If goods are bought on the strength of a specification, they must correspond to the specification of the buyer. If you find that supplied goods do not correspond to your specification consult the suppliers and then act as per their advice.

iv) If the goods are sold by sample

Supplied goods must correspond to the sample shown by the supplier.

v) If on delivery there is not sufficient time for examination

A reasonable time must be given by the seller to the buyer for examination of the goods as there is not much time for examination available to the buyer at the time of delivery.

vi) If goods not ordered are received

If goods that have not been ordered are received, you can either reject them or accept them. If such goods are accepted, they must be paid for. While rejection means informing the supplier that the goods were not ordered or wanted. There is no need to actually return them and it is upto the seller to collect them. In a nut shell if you order something, you have the right to expect the goods that are delivered to you to meet the specification of the ordered items.

5.6.3 Processing of Bills

After taking the delivery of the items supplied by the firms, entries of supplied items are made in the stock/inventory register. Once the proper entries have been made the bills are processed for payment. In processing the bill you will tick mark only those items which have been supplied as per your specifications as you would like to make payment to the firm only for the ordered items.

Delete the prices of those items not desired or supplied as per your specifications. Write on the bill that the bill is passed for payment for this much amount of money and write on the bill the page number of stock/inventory book on which the supplied items have been entered. Then this bill will be countersigned by the controlling authority. He may be Head of lab/department/school. After the bill is duly signed by the controlling authority, it is sent to the Finance Division of the institution for payment.

5.7 ACCOUNTING : RECORDS OF EXPENDITURE

As a lab assistant technician you may not be involved in the exercise of obtaining funds by which your department or lab runs. You will definitely be involved in looking after the funds being spent. This process can loosely be described as accounting; though a proper accountant would apply more rigorous methods in controlling the flow of funds and also in ensuring value for money.

Money is usually obtained and allocated under various heads. These heads include such items as minor equipment, furniture, consumables, and a separate account has to be maintained for each head. In most organisations major items of equipment are obtained by a different process whereby funds are requested for the purchase of a specific piece of equipment.

Of the various heads under which money is accountable there are two more important heads – consumable and minor equipment. For example, in some schools, there is little freedom to make orders for items from anywhere from a except local authority such as Central Store or Super Market. In such cases accounting becomes easier as prices will be known and can be entered on an appropriate form or book. However, situation remains the same whether the items are purchased either through central stores or on open market. In the open market it is common practice to obtain an 'estimate' or and approximate idea of the price of an item.

Now we will discuss a practical approach to the problem of controlling expenditure.

In Fig. 5.10 you can see an extract of some accounts towards expenditure incurred towards minor technical equipment. You will notice from top of the accounts that they refer to one particular financial year 2015/16. The account applies to minor technical equipment for which the money allocated is Rs. 400000/-.

In first two columns the date of the order and the order number are taken straight from the order form. Whereas in the 3rd column just the name of the item that has been ordered, is recorded. No further details of the items are required as these information are already available on the copy of order form. These details may also find entries in the order book.

Next there are four columns of figures. You can consider the first lists of prices of the items obtained, say over the phone. The price may not include account of any recent price rise or postage and package. In the second column a running total of expenditure is calculated as per the estimate at the time of the latest order. So these first two columns refer to what you visualise about the situation based on intelligent guess work, telephone calls and so on.

Gargi College New Delhi				Science Department		
Financial Year:		Expenditure Head – Minor technical		Amount Allocated:		
2015/16		Equipment		Rs. 4,00,000.00		
Date	Order No.	Items	Est. Price	Est. Expenditure	Invoice Price	Actual Expenditure
10.4.15	101	Spectrophotometer	20,000	20,000	20,000	20,000
13.4.15	102	Colorimeter	6,000	6,000	6,000	6,000
17.4.15	103	pH meter	5,000	5,000	5,000	5,000
19.4.15	104	Glassware	5,000	5,000	5,000	5,000
4.2.16	105	Skull/bones	200	200	200	200

Fig. 5.10: Accounting for a lab/Deptt funds.

The last two columns are based on the actual costs that are shown on the invoices received from the suppliers. These two columns are similar to the previous columns but they can only be completed when you know the exact invoiced costs of items. You will not be able to keep these columns up-to-date as you keep yourself waiting until invoices arrive. So the best what you can do you mention actual expenditure with pencil and await further information.

Invoices are presented before the end of March; otherwise payment may not be made to suppliers. Once all the invoices have arrived, the accounts can be totalled, handed over to the Head of the department school and, forwarded to the concerned accounts section for making payment to the parties. You will have to explain any underspent or overspent amount.

Petty Cash/Imprest Money

In the preceding para we have discussed problems related to accounting for

Petty cash, in some offices is called imprest money.

major expenditure within a department. Petty cash as the name itself suggests is concerned with minor expenditure. However, keeping of records is quite important as all money must be accounted for.

Generally with petty cash, small local purchases are made in order to keep the lab running smoothly. Receipts of the purchases made must be obtained in all cases as these are proof of purchase. Formal orders are not required. A receipt should also be given when money is obtained from accounts section to be used as petty cash. This receipt indicates that money has been issued to the keeper of the petty cash.

The most frequently used system of accounting is the 'imprest method', whereby a fixed float is available from which purchases are made from time to time. The maximum value of the float is called the imprest.

In Fig. 5.11 an imprest system for petty cash is shown and in this case imprest is Rs. 400.00. By the end of the month a total of 250.00 has been spent leaving a balance of Rs. 150.00, which is judged to be adequate for the time being. But by the end of second week of the next month a further Rs. 100.00 has been spent leaving a balance of only Rs. 50.00. At this stage Rs. 350.00 is obtained to make the balance to the imprest amounting Rs. 400.00 and so on.

It should be borne in mind that petty cash should not be overused. They should only be used for minor purchases made and all other expenditure should be through the main accounts.

End of month	Description	Expenditure	Imprest	Balance
1.4.2016			Rs. 400.00	Rs. 400.00
5.4.2016	Postage Stamp	100.00		
10.4.2016	Paper (for typing)	50.00		
16.4.2016	Carbon paper	100.00		
End of month		Sub Total of April		Rs. 250.00
3.5.2016	Screw Driver	50.00		
8.5.2016	Postage Stamp	50.00	Rs. 250.00	
10.5.2016	Imprest	100.00		
21.5.2016	Soldering Iron	30.00		Rs. 400.00
29.5.2016	Nails	20.00		
End of month		Sub Total of May=Rs. 50.00		Rs. 350.00

Fig. 5.11: Shows an example of a petty cash account.

SAQ 5

- How far is bargaining with a supplier justifiable? Support your answer with reasons.
- Why is petty cash dealt with in a simplified accounting form as compared to the one used for other expenditure?

You can check your answer with the one given at the end of the unit.

5.8 SUMMARY

Let us summarise what you have learnt so far :

- You have studied the organisation of stock within the store, maintenance of inventories etc.
- The problems of organising the store and the factors affecting the running of it.
- The procedure related to supply of goods, ordering quantities of materials; two major systems used for stock control : (1) the two bin system and (2) the constant cycle system.
- The maintenance of records of stock held and quantities ordered; two main systems i.e. manual systems and computerised systems.
- The factors influencing purchase of equipment.
- The procedures adopted for placing an order to the supplier.
- The procedures to be adopted when goods arrive from a supplier.
- The process involved in looking after the funds being spent.

5.9 TERMINAL QUESTIONS

1. What are conditions under which import duty is likely to be waived on imported items?
2. What is it not always possible to state precisely how much money has been spent under a particular budget head? How should you attempt to make allowance for this?

5.10 ANSWERS

Self-Assessment Questions

1. Mr. Lallan's approach does not seem to be systematic. A much more organised and systematic approach is required to locate where specific items have been stored.
2. a) The two-bin system uses the stock to indicate as to when an order should be placed.
b) A stock control system tells you (2) how much to order and (4) when to place an order.
3. a) Bin cards are used for recording information on stocks held and on order.
b) Inventory is used for recording the list of equipment purchased.
4. a) Order forms are used for placing an order. An order book is used to maintain a record of what orders have been placed and their progress and, to provide an idea of how much money is to be spent towards orders placed. Official order forms are necessary because they help to reduce fraud by ensuring that only authorised people can place an order for purchases.

- b) The following factors are to be considered: cost, duplication, specification, reliability, servicing, availability of spares, references, competition between suppliers, training and other staff implications.
5. a) Yes, on occasion, It is not a process what you can always undertake. Having done it once with a supplier, this is likely to set the price for the time being. (Sometimes some sort of relationship with supplier is also required to bargain)
- b) Petty cash is only for minor amount of purchases. So a simplified system can be used.

Terminal Questions

1. Import duty may be waived on items imported for use in education and research provided similar equipment is not manufactured in India.
2. The price may not be exact for a number of reasons such as VAT has not been included, allowances have not been made for discounts.
No allowance for VAT should be made, because VAT can be reclaimed. You can, however, make adjustments for discounts.



UNIT 6

FILES AND RECORDS

Structure

- | | |
|--|---------------------------------------|
| 6.1 Introduction | 6.5 Special Files |
| Expected Learning Outcomes | Safety File |
| 6.2 Sources of Information | Technician's File |
| Classifying Secondary and Tertiary Information Sources | 6.6 Records |
| Sources of Information in the Lab or Preparation Room | 6.7 Stock Records |
| 6.3 Filing Systems | 6.8 Location |
| Aims of Filing System | 6.9 Recording Loans |
| Classification of Files | 6.10 Recording Stock used and Misused |
| Filing Methods | Record of Use of Listed Poisons |
| Filing System for Equipments | Record of Use of Alcohol |
| Filing System for Chemicals | Record of Breakages |
| 6.4 Filing of Printed and Written Material | 6.11 Information about Equipment |
| Worksheet/Instructions for Experiments | Serial Numbers |
| Technical Communications | Maintenance Record |
| Instructions for use of Apparatus | Electrical Checks |
| Correspondence | 6.12 Miscellaneous Records |
| Orders | Accident/Incident Record |
| Requests for Equipments | Orders and Accounts |
| | Key to Unknown |
| | 6.13 Summary |
| | 6.14 Terminal Questions |
| | 6.15 Answers |

6.1 INTRODUCTION

In modern days an office acts as information centre. It is a place where information is collected, processed, stored and made available for the conduct of various activities of an organisation. In these modern times there

is lot of written communication which generates large amount of papers. Thus the filing, its system and methods become exceedingly important.

Filing constitutes the core of record keeping. It serves as important aid to office personnel because we cannot rely on memory alone. In order to run the laboratory work we all need to refer some person or to a variety of publications and papers. The problem is where to go and find the proper papers. The correct and efficient filing is very valuable for the proper functioning of laboratory. In this unit you will study about various filing systems, their function, and types of records, filing procedure, and various way of cataloguing and record maintenance.

These records become handy in proper working and especially in case of emergency. If you are keeping the records of instruments, chemicals, glassware, instructions given from time to time, etc., you will be able to do work and monitor it in a better way. These records can be kept in files, record books and computer files. In this unit you are going to study various filing system, types of records and how the records are kept.

Expected Learning Outcomes

After studying this unit, you will be able to:

- ❖ appreciate the importance of filing and filing systems;
- ❖ depict suitable system for filing stock and paperwork by using some examples;
- ❖ list ways of cataloguing;
- ❖ state what records should be kept and what information should be recorded (including abnormal incidents); and
- ❖ maintain a record of breakages and report them periodically to the persons concerned.

6.2 SOURCES OF INFORMATION

In the last few years there has been a vast growth in the development of information systems and the generation of information. Along with this development comes the real problem of finding out relevant information quickly and easily. This problem can be solved by proper filing system and record keeping.

In general there are three principal sources of scientific information:

1. Original papers published in academic journals (primary sources).
2. Compilation of data on specific subjects (secondary sources)
3. Text books (tertiary sources)

6.2.1 Classifying Secondary and Tertiary Information Sources

Secondary and tertiary sources are usually in the form of books or recorded materials which are commonly stored in libraries. In an attempt

to overcome the problem of locating information, libraries have adopted a standard method of arranging publications so that information can be readily found. An example of a standard system is the Dewey Decimal Classification System. This consists of assigning an arbitrary number to broad areas of human knowledge. These large areas are then subdivided again and again so that the more subdivisions there are; the more precise is the definition of the subject.

In the Dewey Decimal System, the number 5 is ascribed to scientific subjects. The system is then progressively sub-divided as shown in Fig. 6.1.

SCIENTIFIC (Area 5)

51	52	53	54	55	56	57	58	59				
			541	542	543	544	545	546	547	548	549	
			541.1	541.2	541.3	541.4	541.5	541.6	541.7			

Fig. 6.1: Dewey Decimal System for Science.

Books in libraries, therefore, are arranged in a numerical order. However, the great disadvantage is that the Dewey Classification number is assigned by a librarian who may be guided by the title rather than the content and thus assign an inappropriate number. If this happens it can be very difficult to find a particular book.

The Dewey Decimal System could be applied to some types of equipment classification. For example, a large collection of microscopes could be effectively indexed using the Dewey Decimal System.

6.2.2 Sources of Information in the Lab or Preparation Room

Every lab ought to contain two or three reference books of information for everyday use, for example:

- **Essentials of Plant Techniques, Scientific Publishing Jodhpur, India**

There are other sources of information which are valuable and might not be found in the library such as trade catalogues, e.g., the Catalogue from various manufacturer and exporters, technical specifications, articles from periodicals of interest to technicians such as Laboratory News or Laboratory Digest, and so on. Again some method of cataloguing and accessing these must be devised.

The following is a typical list of sources of information:

1. Reference books
2. Catalogues
3. Card indexes
4. Computer databases
5. Personal experience

As you can see, information sources are various and widespread, and

to locate precisely the material you require can be a formidable task without expert advice. To simplify matters, most sources of information have a reference/index system, which enable large quantities of information to be examined quite quickly. The aim of constructing such an indexing system is to enable relevant information to be stored and accessed quickly.

Essentially, the lab incharge of each lab must decide on the sources of information that are required and then stock and store these, if these are appropriate. (Some reference books are expensive and it may make economic sense to use local library for these.)

File Information located forever. Not more than 200 pages should be accommodated in one file. Always use tag for filing papers. Always number your file papers.

6.3 FILING SYSTEMS

Any laboratory accumulates a vast amount of material that has to be arranged in such a way that any particular item can be found readily and easily. The need for an efficient system of information retrieval is often overlooked and neglected. Many people cannot see the need for an easily usable system.

Let us consider some of the information that accumulates in a lab in order to assess the complexity of the problem:

- 1) Correspondence and related materials
- 2) Literature references
- 3) Indexes for slide and film libraries, samples, general stock, etc.
- 4) Manufacturers' catalogues and specifications

None of this information can be ignored if it is required in a lab's work. At some stage someone will need to gain access to the material quickly and easily. The test is 'is it relevant to the lab's work?' If it is, it is worth keeping. If not, it can be thrown away. Filing is often a job to be delegated to the most junior member of staff because it is a learning experience.

6.3.1 Aims of Filing System

A filing system aims to keep information in its proper place so that it can be easily retrieved when needed. Bearing this in mind, it might be useful to outline what makes for a good filing system:

- a) It should be clear and easily understood.
- b) It should be accessible.
- c) It should be adaptable and easily updated.

All of these are made easier by some kind of indexing of each group of items by some kind of "key" e.g. alphabetical or numerical ordering, or colour coding.

6.3.2 Classification of Files

You can classify the files in different ways. Some important ways are given below:

- i) **Alphabetical classification:** This is the simplest method of classification in which files are arranged strictly in alphabetical orders.
- ii) **Numerical classification:** In this method you can give supplier or subject

a number and all the papers are placed in one folder bearing distinctive number as allotted. The folders are arranged in cabinet in numerical sequence and guide cards are used to divide them into suitable groups of 10 or 20. The numerical filing may be combined with alphabetical system e.g. A-1, A-2, A-3 and so on and files are kept in this order. It is called 'Alpha-numerical filing' which is more flexible than the alphabetical or numerical filing.

- iii) **Chronological classification:** In this method the papers are filed date wise in a sequence as and when correspondence has taken place. It is suitable for filing correspondence.
- iv) **Subject wise classification:** Under this method, records are classified according to subject matters of papers. For example there may be one folder for the main subject Botany, Chemistry, Physics, Electronics, Zoology, and separate sub folders having lower plant, higher plants, physical chemistry, organic chemistry, inorganic chemistry etc.

6.3.3 Filing Methods

The conventional methods of filing (like metal holders, bound or guard books, box filing) are not much of use. Now-a-days there are (1) Horizontal filing (2) Vertical filing.

Horizontal filing: In this Fig. 6.2 method papers are placed in folders and folders are kept in horizontal position. Folders or files are kept one upon the other and the papers are inserted in the order of date on which received or dispatched. Naturally, the latest papers are found at the top. An index prepared allotting number to the files.

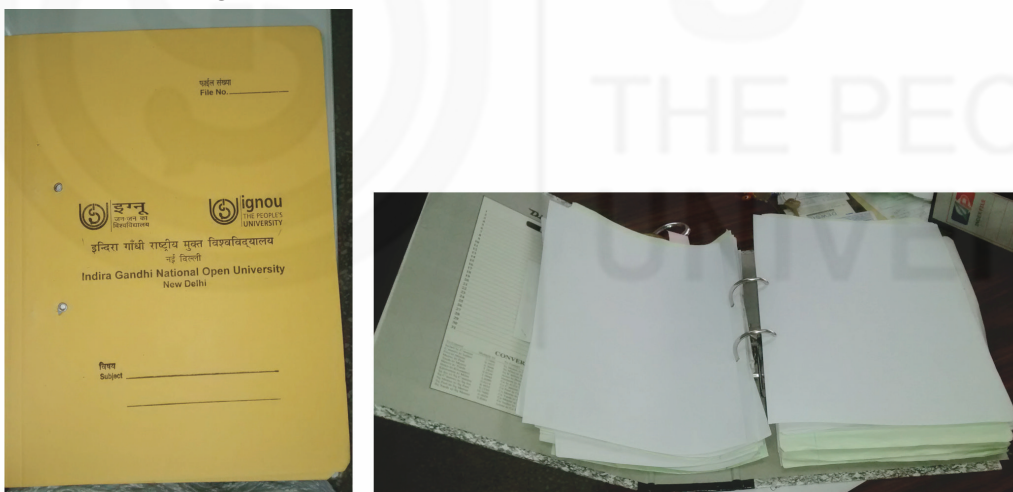


Fig. 6.2: (a) Flat file, (b) Arch lever file.

Vertical filing: Under this method all the papers, folders and files are kept in a vertical or standing upright positions. We will show you some cabinet required in vertical filing by figure only Fig. 6.3.

6.3.4 Filing System for Equipments

You may have thought that our description of the storage of apparatus and equipment as a filing system was inappropriate. Yet this is not entirely far-fetched. For example, retrieval of specific items is aided by

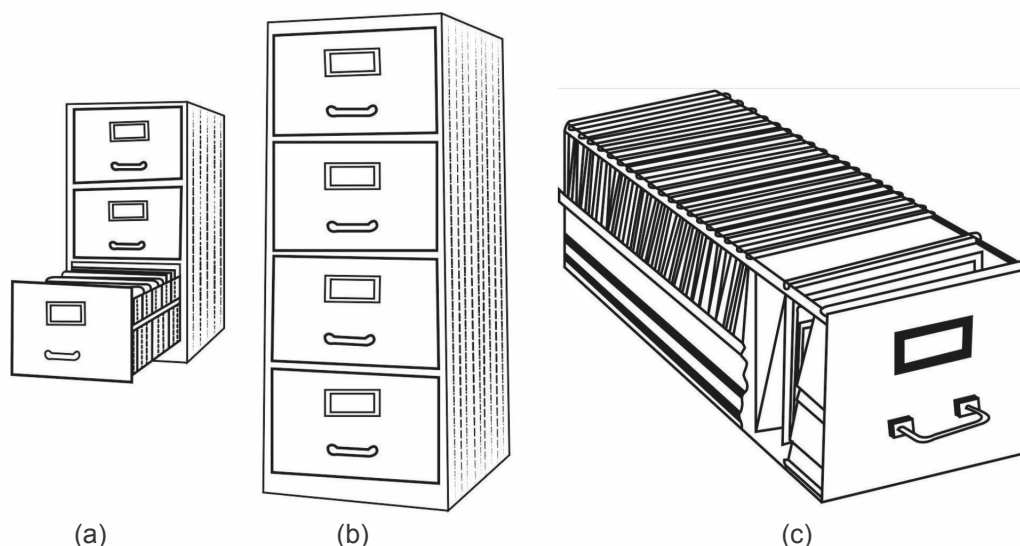


Fig. 6.3: (a) Vertical filing cabinets; (b) Cabinet with drawer and folders; (c) Folders made of hard paper board.

the clear numbering and labelling of cupboards, drawers, shelves, etc. Plastic embossing tape can be used but if vandalism is a problem, white, plastic drafting or artists' tape (which can be written on with spirit-based felt-tip pen) is very useful. Using a stencil to paint the name of the contents of the cupboard, etc. on the door can create problems if you decide to move things round!

If you find that glassware and other small pieces of apparatus tend to “wander” from lab to lab, you can “colour-code” each lab’s contents using a spot of paint of the appropriate colour on each item in a lab (selecting a site where the paint will not be burnt off during heating).

It may also be helpful to put a list of the common pieces of apparatus and their locations (using the number of the cupboard, etc.) in a prominent place in each lab, e.g. on the notice-board. This prevents a lot of searching through cupboards, etc.

6.3.5 Filing System for Chemicals

You need to be aware of which chemicals are in use, where they are being used and where they are kept. However, you might hesitate to make it too easy for other people to find them.

If you have reagents and other solutions in the lab, these can be said to be “filed” if they are arranged in a specific order (It is easier to see if any bottles are missing if you have a set sequence in which they are arranged). There are several ways in which solutions can be arranged, e.g. alphabetical order, sets for particular experiments (such as staining slides or food tests), in order of oxidizing power (for bench acids), in order of strength (for bench alkalis), etc. If you use plastic embossing tape for “permanent” labels, you have the opportunity to incorporate a system of colour-coding.

SAQ 1

- The Dewey Decimal System is a means of classification. Can you briefly describe how it is operated?
 - Besides the system described in (a), what other classification system can be used?
 - What sources of information do you think should be held in the lab/prep. room?
 - Can you think of three ways by which locating a particular chemical could be made easier?
-

6.4 FILING OF PRINTED AND WRITTEN MATERIAL

It is important not to let printed and written material accumulate, otherwise filing becomes a monumental task. There are a variety of headings under which paperwork can be filed and a variety of places in which it can be filed. Boxes, folders, varieties of files, filing cabinets, card index boxes and computers can all be used to store the information recorded.

6.4.1 Worksheet/Instructions for Experiments

A filing cabinet is a good place for these. Failing that, a cardboard storage case or suitable box can be used. They can be arranged in a variety of ways depending on the circumstances, e.g. according to the group/s of people that would use them or according to topic. In all cases, an indexing system can be used, together with a "key".

Incidentally, if you are keeping ink or spirit stencils that have been used to prepare these worksheets, the stencils should have the same indexing systems.

6.4.2 Technical Communications

These are notes, diagrams, etc. that are produced to provide theoretical scientific information. A filing cabinet is the best place to keep them, but of course, the originator concerned may wish to keep them. Once again, if an indexing system is used for these hand-outs, the same system should be applied to any stencils prepared.

6.4.3 Instructions for use of Apparatus

One or more box-files or lever-arch files are suitable for these [see Fig. 6.2 (b)]. If you have more than one set of instructions for a particular piece of apparatus you must decide whether to file them all in the same file, create a back-up file with the spares or throw them away.

Alphabetical order is as good a way to file them as any other. You could file them according to manufacturer/supplier wise and then in alphabetical order. It is a good idea to keep guarantees and service or maintenance agreements

with the instructions, although you could create special files for these. There is also a case to be made out for keeping guarantees with the instructions. The alternative is to create a special file for guarantees. The same can be said for service or maintenance agreements. Either file them with the instructions for use of the apparatus to which they refer or create a file especially for service/maintenance agreements.

6.4.4 Correspondence

The widespread use of the telephone seems to have reduced the volume of correspondence that is generated in developed countries. But countries like our India, there will still be correspondence. If the volume of this is small, a lever-arch file is suitable: file incoming letters in the front, and copies of outgoing letters in the back. Incoming letters can be numbered whilst outgoing letters can be filed by alphabetical order of the addressee and put in date order. It might be useful to keep a brief summary of each letter at the front of the file; an example is shown below in Fig. 6.4.

S.No.	Date	Sender	Subject
1	11.11.16	Hari Om	Quotation for electronic balance
2	14.11.16	Jain & Company	Will send replacement prism
3	21.11.16	Arvind-Arjun	4 mm spade adapters discontinued

Fig. 6.4: Index for File of Incoming Correspondence.

These letters are also kept in date wise order and with the most recent one having the highest number.

6.4.5 Orders

If you are involved in ordering materials or equipment for your lab, you will require a file to house copies of orders that have been sent and possibly delivery notes on which you have written the date of the goods arrived. You may also keep accounts.

Even if, you don't keep copies of the actual orders, you might choose to keep copies of the requests for apparatus, materials, etc. that you have made.

6.4.6 Requests for Equipments

Your main function is to provide equipment for experiment and investigations. The first stage in this process is for someone to ask you for certain items. It is not enough to have an oral request; to avoid confusion, a written requisition is vital, and it should be made available to you some time in advance. It is also possible that the same requests will be made year after year or by different people. It can save your effort, therefore, if you keep the written requests together with the list of equipments and materials that you supplied. You should also have a file containing requests that you have not yet fulfilled.

SAQ 2

Imagine that you are working in a school laboratory, and a biology teacher hands you a scrap of paper with the following written on it.

“A plant in a tray for demonstration”. You assume that this is a request for practical work but what further information would you need before you could provide the necessary apparatus and materials?

6.5 SPECIAL FILES

As a lab technician some very important files are kept in labs under your direct supervision. We are going to describe such files in this section.

6.5.1 Safety File

Now we will describe what a safety file should contain. Every now and then hazard warnings are issued. They originate from manufacturers/suppliers, from your employer, from professional bodies such as the loss prevention Association of India Ltd. Education, from the scientific press and from union safety offices in case of factories; these should be filed in the Safety File. You might choose to include copies of memos reporting hazards and your subsequent actions, as well as any communications from safety representatives and management concerning safety. You can also keep the statement of health and safety policy of your employer if available in a safety file.

Any regulations concerning the use of a Lab's Safety instructions for the treatment of spillage, basic first aid and other information that is “safety” related should also be included in the safety file. If you have a Safety check list, this, together with the records of such checks made from time to time, should also be kept in the Safety File.

6.5.2 Technician's File

Technician file is for you to keep any information that might be of use to you or your successor in the future. The form that it takes is a matter of personal preference. You could use any of the systems we have mentioned.

The file may include the following information:

1. Names and addresses: suppliers, sources of information, useful contacts, etc.
2. Recipes: for all the solutions, stains etc. that you have to prepare.
3. Sources of specific items and materials, e.g. higher and lower plants, various chemicals, various instruments, glassware etc.

Technician's file must include asset's register, which include all the received chemicals, equipment, glassware etc. from time to time. In case of audit, you will be able to locate any particular item and place it for audit. This register or stock book should be passed to your successor in future.

No doubt you can think of many more things as file entries – especially if you are new to the job! In this case, there must be several things that you wish you could ask someone about. The technician's file would solve this problem.

SAQ 3

- a) You have decided that, as there are now 25 slide sets and filmstrips (some with a taped commentary) in the biology section, the time has come to catalogue them.
 - i) What sort of indexing system would you use?
 - ii) What information would you record for the catalogue?
 - b) From the list given below which items do you think should be placed in the Safety File?
 - i) The employer's Statement of Health and Safety Policy.
 - ii) Lab Safety Regulations.
 - iii) Instructions for use of apparatus.
 - iv) Procedure when the fire alarm sounds.
 - v) Employer's advice about hazards.
 - vi) List of chemicals in stock.
 - vii) Names and addresses of suppliers.
 - viii) Accident report forms.
 - c) Give two reasons why it can be helpful to keep the previous year's requests for equipment, materials, etc. from your colleagues.
-

Principles of record keeping:

- i) Safety
- ii) Period
- iii) Economy
- iv) Flexibility
- v) Classification
- vi) Justification
- vii) Verification
- viii) Accessibility
- ix) Simplicity

6.6 RECORDS

Records means "any written matter or document prepared for possible future uses". It may be in the form of a letter, notice, circular, invoice, voucher, picture, chart, report, registers, books of accounts etc.

A record provides a summary of information. For example, if you want to know how many beakers you have in stock, you have at least two ways of obtaining this information. You can count the beakers in each lab and store or you can consult the stock record. (Accuracy that is required and when you last took stock will be relevant here.)

If your lab had the misfortune to catch fire or suffer a major disaster, how could an accurate claim can be presented to the insurance company? How can the number of accidents/near misses and incidences of bad practice, etc. be assessed and monitored? How can Excise department monitor the use of alcohol? How can you make sure that you know where specific pieces of equipment etc., are? The answer to all these questions is not by relying on your memory, but is that you need to keep records. These can be kept on record cards, in record books, or on computer files.

6.7 STOCK RECORDS

As far as record-keeping is concerned, recording stock levels is likely to be most time-consuming. There are three kinds of record that are required. First

6.8 LOCATION

This is essential piece of information for anyone trying to find a particular piece of apparatus, etc. We mentioned that cupboards, drawers, etc. should be numbered and labelled with their contents. The location specified for each piece of apparatus should be unique.

A plan of the lab showing the siting of numbered cupboards together with a list of the contents of each numbered site pinned on the notice-board or stuck on a wall in the preparation room will provide a useful reference.

Location of people is also important. To this end, you need to know who is using what and in which lab during the day and where each member of the department would normally expect to be working. You should know and, if necessary, have evidence to show where the people are working at any time in science department. To facilitate this, you need to know who has borrowed what and where he/she is using it.

6.9 RECORDING LOANS

All loans of stock, both apparatus and books, should be recorded in writing, no matter what time-scale is involved. In the case of apparatus and equipment, you need to know the name of the person concerned, what he/she is borrowing (and possibly why), where he/she is going to use it and when you can expect it to be returned. Items that feature in the official inventory should not be removed from the premises unless written permission has been given. In this situation, you could record this written permission with the loan details. "Borrowing" stock is not the same as using stock that you provide for experimental work.

In an educational establishment, it is necessary to record loans of textbooks to students. This is made easier if sets of books are numbered so that individual books can be identified. If an exercise book is ruled appropriately, it makes a useful loan record.

6.10 RECORDING STOCK USED AND MISUSED

On an hourly basis you should know what is being used, by whom and where it is being used. You will know this from the requests that have been made by other staff. There are three specific instances where you need to record the use of some materials in a little more detail:

1. Record of use of listed poisons;
2. Record of use of radioactive sources; and
3. Record of use of alcohol.

6.10.1 Record of Use of Listed Poisons

This should apply, to the substances that are locked in the poison cupboard, taking care that the same top and liner are in place. Your record should state

the date, the substance withdrawn, the person responsible, for what it is required, the mass of substance used and your initials to denote that it was returned to the poisons cupboard.

The mass of substance used is most easily determined by weighing the bottle when it is issued and again when it is returned. A book is most useful for recording these “before use” and “after use” masses and a specimen entry is shown in Table 6.1.

Table 6.1: Specimen entry in a poisons book

Date	Name of User/ Supervisor	Group	Substance	Mass on Issue	Mass on Return	Used
5.11.16	Mr. Jain	A1	Barium carbonate	541.8 g	536.1 g	5.7 g
8.11.16	Mr. Ram	(C22)	Barium nitrate	235.5 g	215.5 g	20.0 g

6.10.2 Record of Use of Alcohol

As far as record-keeping is concerned, there are two aspects involved. First, you should keep a copy of the letter which is sent to the supplier of methylated spirits when you wish to buy alcohol. Secondly, it is considered to be good practice to keep a record of all the alcohol (Industrial methylated spirit absolute and ethanol) that is issued and new stocks that are received. A book is useful for this and specimen entries are shown in Table 6.2 which indicates stock positions of methylated spirit. It is worth mentioning that alcohol is an Excise item and the Excise regulations of your State Government are to be followed while dealing with alcohol purchase and stock maintenance.

Table 6.2: Specimen entries in stock book for methylated spirit

Date	Volume Issued	Area of Work	Cumulative Addition	Stock Remaining	New Stock
4.11.16	100 ml	R & D	100 ml	2.4 litre	
5.11.16	250 ml	Microbiology	350 ml	2.15 litre	
8.11.16	50 ml	Workshop	400 ml	2.10 litre	
8.11.16	100 ml	”			
11.11.16		Quality Assurance	500 ml	4.5 litre	2.5 litre

6.10.3 Record of Breakages

Misuse of stock is generally concerned with breakages and these usually involve glassware although all types of stock can be included. A book is useful for recording breakages and each lab should have its own “Breakage Book”. The entry should include the date, name of person responsible, article broken and member of staff in charge. Whether or not you include a column for the cost of the article (for you to fill in afterwards) is a matter of policy.

There are one or two more details about equipment that we need to mention but which has not fitted in with our classification so far.

6.11 INFORMATION ABOUT EQUIPMENT

Equipment, in this context, is being taken to mean items that need a power supply of some kind and which are likely to be enclosed by a metal or hard plastic case.

6.11.1 Serial Numbers

Most of the expensive pieces of equipment have a serial number engraved on the name plate that tells you the operating voltage and current used/power consumption. It is important that the serial number should be recorded so that the equipment can be identified when stock is checked, insured specifically and identified by the supplier or manufacturer in the event of a fault or complaint. If you keep a card index file of stock, the cards make an ideal place to record the relevant serial numbers. If you record stock location and serial number on a record card, you will have cards similar to the one illustrated in Fig. 6.6 or in India you can keep a separate record for this purpose.

Details of Item	Inventory Ref.	Date	No. in stock
e.g. Make, Reg./Cat. No. Serial No. Location details			

Fig. 6.6: Specimen Record Card.

6.11.2 Maintenance Record

Your workplace may have a service contract covering such things as balances. This means that they should be checked (and repaired, if necessary) by a visiting engineer. If you don't have a service contract or if it is not possible to have one, you may choose to maintain some pieces of apparatus and equipment yourself, e.g. microscopes. It may also be necessary to send a piece of equipment back to the supplier for repair. In all these cases, you should keep a record.

6.11.3 Electrical Checks

Each piece of equipment that uses mains electricity should have its plug, cable, and fuse checked at least once a year, and you must keep a record of the checks that you make. Once again, a card index system can be useful. Each piece should have its own card. If you have several similar items with no serial numbers you must allocate each with a means of identification so that you can distinguish between them. A simple record card is shown in Fig. 6.7.

ITEM:	Balance	NO:	2
MAKE:	Torbai	MODEL	PL400
SERIAL NP:	502186	POWDER RATING	400 W

Fuse		Plug	Earth	Date
Rating	Comment	Comment	Comment	
2A	OK	OK	Good	30.03.2016

Fig. 6.7: Record Card showing details of electrical check.

6.12 MISCELLANEOUS RECORDS

We are now left with three types of record that we cannot classify by any stretch of the imagination. The only way is to present them “as they come”!

6.12.1 Accident/Incident Record

All accidents, however minor, should be reported through appropriate channels. Most workplaces have an accident reporting procedure based on written reports which comply with statutory requirements and recommendations. However, it might also be appropriate to keep a record in your department. Certainly, a record of “incidents” should be kept. In both cases a book can be used. These provide a more permanent record than a loose-leaf file from which pages can easily be removed and mislead.

6.12.2 Orders and Accounts

This is a topic that we mentioned in subsection 6.4.5. As far as a record is concerned, this will only apply if you handle orders. If you file orders, it can save time to have a list at the beginning of the file, showing date, order number, supplier and expected cost. In order to keep track of the expenditure, you will need to record the prices paid for goods, etc. If you handle petty cash, you will also, naturally, need to keep a record of income and expenditure.

6.12.3 Key to Unknown

In Chemistry, it is often the practice in educational establishments to give students unknown substances (unknown by them, that is!) to analyse. If you keep such a set of substances for use each year, it is important that you keep a record of the identity of each substance. It is also important that you keep this record in a safe place and that you remember where you put it.

Well, we have covered a number of records in this section and we acknowledge that it is quite possible that you might keep a record that we have not considered. Before we leave records, however, there are just a few general points to be made. Where to keep your records deserves some thought.

For records to be of any use in an emergency, they need to survive. Therefore, you should try to keep them in a relatively safe place.

For information which is useful for the day-to-day work in the labs, don't neglect the notice-board as a useful place to keep records. Records such as timetables, lists of batches of students, student number, etc. can well be displayed on a notice-board in the preparation room.

Finally, you should give some thought to the security of your records. If you handle any confidential information, this must be kept under lock and key, within the preparation room. This makes a lockable filing cabinet almost essential (although lockable desk drawers can be used).

SAQ 4

- a) Would it be a good idea to keep your chemical stock records in the chemical store? (Explain your answer in one or two sentences).
 - b) Give three examples when up-to-date records could be useful.
 - c) List all the information that might need to be recorded about:
 - i) Top-pan balances,
 - ii) A video tape, and
 - iii) Chemicals.
 - d) Name three materials whose withdrawal from stock should be recorded.
 - e) Suggest how a record of breakages could be set out.
 - f) Give two reasons why it can be useful to keep a record of "incidents" and/or "near-misses".
-

6.13 SUMMARY

A filing system is necessary for smooth running of any office, school and laboratory. All the information about experiment, chemical, stock books and correspondence should be clear, accessible, adaptable and easily understood in a good filing system. There are various systems of filing for stock in science laboratory, paperwork and for practical. The catalogue filing can be done in different ways. The record of information about abnormal incidents is also to be kept for being reported to proper authority. Another important aspect is the recording of listed poisons and alcohol used. Record keeping is an important aspect of laboratory safety.

6.14 TERMINAL QUESTIONS

1. Write a list of items found in your lab that require filing.
2. Write a list of records that need to be kept in your lab. Describe each group of records from the point of view of the information that the record gives rather than listing specific details. An example of this would be "stock levels".

3. Imagine that you have just taken a job as only technician in a science lab. You find that there is no technician's file. Write a list of headings that you would use in preparing such a file and give a few details about the contents under each heading.
4. Describe, in your own words (not exceeding 200), why you think that filing and record-keeping systems are necessary.
5. Write down brief definitions for the following terms:
Channels of Communication
Requisitions
Stock Level

6.15 ANSWERS

Self-Assessment Questions

1.
 - a) The Dewey Decimal System involves assigning arbitrary numbers to broad areas of knowledge. These large areas are then subdivided again and again so that the more subdivisions there are; the more precise is the definition of the subject. See subsection 6.2.1.
 - b) Alphabetic. This system is used where only a simple system is required, e.g. filing of catalogues.
 - c) Every lab ought to contain two or three reference books of information for everyday use. Trade catalogues and articles of interest to technicians from periodicals should also be held in the lab.
 - d) You may have given any of the following three ways, all of which help in locating chemicals:
 - i) Labels on shelves;
 - ii) A chart; and
 - iii) A plan on the door of the store room.
2.
 - i) Date
 - ii) Time and duration of class
 - iii) Room/lab
 - iv) Class set/demonstration
 - v) Which method of preparation
 - vi) Which plants
 - vii) Any other chemical, e.g. tap water/distilled water
3.
 - a)
 - i) You have a choice. If they fall into definite categories, e.g. botany, histology, etc., you could give each category a prefix letter and then use numbers (this means that some would have the same numbers but different letters) or you could just use consecutive numbers. You should not use letters only since would run out of letters quite soon in future.
 - ii) Title and whether or not there was a taped commentary. If you include the number of slides in the set or frames in the film strip,

.....
 this could give some indication of the time they would take to be shown.

- b) All could go in the Safety File except (iii) and (vii).
- c) i) So that you can get back to see what you provided when a similar request came in the previous year.
 ii) So that you can demonstrate the amount of work that you did in a given period of time!
4. a) No, for three reasons.
 i) In order to refer to them, you would have to go to the store.
 ii) The atmosphere inside the store will not facilitate preservations of records.
 iii) In the event of a fire or explosion in the store, the records would be lost.
- b) Choose from the following:
 i) after a fire,
 ii) after a theft,
 iii) when reordering, or
 iv) when tracing down a specific item.
- c) i) Make and model
 Date of purchase
 Serial number
 Service/repair history
 ii) Title
 Running time
 Type of cassette, e.g. VHS, Betamax
 iii) Name
 Grade
 Catalogue number
 Date of receipt/transfer (from store to use)
 Hazard/s
 Stock level
- d) i) Radioactive sources
 ii) Industrial Methylated spirits/Ethanol
 iii) Poisons
- e) One possible way would be as shown in below – using an exercise book for each lab:

Date	Name of the person responsible for breakage	Group	Article broken	Cost	Initials of Supervisor

- f) i) To identify a commonly occurring type of incident, e.g. a chemical reaction, this often behaves unpredictably.
 ii) To identify a faulty technique, experiment or procedure.

Terminal Questions

1. The headings that we came up with are:
 - i) Equipment (including apparatus and glassware).
 - ii) Chemicals (including radioactive sources).
 - iii) Books.
 - iv) Audio-visual aids.
 - v) Printed and written material.
 - vi) Safety notes.
 - vii) Technician's file.
2. Your list could include:
 - Stock levels of apparatus and chemicals
 - Locations of apparatus and chemicals
 - Book loans – text and reference
 - Equipment on loan
 - Service/maintenance information
 - Accidents/incidents
 - Electrical checks
 - Apparatus and materials requested by colleagues
 - Experiments performed
 - Alcohol used
 - Radioactive sources – stock and use
 - Use of poisons
 - Orders placed and expenditure
3. If you don't find the technician file then you should go through the previous correspondence file and would be able to make a list of following:
 - i) Supplier – names and their addresses.
 - ii) Useful contacts – name and their addresses.
 - iii) Any useful information.
 - iv) All the recipes of stains and solution that you have to make.
 - v) Sources of specific items.
 - vi) Sources of materials.
 - vii) Record of files – you will like to see what is on file records.
4. See summary 6.13.
5. **Channels of Communication:** Formal lines or chains of communication throughout the organization and Inventory Stock levels.
Requisitions: Written documentation of stock items in your charge, which is provided by the user, giving details of what is being used, by whom and where.
Stock Levels: A continuously updated record of all items for which you are responsible in your working environment.

USE OF COMPUTERS IN LABORATORY ORGANISATION AND MANAGEMENT

Structure

7.1	Introduction	7.4	Application Software
	Expected Learning Outcomes		MS Word
7.2	Components of a Computer		MS Excel
	Central Processing Unit		MS PowerPoint
	Memory		Internet or World Wide Web
	Input and Output Devices	7.5	Forms of Data Output
	What Goes on Inside a Computer	7.6	Summary
7.3	Overall Functions	7.7	Terminal Questions
	Data Input	7.8	Answers
	Data Processing		
	Data Output		

7.1 INTRODUCTION

In the earlier units of this block you learnt about the importance of proper filing and record keeping. You are also aware that in laboratory organisation and management, work related to filing, records and stocks is generally maintained manually on paper or electronically with the use of computers as a tool.

Most of you are familiar with personal computers (PCs as they are popularly called) or a laptop. Some of you may already be familiar with its use. In this unit we will try to make you conversant with what a computer is and how it can be useful for your workplace. Often schools and colleges that have science education have computers for the student's use and in the office for administrative use. In fact computers are a necessity in all spheres of life and there is hardly any laboratory, office or institution now that does not use the computer at some level for handling data and organising information. Therefore, it would be in your interest to learn its use in laboratory organisation and management.

In this unit you will become familiar with the basic components of a personal computer, the terminology used in computerised systems and the various possibilities of their uses in laboratory organisation and management. For instance, computing systems can handle large amounts of information with far greater facility than humans can. Time consuming activities like filing, record keeping, stock controls and their link with accounts can be managed better with computerised systems.

Expected Learning Outcomes

When you have completed all the work in this unit, you should be able to:

- ❖ list the basic components of a personal computer system;
- ❖ describe the use of computers in laboratory organisation and management;
- ❖ list the various functions of a good application software for your laboratory; and
- ❖ state the advantages of using a computer system in laboratory organisation and management.

7.2 COMPONENTS OF A COMPUTER

The computer derives its name from the word compute, which means calculation. A computer is an electronic device whose basic function is the execution of command(s). We use a computing system basically to feed in some data that is processed by the computer and some information is generated as a result. For this we need **input devices**, to feed in some data into a **central processing unit (CPU)** and the results of the processing are displayed through **output devices**. Let us first describe the parts of a personal computer very briefly for those of you who have not had a chance to work with a computer before. The input devices, the CPU, and the output devices that you see in Fig. 7.1 form the **hardware**. These are the physical parts that you can see and feel. The instructions given to the computer to perform a task are known as a **program**. A set of programs is known as the **software** of the computing system. Software is usually prepared in advance and then loaded into the computer when somebody is ready to use it.

Computers for personal use come in different shapes and sizes depending upon how and for what purpose they are used. Some common personal computers are shown in Fig. 7.1. With appropriate software, they are powerful enough for organizing and maintaining the records in your laboratory.



Fig. 7.1: Personal computers: a) personal computer system with printer; b) laptop

Let us first talk about the hardware of computing systems.

7.2.1 Central Processing Unit

Central Processing Unit (CPU) is the brain of the computer. The intricate electronic circuitry of the CPU performs the computer's tasks of handling data. It is composed of:

- i) The Arithmetic Logic Unit or ALU, which computes mathematical functions, like addition, subtraction, multiplication and division.
- ii) The control unit which carries out the computations and coordinates the movement of data and executes the instruction given to the computer.

The CPU receives programs and data through input devices, processes it and gives out the result through output devices.

7.2.2 Memory

Computers store information internally as well as externally for future use and retrieval, on various storage devices.

Linked to CPU is an internal memory unit where all the instructions and data are stored. It contains the computer operating instructions or **program**. The memory of the computer is of two kinds; **RAM** and **ROM**. Random Access Memory (RAM) is the computer's short term working space. During its working life, a computer's RAM may be overwritten with new information millions of times. RAM is more like a blank cassette which can be recorded, wiped clean and recorded again. The computer can get to or access any part of the RAM memory 'at random'.

ROM is the Read Only Memory that is, one can read from it but it cannot be written on. It is used to store software which will always be needed. ROM software is a permanent part of the machine, unlike the RAM which is forgotten each time the machine is switched off.

The secondary memory or the auxiliary memory of the computer stores the programs and data which are required to be used again and again. This memory can be separated from the computer and therefore, is called the external memory. Compact discs (CDs), pen drives and external hard drives are examples of external memory. You can read and write the information on them. They can hold an enormous amount of information. Because of its relatively slow speed, auxiliary memory is used to store programs and data that is not required all the time. The programs and data are then copied onto the faster main memory when needed.

7.2.3 Input and Output Devices

The most common input devices that you will see in your PC are the keyboard and the mouse.

The keyboard of the computer looks like the keyboard of a typewriter with a few additional keys. One of the most common uses of the computer is as

a word processor – basically a sophisticated typewriter that is capable of storing and manipulating text. With a few key strokes the writer can add or delete words and move entire similar sequences or paragraphs from one place to another in the text. Entire books can be written, edited, and printed with the use of computer discs without the manuscript even being committed to paper.



The mouse is a pointing device which is used while working with a display based computer system. It points or selects some area of display on the screen of the monitor and can be moved to another area of the screen. There are several other input devices like scanners, optical pens, joy-sticks that you may see associated with computing systems depending on the kind of requirements.

The output devices of the computer present the results of its work to users. The most common output devices are the **monitor** which looks like a TV screen and the **printer**.

The input and output devices are so closely related that they are referred to as **input/output or I/O**. The most common I/O devices are, compact discs, modem (MODulator-DEModulator) that connect to telephone lines. There are several other devices that can be connected to the computer. These are called peripherals. I/O peripherals are XY plotters to print graphs, devices that recognise and produce sounds, optical scanners to see text etc.

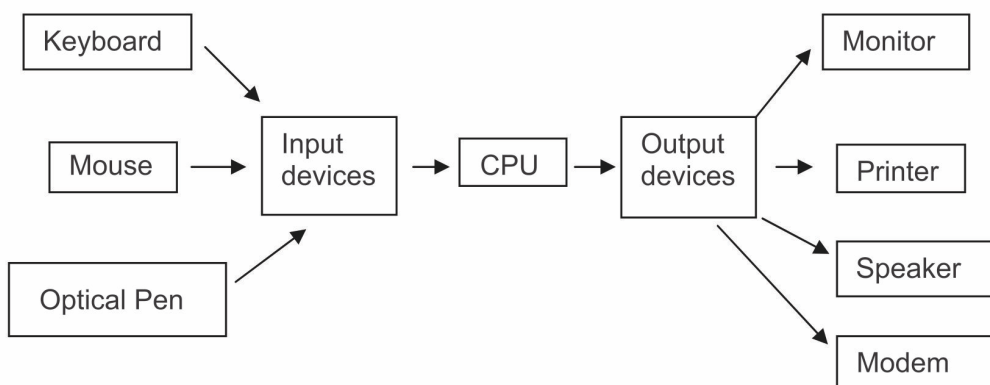


Fig. 7.2: Components of a computing system.

7.2.4 What Goes on Inside a Computer

You would have realized by now that computing systems are most useful for manipulating information. Any organisation and management of information basically involves three steps:

1. Information input
2. Information processing
3. Information output.

Information is usually in the form of data. Can you think of items which could form the data in a laboratory setup?

Data could be any of the following: information about stocks, equipment, finances, personnel, technical data, student records etc. You could add more to this list according to your own situation. This data is normally stored, processed or analyzed and then we get final results based on it. Sorting information fed into the computer is one of the most important operations it performs. The computer is able to arrange similar data items in a particular order, be it, numerical, alphabetical or some other sequence. On command the computer can compare any two data items and determine which is the next one in that sequence.

A collection of similar data is known as a **file** and each item is a **record**. In a file on students for example, each record contains data about one student such as the registration number, name, date of birth etc., and sorting can be done according to the type of required information.

Once data has been sorted it is stored internally on the hard disc of the computer or on a CD and can be printed out on paper. This information in a computer can be logically organised into files with separate records within files and individual items within records. When files are arranged in a database, each record contains identification labels known as **keys**. A key could be a code number, a name or perhaps data. When looking for particular data, the computer calls up each item from memory and checks to see if it contains the suitable key. Therefore, when a key is entered into a record, the computer scans its memory and displays that record.

The processing cycle (retrieve instructions, decode and execute instructions, save results) is repeated until all the program instructions have been carried out by the CPU. The final results are then either stored in the main memory or sent to an output device like a monitor or printer.

SAQ 1

Fill in the blanks with suitable words:

- i) In a computer mathematical computations are performed in the unit of CPU.
- ii) A compact disc is a device while the monitor is an device.

- iii) The hard disc of the computer contains its
- iv) The programs loaded on the computer form the
- v) A key is used to identify a in the file of the database.
-

Let us now consider how a computer can be used as an effective tool for laboratory organisation and management.

7.3 OVERALL FUNCTIONS

There are three points that must be borne firmly in mind when considering the use of computers in laboratory management.

1. Overall Function

This includes the three steps we highlighted earlier, namely:

- a) Data input
- b) Data processing
- c) Data output

2. The GIGO Principle

This is a simple principle with a clear message and universal application – Garbage In – Garbage out!

Always try and enter any data in the form you want to see it printed out. For example, if you type in 'bkr' don't expect the computer to print out 'beaker'! Secondly be consistent in the way you enter your data. Using the same example, enter either 'bkr' or enter 'beaker'. Don't enter both because if you ask the computer to list all beakers, don't be surprised if it misses out the 'bkr'.

3. Paper System

When setting up a computer system you need to ask yourself 'Does the system you plan to operate work manually, i.e., on paper?' It is a popular misconception that to computerize a system that does not work will remedy the system's faults. Nothing could be further from the truth. If a system does not work, no amount of computing equipment will make it work. On the contrary, the system is likely to fall apart! It is always better to set up a system manually before attempting computerization.

Let us discuss overall functions in detail.

7.3.1 Data Input

There are several aspects of data input that need careful consideration. We shall assume that in a laboratory environment you are mainly concerned with entering data via a keyboard. There are other methods which, although not frequently used, you may encounter:

1. Optical character recognition – scanners that read text from paper directly into a computer;
2. Scanners, e.g. for reading bar code information;
3. Analogue-to-digital converters – reading experimental data from photoelectric cells in, for example, spectrometers.

At first sight, entering data into a computer might not seem problematical. Indeed, the mechanics of data entry are well tried and straightforward. However, from a management point of view there are several considerations.

First of all, there is the problem of access. This is often an acute problem in educational establishments where there might be an abundant supply of computers for teaching but a desperate shortage for management and administration. Sharing a computer terminal does not really work satisfactorily, and if a computer is to be a really useful management tool, it must be on hand at all times.

Another point to consider is that of training. Whoever enters data into your system, must know what they are up to. Otherwise it will not be long before the GIGO principle is brought into play. Adequate training is the cornerstone of good computer systems.

Coupled to both access and training is the problem of the time taken to 'key in' data. There will be a need to update the data regularly which will require more time at the keyboard. Never underestimate 'keying-in' time.

7.3.2 Data Processing

Processing data is the most complex function of a computer system. It is where the computer itself (as opposed to a peripheral, e.g. a visual display unit or a printer) is brought into play together with suitable programs. We will discuss programs, or software, later; so here let us consider what kind of management decisions need to be taken in relation to the hardware – the computer itself. In practice, when you choose a computer system, you decide:

- 1) What your aims are;
- 2) What programs (software) will meet those aims; and
- 3) What machines (hardware) will support the programs.

Sometimes your aims affect the choice of hardware directly. For example, you require more than one person to gain access to the system at a time, you will need a multi-user system.

In defining your aims, you will define what data processing needs to take place and this will lead to a number of options – choices of programs. Once you have chosen a program for your task you will usually have a range of options, and a set of parameters for choosing hardware you may ask:

- Will you require a stand-alone workstation, a network, or a full multi-user system?
- What size RAM (the computer's own working memory) is required to support the program?

- What size hard disk (data store) is required?
What data storage method will you use for backing up information?
- What is the cost of the computer and its subsequent maintenance?

7.3.3 Data Output

Processed data is no use to you if you cannot use it. Once data has been processed, you will either:

1. Send it as a data file to another system, e.g. write a file to disk, transmit a file over a phone link via a modem, etc. For example as e-mail.
2. Send it to a peripheral where it is decoded into information that can be readily understood. The most common peripherals are visual display units (VDUs) or printers.

SAQ 2

Can you remember from the previous paragraph THREE important parameters to be decided when choosing a computer system? Write them down in order here.

- i)
- ii)
- iii)

Check your answer with ours at the end of the unit before continuing.

7.4 APPLICATION SOFTWARE

The most popular application software that is used in most computers is **Microsoft Office package** which was developed by Microsoft as a document processing application. Microsoft Office includes **MS Word**, a word processing software; **MSExcel** — a spreadsheet software; **MS Powerpoint** — a program for creating presentation; **Outlook** a program for email and scheduling; **Onote** a program to keep your notes organised.

Knowing how to use Microsoft Office is essential in labs that base all their records, inventory procurement in electronic form. We will discuss mainly the uses of MS Word and Excel, as these are what you will most likely use in your laboratory duties.

7.4.1 MS Word

Many laboratories and educational institutions now use computers to produce and organize written material, correspondence, reports, etc. In this subsection we will discuss MS Word which is a word processing package, which means it is useful for typing and storing letters articles or anything that contains words! Basically it is a fancy typewriter with a built in filing system. Therefore, you should become familiar with your keyboard and mouse and know what you can do with them. Fig. 7.3 shows a blank word document. You will learn how to use MS Word in the laboratory exercise related to this unit.

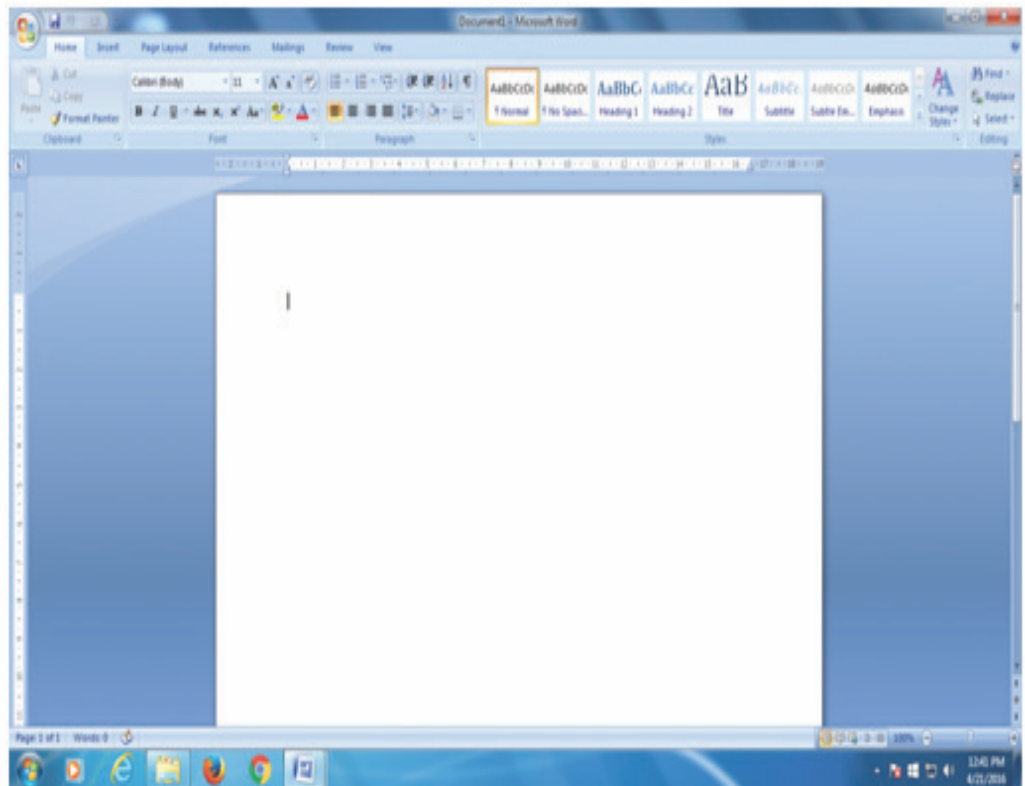


Fig. 7.3: Blank word document.

Useful Features in MS Word

1. Check documents for spelling and grammar errors. You can easily replace words and phrases in your document through Word recommendations.
2. Add header and footer and page numbers to organise your word content well.
3. Protect your word document using a password.
4. Conversion between Word and other formats. You can protect your document as a PDF to make it easy to share with other users and also convert from PDF to word format for further editing as PDF is not easy to edit.
5. Convert word to power point presentation outline, saving the effort of re-typing the content into a power point slide.
6. You can format your document as your requirement into various paragraphs and assign different fonts and font sizes, aligning text, dividing into columns, adjust spacing between lines and adjust the margins.

Advanced Features in Word

1. Mail merge is a useful feature that allows you to send letters with identical information to multiple recipients, for instance each recipient will have a different address.
2. You can create tables to help you organize complex columnar information.

SAQ 3

List three most important features of MS Word which you might find useful for completing your tasks.

7.4.2 MS Excel

MS Excel is a spreadsheet program used to store and retrieve numerical data in a grid format of columns and rows. It is ideal for entering, calculating and analyzing data regarding purchases, sales tax, inventory etc. Even though Word can be used to present data in a table, Excel has far better capabilities of manipulating data like calculating numerical formulas, keeping inventory and accounts of purchases in the laboratory, keeping track of expenses from grants etc. The Excel program can convert a spreadsheet of numbers into a pie chart, bar diagram or a variety of visual diagrams. It can also be used to store text based data such as supplier lists, employee data and mailing addresses. Excel can store and calculate data as directed, using existing or new data.

An Excel document is called a **workbook** (see Fig. 7.4). Each workbook has at least one **worksheet**. A worksheet is the grid where you store and calculate data. You can have many worksheets stored inside a workbook each with a unique worksheet name. Worksheets are laid out in columns and rows and the intersection of a column and row forms a cell, where you enter the information like date numbers or formula and even text.

Each worksheet can be added as separate tab in the workbook.

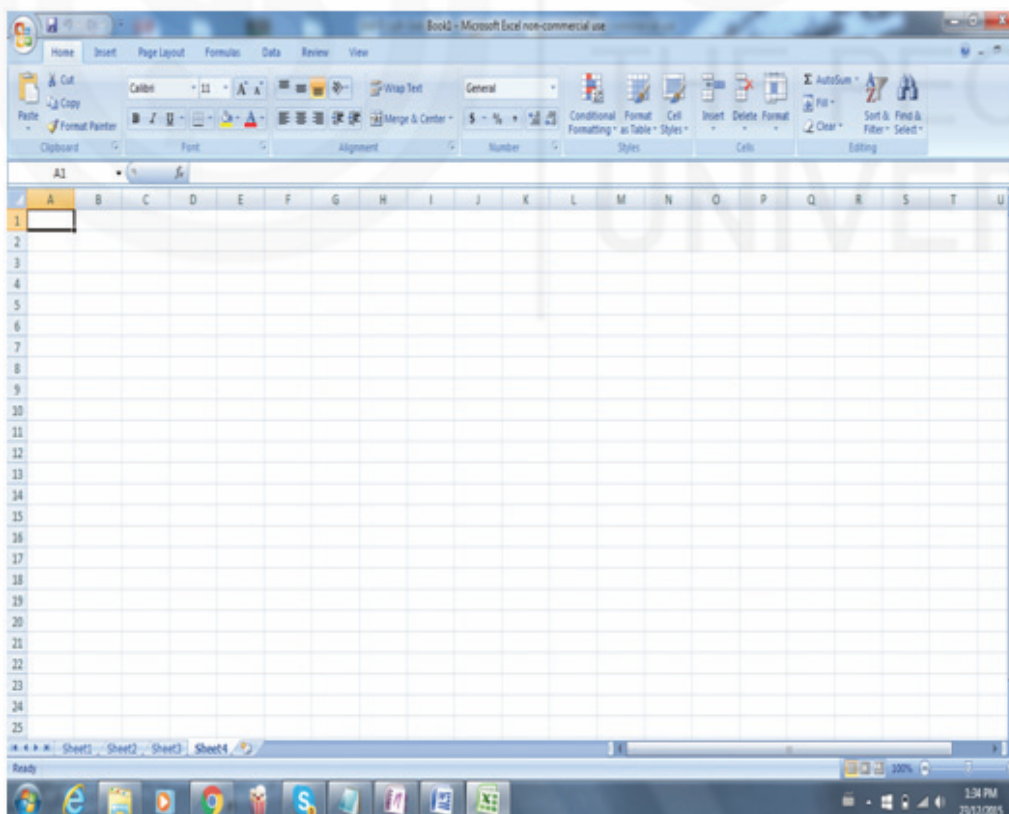


Fig. 7.4: Blank Excel worksheet showing columns, rows and cells.

Spreadsheets and files are necessary documents that you might have to deal with in the laboratory. Most scientific labs would now be creating and storing records as electronic files and it might be one of your duties to keep records using computers. Fig. 7.5 shows an example of a printout from a spreadsheet.

	A	B	C	D	E	F	G
1	CASH FLOW						
	ANALYSIS						
2							
3		TOTAL	MAY	JUN	JUL	AUG	SEPT
4							
5	INCOME						
6	Lab budget	3750	750	750	750	750	750
7	Grants	1500	1500				
8	Capital grants	500					500
9	Miscellaneous	150	50		50		50
10							
11	TOTAL	5900	2300	750	1000	1000	1600
12							
13							
14	EXPENDITURE						
15	Insurance & maintenance	175	35	35	35	35	35
16	Books, etc.	200				100	100
17	Phone	500	250			250	
18	Postage	150	30	30	30	30	30
19	Stationery	215		95	95		25
20	Replacements	635	45	45	500		45
21	Chemicals, etc.	700	100	200	200		200
22	Print & copying	350			250		100
23	Miscellaneous	250	50	50	50	50	50
24	Contingency (10%)	352	57	51	129	52	65
25							
26	TOTAL COSTS	3527	567	506	1289	571	650
27	CAPITAL EXPENDITURE	1250			1250		28
28							
29	INCOME-COSTS-CAP.EXP.		1733	244	-	483	950
30					1539		
31	CASH FLOW		1733	1978	439	922	1872

Activity 1

Write down what work can be organised by using spreadsheet software.

7.4.3 MS PowerPoint

PowerPoint is a software that is used to create overhead transparencies, paper presentations, slides and on-screen presentations. We can insert pictures, sound, animations and text in the presentations. There are auto layouts and templates that can be used to make the creation of the presentation easy and simple. PowerPoint offers a method to preview, show, add special effects to the slides as displayed on screen and rehearse the timing of each slide. You should practice making a PowerPoint presentation in your lab or at home once you have learnt the basics of MSWord.

7.4.4 Internet or the World Wide Web

You would all be familiar with the Internet. Internet provides specialized services to its users. It has changed the way information is searched for, accessed and provided to the user. The internet or the worldwide web of interconnected databases holds vast amounts of information on almost all topics under the sun and allows a convenient method of accessing information regarding laboratory supplies, chemicals and product information. By obtaining details in this way, you do not need to hold large stocks of reference books, or spend time journeying to your local library and thumbing through weighty volumes. You obtain only the information you want, when you want it. In the education world, there are databases whose users not only draw data out, but put their own data in thus providing a dynamic data exchange, for example, web sites of companies which have information about their products and how to obtain them.

For instance, you can obtain all the information regarding a product that is required in the laboratory and contact the supplier through its website and place your order through email without having to go out from your place of work. This system is now widely used for stock ordering and many of your suppliers will have an electronic mailbox. The most competitive companies equip their salesmen with computers. Once a sale is made, the salesman sends exact ordering details to his distribution manager's mailbox. The distributor usually opens his mailbox every few hours, and should be able to despatch and invoice the sale within hours.

Activity 2

If you are already working in a lab, how many of your suppliers have email? Write down the emails and names of your suppliers here OR use a supplier's catalogue to write down at least 4 emails of those suppliers you will want to contact.

Can you see a use for data communications in the management of your work?

Yes / No

7.5 FORMS OF DATA OUTPUT

Whatever, data or information that you feed into a computer will be the data output from a computer system and will be a data file sent from the computer to a peripheral unit. It may take the form of:

1. A file written on to a CD,
2. A file sent to a VDU and displayed on a screen, or
3. A file sent to a printer and printed onto paper (hard copy).

A file may even be sent first to a VDU and then to a printer.

The consequences from an organisational point of view can be summarised as follows:

i) Disk output

You will already have decided whether to use a hard disk or CD or pen drive for storing data. An important point of disk management is to ensure a secure method of keeping copies of your (valuable) data. The method shown in Fig. 7.6 is suggested.



Fig. 7.6: Backing Up Data.

This is a very important part of your work – to keep all the data safe by taking regular backups.

VDU (*Visual Display Unit*) output

Make sure that VDUs are of an appropriate type. They can cause severe eyestrain and tension if you do not check:

- a) Colour
- b) Resolution and screen size
- c) Flicker rate
- d) Viewing angle adjustment.

ii) Printer output

Consider what is required here. Do you just require management information on the one hand or camera copy for reprographic purposes?

Inkjet Very quiet, cheaper than laser printer. Quality can be very good, and colour printing is a real option with inkjets. They are slower than laser printers, but their technology is changing rapidly.

Laser Have graphics capability. Printouts give camera copy. It can be expensive to maintain. Best choice for quality work. Some print double sided.

Resolution of printers is measured in d.p.i. (dots per square inch) with 1000 d.p.i. being relatively high resolution. A good laser printer may be capable of 1200 + d.p.i.

Each year more advanced printers are available in the market that can give high resolution prints at high speed.

Activity 3

If you have a computer printer at your workplace:

(1) What general type is it:

- Laser?
- Inkjet?

(2) Is it adequate for your purposes?

Yes / No

(3) What improvements would you like?

(4) Are there any additional uses for which its printout could be used, e.g. for notices, letters, etc.

A Cautionary Word

A final cautionary word on computing systems. It is imperative that any computer-based information system is backed up by a sound paper-based system. For example, can you imagine a petty cash ledger on a spreadsheet where invoices and orders were not numbered and filed properly? The spreadsheet would soon become meaningless and an auditor would have a fit!

7.6 SUMMARY

You have learnt in this unit that:

- Computers can be used for better and more efficient management and organisation of laboratories. A computer like the human brain receives information, stores and processes it and then displays the results. It receives information through input devices and stores it in its memory, processes that information in the central processing unit and displays it on an out put device like a monitor or through a printer. The physical parts of the computer form its hardware and the instructions given to the computer to process the information form the software.
- Software can be of two kinds, system software that controls the actual working of the computer and applications software that are the programs written to achieve the desired results for the user. The most important

categories of applications software useful for laboratory organisation and management are: database, spreadsheet, communications programs and word processing.

- Microsoft Office is the most widely use application software, which includes MS word for word processing, Excel a spreadsheet program, Powerpoint a program for presentation of information and Onenote a program to organise all the files and folders.
- Internet or the word-wide-web is a communications programme that has linked and allowed sharing of huge databases as well as information across the world in all sectors of life.
- Any organisation and management of information basically involves three steps. Data input, Data processing and Data output.
- Before using computerised systems it is important to understand and decide what the aims are, what software/programs will meet those aims and what hardware will support the programs. It is also important to work out the costs of using a computerised system.

7.7 TERMINAL QUESTIONS

- 1) What sources of information can you access with a computer to help you in your work in a lab?
- 2) List the following sources of information in order of speed of retrieval. Start with the slowest.
 - i) Subscription database from the internet
 - ii) Catalogue
 - iii) Card index
 - iv) Own database
- 3) What kind of computer program would you choose to keep track of laboratory budgets over the year? (Tick the correct answer.)
 - i) Word processing
 - ii) Spreadsheet software
 - iii) Database software
 - iv) Stock control software
- 4) What advantages do computers offer when used for information retrieval or for stock control?

7.8 ANSWERS

Self-Assessment Questions

1.
 - i) ALU
 - ii) I/O, output

- iii) permanent memory.
 - iv) system software.
 - v) record
2. i) Decide on the aims of the system.
- ii) Decide what programs will achieve the aims.
- iii) Decide what hardware will support the progress. Computer salesman would like you to believe that these items are in reverse order! You will probably not have to look far to find a system running at fifty per cent efficiency as a result of this simple discipline being ignored!
3. Writing letters to suppliers, etc.; if you are entrusted with making notes about some activity in the lab; communication with other staff members/ students in your lab or in other labs; making reports, etc.

Activity 1

Typical examples are:

- (1) Stock control
- (2) Inventory
- (3) Library records
- (4) Ledgers. More or less any accounting ledgers are suitable for putting on spreadsheets.
- (5) Budgeting and forecasting. A spreadsheet could help in monitoring a budget. However, in setting up a forecast of, say, cash requirement for a year, a spreadsheet is invaluable and will save much time with a calculator.

Activity 2

Answers will vary.

Activity 3

Answers will vary.

Terminal Questions

1. Subscription databases, your own database, internet-based databases (e.g. dictionaries), electronic mail, other computers via a communication network like internet /intranet.
2. (ii) You might have to go to the library for this.
- (iii) Although this depends on its efficiency, it could be as quick as (iv).
- (i) Access times vary.
- (iv) If you've set it up well, this should be quickest.

3. (ii) Spreadsheet would be best
4. Computing systems can handle large amounts of information with far greater facility than people. They are speedier and more reliable. Information regarding stock and inventory is more easily accessible in comparison to ledgers.

