EXPERT SYSTEM IN DRUG FORMULATION
(A CASE STUDY OF MINNA PHARMACEUTICAL INDUSTRY)

BY

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PGD/MCS/ 98/99/747

A PROJECT SUBMITTED TO THE DEPARTMENT OF MATHEMATICS/COMPUTER SCIENCE, FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE. IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE POST GRADUATE DIPLOMA IN COMPUTER SCIENCE.

SEPTEMBER, 2000.

CERTIFICATION

This is to certify that this project has been examined and found to have met the requirement for the award of the post graduate diploma in computer science of the federal university of Technology, Minna.

.....	.....
DR. S.A REJU PROJECT SUPERVISOR	DATE
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DR. S.A. REJU HEAD OF DEPARTMENT	DATE
.....	.....
EXTERNAL EXAMINER	DATE

DEDICATION

This project is dedicated to the king of kings and to the Lord of lords (my Lord Jesus Christ).

I wish to express my sincere appreciation to Pharm Tunde Omotoso for his immense contribution in the provision of materials during my course of study. I also thank Eng. and Pharm (Mrs) Jimoh

I thank the computer lady V.F Adeboye who has made this project to be typed and printed.

I hereby thank Mr. Moshood Banks for his support and assistance throughout this project. May God bless you abundantly.

My dear friend, if your name is not mentioned here, just knows that I love you.

I say thank you all

Alawode J.S

July 2000.

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(b) NATURAL LANGUAGE

The AI area of natural language systems involves using the computer to communicate with user in natural language such as English, Spanish, French, or Chinese. Although, it is relatively easy at times for the computer to provide natural language output to users , input is clearly another matter. For instance, although the definition of words can be stored in a dictionary, the way in which aggregation of words or sentences conveyed meaning is rather complex. Also, people have ways of misusing word or using them in strange contexts. And even when human have finished communicating an idea or an intention, it is not always that clear just what they were trying to say.

Progress in natural language interfaces has been slow, but nonetheless fruitful in some areas.

(c) VISION SYSTEMS

Vision systems are computer systems that perform tasks that could, at one time, only be done through the use of human eye. They often work through a technique called pattern recognition. For example, vision systems are commonly used today to inspect parts of sub assemblies for defects. Such a system has a number of image patterns of defects stored in a database, and it consults these to determine whether the item being inspected is defective. This task is not quite as simple as it seems. Storing, accessing, and comparing a large number of images is difficult. Also if the items being inspected is tilted the wrong way, it has to be reoriented so that it is identifiable to the vision software.

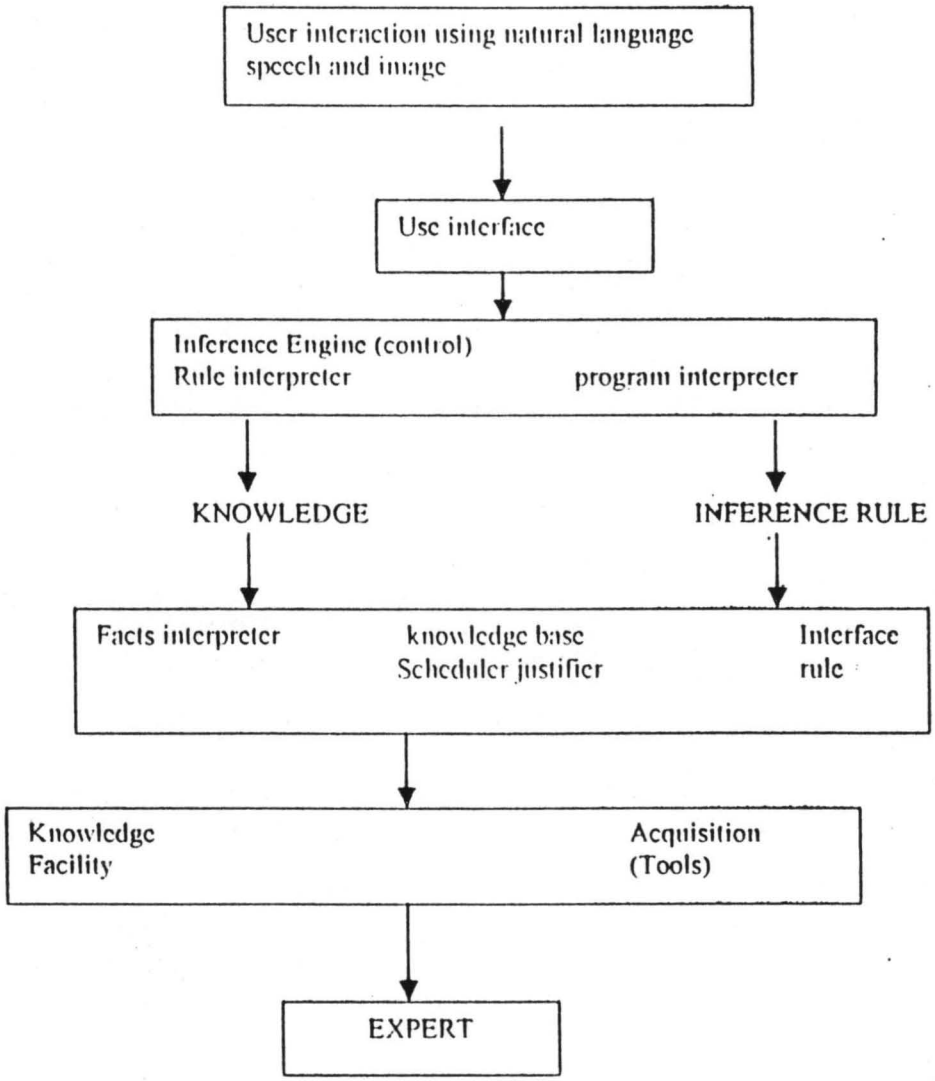
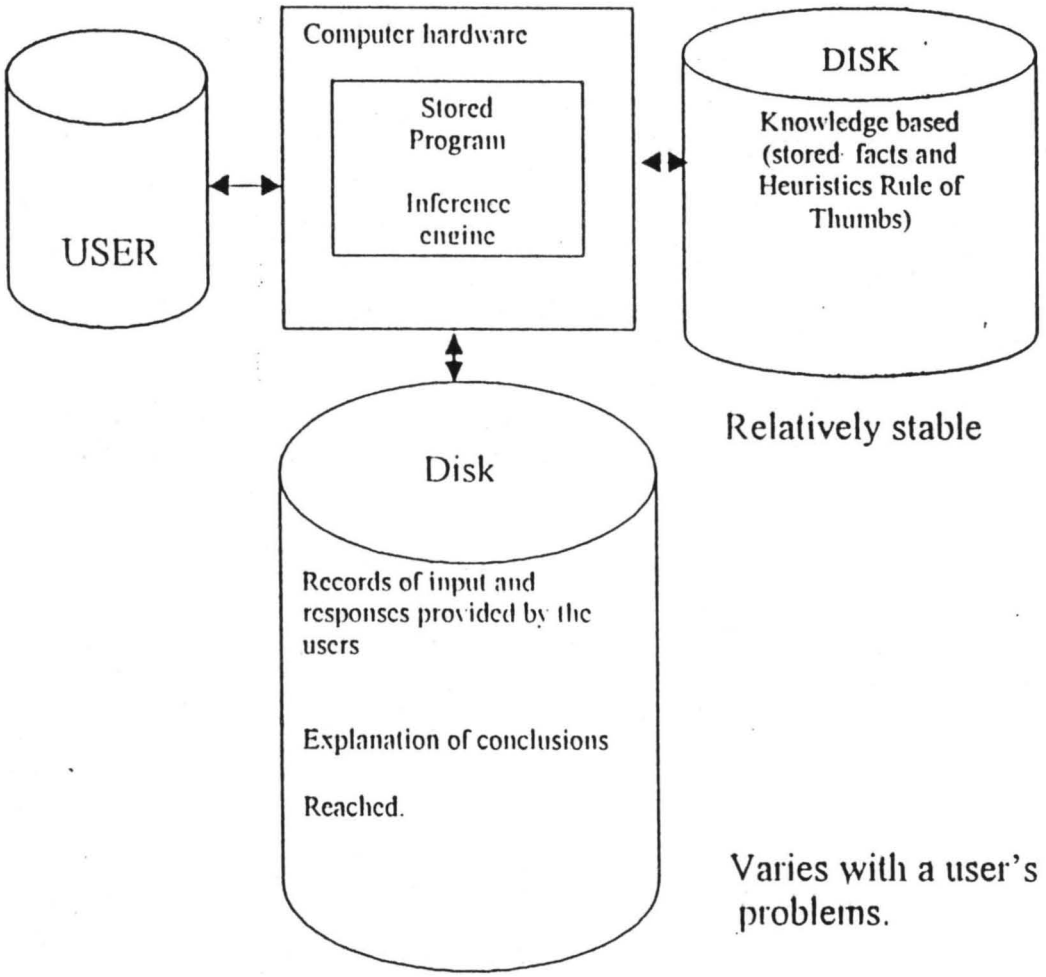


FIG 1 : A TYPICAL STRUCTURE OF EXPERT SYSTEM

The knowledge Base system (KBS)

The knowledge base is the central part of the Expert system. It contains rules describing relations or phenomena, methods and Knowledge for solving problems in the systems areas of expertise. The KBS can be thought of as consisting of factual knowledge and inference knowledge. The statement "Rain makes one well", is an example of factual knowledge. If you have a headache, then take two Paracetamol tablets" is an example of inferential knowledge

Fig 2 : Essential parts of a knowledge base system



THE INFERENCE ENGINE (IE)

The inference consists of operating rules and principles. The IE "knows" how to use KBS so that reasonably consistent conclusion (inference) can be drawn from the information in the KBS.

When the ES is queried, the IE decides which techniques are used to determine how the rules in the knowledge base are to be applied to the problems poses in the query. In effect, the IE runs the ES by determining which rules are involved and accessing the appropriate rules in the KBS. The IE executes the rules, determines when an acceptable solution has been found and passes the results to the user interface system.

(a) THE USER INTERFACE SYSTEM

The KB of an ES is assessed through the user interface system when a users query is to be processed. This part of the ES is that which communicates with the user. The user interface system both accepts information from the user and communicates information back to the user.

As a user describes the problems, the interface passes the information to the inference engine (IE),which in turns returns the available knowledge inferred from the KBS to the user interface system (UIS) in a user readable form.

(b) EXPERT SYSTEM SHELL

The user interface system (UIS) and inference engine (IE) both constitute what in called an Expert system shell. Several shells should be created, maintained and developed on the extension of the expect system (ES). An Es that exhibits flexibility allows for adding and updating of knowledge base.

(c) TYPES OF EXPERT SYSTEM

A system could be said to be an expect not just for the interface between man and machine or its inference engine, but for the rules or logics established KBS. Expert system are therefore divided into two types namely.

- Logic – based Expert system,
- Rule based – Expert system.

(i) LOGIC BASED EXPERT SYSTEM

In a logic based expect system, the KBS consist of statement in terms of predicate logic clause. These clauses are of two predicate forms: RULES and CONDITIONS. The rules contain condition numbers to possible goals. After the

Expert system is queried, the pattern to formed is match with database (KB) patterns. At the end of a successful search, matched pattern (containing condition numbers) triggers off the production rule that is related to the user interface system as output to the query.

Man in his daily life work with rules. These rules which are store in the memory (knowledge base) are pick up and appropriately applied to tackle the obstacles that across his way daily. A system is said to be expert based on its acquisition of rules and the ability of these rules in its filed of expertise.

(ii) RULE BASED EXPERT SYSTEM

Expert systems that are rule based are often and quite easy to build as well as maintained. A collection of rules making up the knowledge of the rule based system often test imputed data and by use of the inference engine interprets the data to itself, modify it if need be, perform operation on it, performs other actions of data test succeeds, present output to the user in user readable from or update its rule base, it data test fails. Such a rule based system exhibits flexibility as flow of control is determined by the program code but the data inputted as well as the contents of its knowledge base. Rule being more independent of one another than program codes brings about this flexibility.

The system for an independent rule based system is represented often by the "IF THEN STATEMENT" it is of form:

IF < CONDITION> THEN < ACTION>

The condition refers to the facts within the system (i.e. already existing in its knowledge base) based on the conclusion or previous rules. The conclusion of a rule therefore is determined from outcome of combining other rules producing some facts. These simple rules are chained together forming a complex chain of decision resulting to a fixed rule, which is the out come of the operation.

The advantage of the rule -based system over the logic based system in that new rules could be acquired and appended to existing sets of rules. This operation produces little or no problem as the system immediately adjusted itself is its recent amendments. This capacity allows for easy knowledge acquisition.

Rules are two sided, the antecedent (or left hand side) and the consequent (or right hand side) operation performed on rules are such that the antecedent sides are matched and then the consequent sides are executed or consequent side matched and the antecedent side set off for further matching.

1.4 Application of Expert Systems

Expert system has variety of applications in various field of human endeavor. Some of the earlier applications are in Mycin and Prospector. Mycin is an expert system developed for medical consultation while the prospector help in the field of geology.

Below are some of the applications of expert system in business. The systems are either currently in use or in development. In either case, they will give one a good feel for both the use and potential of expert system in business.

(i) Assembly

The RI expert system created and used by digital equipment corporation (DEC) is used to help build and assemble computer systems ordered by clients. .When a client order is input to the system ,it is configured by the system into schedules and diagrams showing the component required in the order and the relationship among those components (Michaelson and Michie,1986)

(ii) Auditing

An expert system has been developed for helping auditors select auditing procedures by which to verity a firm's accounts receivable.

Accounts receivable data such as internal control features, account collect ability, and so on are input to the program and recommended auditing procedures are output (Michealson and Michie,1986).

(iii) INSPECTION

The parts manufacturer has a vision-aided expert system that compares X-ray images of a machine part with specification drawing .If a defect such as crack is found , the system directs a carefully aimed laser beam as if to seal the crack and prevent it from spreading .

Also, the system creates a report that goes to quality assurance concerning the nature of the defect and the remedy required to correct it (Williason, 1987).

(iv) PRODUCTION

An expert system has been desired to analyze a manufacturer's production schedules, optimize the scheduling of resources , and identify opportunities to salvage materials in the rework pile for use in filling customer orders. Traditionally, it has cost less for company to discard unused materials than to spend time performing the complex calculations it would take to discover other uses for them .A typical process factory can have anywhere form 5 to 10 percent of its inventory in a rework pile at any one time. Turning even half of that amount into salable finished goods can have a significant on the company 's bottom line (Williamson,1967).

(v) **FINANCE.**

A program called FINANCIAL ADVISOR incorporate the financial advice of eight faculty members from MIT'S SLOAN school of management and ten senior financial officers from major corporation. FINANCIAL ADVISOR provides on such topics as investment projects, products, and merger acquisitions. The system has been validated through real world use and is available commercially

1.5 LIMITATION OF EXPERT SYSTEMS

Despite the various uses of expert systems in almost every field of human endeavor. It is not without limitations. The limitations of expert system are outlined below

1) The knowledge acquisition process (i.e. learning process) is a major limitation of expert system. Since computer programs are prone at making analysis most cannot learn from experience
2) High development cost. Even with the newer programming languages and approaches, expert system can be expensive to develop and use. Users with limited programming experience may find it difficult to develop and effectively use expert system. This is a limitation today, but future developments in software and expert system approaches may make the development and use of expert system more cost effective.
3) Expert system should be able to automated the input from various experts and integrate it, instead of having one experts acting as the sole source of knowledge.
4) Not widely use or tested. At this time, we are at the early stages of expert Systems development usage. Even though there is success, expert system is

not used in large number of organization. In other word, they have not been widely tested in corporate setting.

5) Difficult to use. Some expert system are difficult to use .In some cases, computer personnel or individuals trained in the use of expert systems are required to help the users get the most from these systems. Today's challenge is to make expert system easier to use by decision makers that have limited or no previous computer programming experience.

6) Difficult to maintain. Today's expert system can be difficult to maintain or update. Some are not responsive or adoptive to changing conditions Adding new knowledge and changing complex relationship may require programming skills.

7) Since the field is relatively new, there is a shortage of knowledge engineers, which are responsible for acquiring representing and programming expert knowledge.

The process of preparation of pharmaceutical product under an aseptic condition to a form that is well presentable, available and of good quality is referred to as formulation of pharmaceutical product. Also, the process of producing drugs according to the specification of the monograph to an acceptable, palatable and presentable in order to achieve the biological response on the patient is referred as Drug formulation

2.2 WHAT ARE DRUGS?

Drugs are chemical substances that have medicinal value or active principle in a medicinal preparation that can be used for curative and diagnostic purposes. Drugs elicit therapeutic activities by acting on the site of action especially at the receptor sites.

2.3 TYPES OF DRUGS FORMULATIONS

Drugs are formulated into different form based on the age of patient, weight of patient and the severity of illness, etc: The various forms of drug formulations are as follows; Tablets, Capsules, Powder, Solution, Mixture, Suspension, Emulsion, Creams, Pastes, Lotions, Ointments, Aerosol inhalations, Inject able. Ear, Eye and Nose preparation, Surgical, Suppositories etc.

DEFINATION OF DIFFERENT DRUGS FORMULATIONS

1) Tablets:

Tablets are solid single – dose forms which comprise medicament(s), usually with excipents, compressed or moulded into circular shapes with flat or convex faces, or other suitable shape. They are formulated to release the active ingredients in a way that will achieve the desired effect, and their quality is

6) Sustained – release tablets

Sustained –release tablets or slow tablets are usually formulated to provide an initial dose of the medicament and to release slowly further amounts to maintain a therapeutic response over a period of several hours.

An advantage of sustained –release tablet is the reduction that can be achieved in the frequency of administration.

7) Coated tablets

Coatings may be applied to tablets to protect the active ingredients from light and the atmosphere; coatings may also mask unpleasant tastes and odors or prevent contact with a substance of an irritant or potentially sensitive nature. The purpose of enteric coating is to control the location of drug release in the body whereas in sustained – release tablets the aim is to control the rate of release by suitable coatings on either the granule or the tablet cores. The main coating processes are pan coating, compression coating, and air – suspension coating.

2) SYRUPS

Syrups are concentrated aqueous solution of sucrose or other sugar to which medicaments or flavorings may be added. Glycerol, sorbitol, or other polyhydric are sometime added in small amount to medicament syrups to retards crystallization of sucrose or to increase the solubility of other ingredients.

Medicated syrups provide a convenient form of stock solution of certain drugs for use in extemporaneous preparations.

Flavoring syrups are not usually medicated but contain various aromatic or pleasantly flavored substances and are intended to be used as vehicles or flavors for extemporaneous preparation. They are of particular use in masking the disagreeable taste of bitter or saline drugs.

Dilute solutions of sucrose will support the growth of moulds; yeasts, and other micro –organisms. The apparatus used in the preparation of syrups should therefore be thoroughly cleansed before used. Water for preparation should be used and care should be taken to avoid contamination during preparation

Dilution of Syrups.

Unless otherwise indicated in the individual monograph, when a dose ordered or prescribed is less than or not a multiple of 5 milliliters, the syrups should be diluted appropriately with syrup so that the dose to be measured by the patient is one 5 – ml spoonful or multiple thereof.

Storage

Syrups should be recently prepared unless special precautions have been taken to prevent their contamination. Fruit syrups may be stored for longer period if they have been heated to boiling point and filled into sterile bottles, which are then sealed to exclude micro –organisms.

3) MIXTURES

Mixtures are liquid preparation intended for administration by mouth. They consist of one or more medicaments dissolved or suspended in an aqueous vehicle or occasionally in a suitable non –aqueous vehicle.

PRESERVATION OF MIXTURES

Mixtures, in common with other aqueous preparations, are liable to growth of bacteria and mould unless adequately preserved. Mixture that are prepared extemporaneously are not usually formulated to keep for long periods, but they are prepared with water of low bacterial content and most formulae include a preservative such as chloroform. When so indicated they should be recently

prepared. Some mixtures are also subject to chemical decomposition and an expiry date may be specified, in some cases they most be freshly prepared.

4) LOTIONS

Lotions are liquid preparation intended for application to the skin. The inclusion of alcohol in a lotion hastens its drying and accentuates its cooling effect, whilst the inclusion of glycerol keep the skin moist for a considerable time Lotion are applied, without friction, on lint or other soft absorbent fabric and covered with waterproof material, or dabbed on the skin.

5) CREAMS

Creams are viscous semi – solids and are usually either oil –in – water emulsion (aqueous creams) or water –in – oil emulsion (oily creams). Certain water – miscible bases which have a complex matrix – like physical structure are also known as "creams ", they are often anhydrous or contain only a small portion of water and are similar in appearances to traditional emulsion – type creams bases.

Creams are used to apply solution or dispersion of medicament to the skin for therapeutic or prophylactic purposes where a highly occlusive effect is not necessary. Bland creams may also be applied for their emollient, cooling, or moistening, effect upon the skin.

6) SOLUTIONS

Solutions are liquid preparations containing one or more solution ingredients usually dissolved in water. They are intended for internal or external use or for instillation into body cavities. They are issued sterile or unsterilised, depending on the purpose for which they are intended.

Sterile Solutions-

These include solution for external application to wounds and abraded surfaces, anticoagulant solutions, bladder irrigations, intraperitoneal dialysis solution, and concentrated solution for the preparation of injection.

7) SOLUTION – TABLETS

Solution tablets are compact product containing a medicament or a mixture of medicaments in compressed form and are intended, after being dissolved in water, to be used externally or on mucous surfaces. They are usually circular in shape with slightly convex surfaces.

8) CAPSULES

A capsule is a dose of one or more medicinal substances enclosed in a hard or soft (flexible) gelatin shell. Capsules are convenient for the oral administration of many solid or liquid substances, especially those that have unpleasant taste or odor.

9) PAINTS

Paints are liquid preparation for application to the skin or mucous surfaces. They are usually medicated with substances possessing antiseptic, astringent, caustic or, analgesic properties.

Resinous substances such as benzoic, prepared storax or Tolu balsam in ethereal solution are employed as bases of medicated varnishes

10) EYE DROPS

Eye –drops are sterile liquid for instillation into the conjunctiva sac, they contain medicament dissolved or suspend in aqueous or oily vehicles. Eye – drops may be in single dose forms consist of about 0.5 ml of the eye –drops in a flexible

applicator pack enclosed in a sealed outer container, the applicator pack and its contents are sterile.

11) EYE LOTIONS

Eye lotions are sterile aqueous solution used usually undiluted for bathing the eyes. There are two types of eye lotion,

1) Sterile aqueous solution which contain no bactericide; these are used once only for first –aid or for a period of treatment not longer than 24 hours.
2) Aqueous solution (sterile when issued containing a bactericide for intermittent domiciliary use for up to 7 days.

12) EYE OINTMENTS

Eye ointments are sterile semi –solid preparations for application to the conjunctiva sac or to the eyelid margin, they contain, medicament dissolved or dispersed in a suitable non –irritant basis.

13) SUSPENSIONS-

They are liquid preparation intended for oral administration. Suspension consists of one or more medicament suspend in an aqueous vehicle or occasionally in a suitable non aqueous vehicle. If consisting of suspending agents which are insoluble substances which do not diffuse evenly throughout the aqueous vehicle when shaken should be finally powered and mixed with compound tragacanth powder, sodium carboxymethyl cellulose, or other suitable suspending agent, sodium starch glycollate and certain pregelatinized starch may be suitable in some cases.

14) POWDERS

a) ORAL POWDERS

Oral powders are mixture of powder substances intended for administration by mouth. They are usually mixed with water before administration. But some are administered by mixing with animal rations. They consist of a powdered medicinal substances or a mixture of powder medicinal substances, sometime with the addition of adjuvant such as dilutes and dispersing agents.

b) DUSTING _ POWDERS

Dusting powders are used externally and are usually mixture of two or more substances in fine powder free from granule. They should not be applied to open wounds or to raw surfaces of large area. Dusting – powder should be dusted highly on the affected area.

15) EMULSIONS

An emulsion consist of two immiscible liquid phases, one of which is finely subdivided and uniformly dispersed in the other, the system is stabilized by the presence of an emulsifying agent. The dispersed liquid or internal phase usually comprises globules of size down to 0.1 micrometer, which are distributed within the external or continuous phase. In pharmaceutical emulsion, one phase is usually water while the other is an oil, fat, or waxy substances and systems are referred to as oil – in – water or water – in – oil.

16) EAR DROPS

Ear drops are solution or suspension of medicament in water, glycerol, diluted alcohol, propylene glycol, or other suitable solvent, for instillation into the ear. Phenol ear drops are used in the treatment of otitis media and of boils in the ear.

17) INJECTIONS

Injection are sterile solution, suspensions, or emulsions that contain one or more medicament in a suitable aqueous or non –aqueous vehicle, they are intended to be administered parenterally to produce a localized or systemic, rapid or sustained response. The parenteral route of administration is often adopted for medicament , which cannot be given orally because of patient intolerance or because of instability, therapeutic in activity, or poor absorption. In an emergency, an injection can provide a rapid and effective response.

18) AEROSOL INHALATIONS

An aerosol inhalation consist of a solution or suspension of a medicament in a mixture of inert propellants which is held under pressure in an aerosol dispenser, which consist of a suitable container fitted with a special metering valve. In the case of a solution, the medicament is dissolved in a solvent (co-solvent) which is miscible with the propellants. The particle size of the medicament in a suspension and the droplet size of a solution must be controlled so that, when the aerosol is inhaled, the medicament reaches the region of the respiratory tract where it is intended to be deposited. The preparation may also contain surface- active agents, stabilizing agents, and other adjuvant.

2.4 EFFECT AND USES

1) Tablets e.g Paracetamol tablets

ACTIONS AND USES

Paracetamol has analgesic and antipyretic actions. It is used in the treatment of pain, such as headache, toothache, rheumatism, and neuralgia.

Dose: paracetamol is given by mouth in a dosage of

0.5 to 1 grm every 3 or 4 hours with a maximum of 4 grams in 24 hours.

The usual dose for a child under 1 year is 120 milligrams, and for a child of 1 to 5 years 250 milligrams.

Side effects: Side effect are rare, but rashes, blood disorder, acute pancreatitis reported after prolonged use, liver damage (and less frequently renal damage) following over dosage.

2) Mixture e.g Magnesium Trisilicate

Actions and uses:

Magnesium trisilicate has adsorbent and antacid properties and is non – toxic even in very large doses. It is used in the treatment of dyspepsia, gastric hyperacidity and heartburn.

Dose: Magnesium trisilicate is usually given in a dosage of o.5 to 2 grams, to repeated in accordance with the needs of the patient

Side effects: Magnesium trisilicate may cause diarrhea. The release of carbon dioxide in the starch may cause flatulence and eructation.

3) Capsules e.g Chloramphenicol

Action and uses: chloramphenicol is an antibiotic with a bacteriostatic action which has a wide range of antimicrobial activity. It acts against salmonella typhi and salmonella paratyphi.

It is used in the treatment of typhoid and paratyphoid fevers, furunculosis, impetigo, eye or ear infections. It is used in the treatment of haemophilus influenza, meningitis, chronic infection of the urinary tracts with a sensitive strain of proteins vulgaris that is resistant to other antibiotics, and rickettsial infection which do not respond to treatment with other drugs.

Dose: Usually administration by mouth in a dose of 500mgs every 6 hours for an adult. For a child, the usual daily dosage is 25 to 50 mgs per kilogram body – weight given in a divided dose at interval of 6 hours.

Chloramphenicol is usually administered in capsules, patient unable to swallow the capsules may be given the antibiotic by mouth as a suspension of the palmitate

Chloramphenicol may be given to seriously ill patient by injection of aqueous solution of chloramphenicol sodium succinate.

Side effects: The most serious toxic effect caused by chloramphenicol is that ccasionally exerted on the haemopoietic system, resulting in agranulocytosis, thrombocytophenic purpura, or aplastic anaemia.

4) Injections e.g. Tubocurarine

Action and uses: Tubocurarine produces relaxation of voluntary muscle by reducing its response to Acetylcholine. When administered intravenously it produces first fatigue, then weakness, and finally, paralysis of voluntary muscle, beginning in the eyes and spreading to the face, neck, limbs, abdomen. Intercostal muscles, and diaphragm, recovery of muscle function occur in the reverse order.

Dose: Tubocurarine chloride is used chiefly as an adjunct to anaesthesia to secure muscular relaxation in surgery for this purpose, 10 to 20 mgs of Tubocurarine chloride is given by intervenous injection followed it necessary, as indicated by

the degree of muscular relaxaion, by further doses of 2 to 4 mgs at intervals of about 30 minutes up to a total of 45 mgs, provide that adequate methods for dealing with respiratory failure are at hand.

EAR DROPS : e.g Phenol ear drop

Action and uses: phenol ear drops are used in the treatment of otitis media and of boils in the ear.

Dose: Prescribed drops to be applied on the affected part of the ear.

Side Effects: - With continued application, phenol penetrates into deeper tissues causing paralysis of sensory nerve endings and painless gangrene.

LOTIONS e.g Calamine lotion

Action and uses: - Calamine has a mild astrigent action on the skin and is used in dusting powders, lotion and ointment to relieve the discomfort of dermatitis pruritus. Calamine lotion cools the skin by evaporation and is useful for allaying the pain and swelling of sunburn –oily calamine lotion is a soothing application for the treatment of eczema. It is used to treat acute inflammatory skin diseases with vascular eruptions, exudation, oozing and crustings.

Dose: frequent application to the affected parts

Side effect: skin irritation

7) **SOLUTIONS e.g Ammonium chloride**

Action and uses: Ammonium chloride is an ingredient of expectorant cough mixture. It is used in the treatment of urinary infections. It also aids the elimination of lead in lead poisioning.

It is occasionally used by intravenous infusion in the treatment of alkalosis

Side Effect: Nausea, vomiting, thirst, headache, hyperventilation, progressive drowsiness, mental confusion and hyper chloraemic acidosis.

8) **PAINTS: Crystal violet paint (Gentian violet paint)**

Action and uses: crystal violet is an antiseptic with a selective action on Gram Positive organisms. 0.5% solution is used in the treatment of burns, boils, car buncles, and mycotic skin infections.

A solution containing 0.5% each of crystal violet and brilliant green has been used for disinfecting the skin.

Dose: - Apply to the affected part.

Advice for patient: The paint stains skin, haw and fabric

9) **OINTMENTS: e.g. compound benzoic acid ointment (whitflefld's ointment)**

Action and uses: Benzoic acid has antibacterial and anti fungal properties. Is it used in the treatment of fungal infection of the Skin

Dose: To be applied sparingly to the affected area

Side effect: Excessive dryness or irritation of the skin occurs.

10) **CREAMS e.g.** Hydrocortisone. Action and uses: used as anti-in flammatory agents in a large number of disorders.

Dose: Apply 3 or 4 times daily

Side Effects: Hydrocortisone causes cushings syndrome such as rounding of the face. Hirsutism, acne, striae over the hips and shoulders.

EYE DROPS: Chloramphenicol eye drops

Action and uses: ocular infections

Dose: 1-2 drops 4 times daily (up to hourly in severe cases

Adverse effects: Blood dyscrasias

EYE LOTIONS: e.g. Sodium chloride actions and uses: sodium is the most important salt for maintaining the osmotic tension of the blood and tissues.

Dose: To be applied on the affected eye

Side Effects: Oedema

Aerosol inhalations e.g. Salbutamol

Action and Uses: Salbutamol is a directly actions sympathomimetic amine. Its main action is on the adrenergic receptors in the bronchi and the respivatory tract rather than on the cardiac receptors. It induces bronchodilatation and inhibits bronchospasm in dose that do not produce marked cardiac acceleration. It is used in the treatment of asthma, chronic bronchitis, emphysema, and other bronchopulmonary disorders involving branchospasm.

Doses: It is administered as an aerosol inhalation in doses up to 200micrograms 3 or 4 times daily. The usual dose for children is one inhalation of 100Microgram 2 to 4 times daily

Side Effects: Palpitations and tachycardia may occur in some patients. It may give rise to muscle tremors.

Lotion: Benzyl Benzoate lotion

Actions and uses:

Benzyl benzoate is an acaricide used in the treatment of scabies.

It is also used in the treatment of pediculosis of the scalp, body and pubis

Dose: Benzyl benzoate application is applied over the whole body surface below the neck and is allowed to dry.

Side effects: Transient burning of the skin; occasional skin eruptions.

POWDER

(1) **Oral powder:** Oral Rehydration salts. Action and uses: for the treatment of dehydration due to diarrhoea

Dose: Dissolve the entire contents of packet in one litre of drinking water.

Infant: one litre over 24 hour period. Children one litre over an 8 to 24 hour period, according to age

Adults: drink freely as required.

Side: administration of large qualities may produce oedema, owing to accumulation of salt in the tissues.

Solution e.g. chloroform mater

Actions and Uses: it is used as a preservative for Pharmaceutical mixtures, and aqueous extracts of vegetable and animal tissues.

Dose: 10 to 30 mls to be used in pharmaceutical mixtures

Side Effects: Abdominal pain and vomiting

2) **Dusting powder e.g** Zinc starch and talc dusting powder

Action, and Uses: Zinc oxide is applied externally in dusting powders as a mild astringents for skin as a soothing and protective application in eczema and as a protective for slight excoriations

Dose: To be applied Sparingly on the affected part

Side Effect: Causes skin Irritation.

2.5 DRUG FORMULATION PROCESSES

1. Production of Paracetamol tables 500mg

Batch processing record/ instructions

Batch Number..... Manufacturing date.....

Batch size ..... Edited by .....

Production Manager

Product code.....

CLEANING

Last product manufactured .....

Batch number.....

Batch size .....

Cleaning of production area

And equipment **signature of officer**

Involve and date

- Ceiling .....
- Walls .....
- Windows .....
- Floor .....
- Containers for weighing .....
- Weighing Balances .....
- Quadro comil .....
- Mixer Granulator .....
- Fluidised bed dryer .....
- Cubic mixer .....
- Communiting machine .....
- Tabletting machine .....

- Deduster .....
- Containers for collecting tablets

Weigh accurately the ingredient as per the formula. Checking before processing operations. Production managers

Sign .....

FORMULA

S/No	MATERIAL	QTY(KG)	GROSS	NET	TARE	SIGN/DATE
1	Paracetamol powder B.P	100				
2	Starch B.P	17.6				
3	Microcrystalline cellulose B.P	1.8				
4	Benzoic acid B.P	0.06				
5	Talc B.P 0.5%	565g				
6	Magnesium stearate B.P 0.5%	565g				

Preparation

(A) Starch Paste

i) To each of the 3.6kg starch weighed separately into two plastic containers, add 4liters of water to make a slurry.

ii) To this add the benzoic acid powder

iii) Measure as 9 liter, of water into each of the cooking pot provided

iv) Heat the water to boiling and rapidly pour the boiled water into the slurry and allow to set. Turn to ensure that a paste is formed.

Time processing started ..... Time ended .....

Repeat the procedure and allow to the set and control.

B) GRANULATION

i) Checked the cleanliness of the mixer granulation. Checked by ..... Confirmed by .....

ii) Introduce the Paracetanol powder, microcrystalline cellulose and the corn starch into the mixer granulator and mix using speed iv for 10minutes.

Time started .....Time completed .....

iii) Introduce the starch paste and mix, using speed ii for both mixer and granulator for 7 minutes

Time stared ..... Time completed

iv) Collect the wet granules into the clean fluidised bed dryer container by a fraction of about 60kg.

C) DRYING

1) Check the clean lines of the fluidized bed dryer

Checked by .....confirmed by .....

2) Load the fluidizes bed dryer (FBD) containers with a quantity of wet granules (about 60kg tree of lumps) this container loading should be done just before drying to avoid settling. Break any lumps before drying.

3) Place the container or position in the dryer. Fasten the 4 clamps.

4) Select on the controller any entry temperature of between 20-30^{o}C and initiate fluidization for 10 minutes

Time started ..... Time completed .....

5) Observe that the wet product is lifted up after 1 or 2 minutes of blowing air. If the product moves too much either at the start or later on during drying reduce air flow by putting butterfly valve in position 1 or 3 if product is not lifted up place the knob on position 2 and press "Fermenture" and release. If product is not still lifted up, remove and

reduce the quantity of the lumps that may have formed and continue the process.

6) After 10 minutes start heating at 60°C

Time heating started.....Time ended .....

7) At the end of the drying time of 30-45 minutes unlock the clamps, lower the container and trolley to discharge the product.

Time drying completed .....

8) Call Quality control department to take the samples for moisture content determination. Re-dry if necessary.

9) Repeat above procedure for all the loaded containers.

Sampled by .....

Moisture content (1).....%

(2).....%

(3).....%

(4).....%

Average moisture content .....%

10) Check the clean lines of the comminuting machine

Checked by ..... confirmed by.....

11) Pass the dried product through the communiting machine of necessary.

Time started..... Time completed .....

12) Call quantity control department to take and determining the particle size and the moisture content of the granules (standard = ≤ 2%)

Average particle size ..... Average moisture content.....

13) If drying and size reduction are no longer required transfer the balk dry power to the certified clean dry cubic mixer or granulation mixer

Transferred by ..... Checked by .....

14) Add the weighed magnesium stearate and Talc to the bulk in (12) above and mix for 15 minutes Time started .....Time ended

Time Started .....Time ended

15) Call quantity control department to ascertain the uniformity of mixing, the final moisture content and average compression weight of the granules

Sample by ..... Time .....

Remark on mixing ..... Sign /Date

Average particle size .....Sign /date

Average compression weight .....Sign/date

TABLETTING

1) Check the cleanliness of the tabletting machine, deduster and collection Trays/containers

Cheeked by: ..... Conformed by .....

2) Call the maintenance department to ascertain the state and worthiness of the machine for use in this operation.

Cheeked by ..... Approval for use by .....

3) Successively start the tablet press, vaccum cleaner and the deduster.

4) Adjust the average weight to conform to value in (15) above

5) Adjust the hardness to conform to standard (5-8Kgf)

6) Start the tabletting, check and record at specified time interval the following

parameters – unitary and average weight, friability, hardness, disintegration time of the tablets.

7) Collect the tablets in the clean dry, polythene lined, plastic containers provided.

8) Transfer the compressed tablets to quarantine room.

9) Call quality control department to observe and place their appropriate labels.

10) Remove the tablets certified ready for packing to the packaging area and sort them out.

Sorted by (1).....

(2).....

(3).....

11). Check the cleanliness of the plastic containers, the polythene bags, and the countering machine

Check by (1) ..... Confirmed by .....

12) Pack the sorted out tablets in the required pack size into the product polythene bags using the preset counting machine, seal using the sealing machine and pack into appropriate containers. Operator ----------

Time started ---------- time completed.....

13) Cover the packed container with the snap – shot cover, label and package the products into the outer action.

14) Using the masking tape, seal each completed carton and affix carton labels.

Production manager' sign

.....

2) LIQUID FORMULATION.

a). Magnesium Trisilicate.

Magnesium Trisilicate had adsorbent and antacid properties and is non – toxic even in very large doses. It's action is exerted shortly, so that it does not give such rapid symptomatic relief as the alkali carbonate, bicarbonates and oxides. Magnesium trisilicate is usually gives in a dosage of 0.5 to 2grams, repeated in accordance with the needs of the patient.

Preparation.

Magnesium Trisilicate Suspension.

FORMULAR FOR PREPARATION.

Magnesium trisilicate 50g

Light magnesium carbonate 50g

Sodium bicarbonate 50g

Peppermint emulsion, concentrated 25ml

Chloroform water double strength 50ml

Water for preparations .....to 1000mls

It should be recently prepared.

Calculation For Preparation.

From the formula above, to prepare 100mls of magnesium trisilicate.

1000mls of magnesium trisilicate mixture contain 50gm of magnesium trisilicate

100mls of the magnesium trisilicate will contain 50/1000 x 100/1 = 5g magnesium trisilicate.

1000mls of magnesium trisilicate contain 50g of light magnesium carbonate.

100mls of magnesium trisilicate will contain 50/1000 x 100 = 5g of magnesiu trisilicate.

1000mls of magnesium trisilicate contain 50g of sodium carbonate.

100mls of magnesium trisilicate will contain 50/1000 x 100/1 = 5g of sodiu carbonate.

1000mls of the magnesium trisilicate contain 25mls of peppermint emulsic concentrated.25/1000 x 100/1 = 2.5mls.

100mls of the magnesium trisilicate contain 500mls pf chloroform water, doub strength.

500mls of the magnesium trisilicate will contain 500/1000 x 100 = 50mls.

Water Add to ..... 100mls.

METHOD.

1). Weigh 5gms of magnesium trisilicate powder into a mortal and triturate with pestle.

2) Weigh 5gms of light magnesium carbonate into the same mortar and triturate with magnesium trisilicate powder.

3) Weigh 5gms of sodium bicarbonate into the mortar and triturate to form homogenous mixture of magnesium trisilicate, light magnesium carbonate and sodium bicarbonate powder mixture.

4) Add 50mls of chloroform water to the homogenous powder to form a pour able mixture.

5) Pour the content in the mortar into a graduated 100mls bottle.

6) Add 2.5mls of peppermint emulsion, concentrated to the mixture and shake the bottle.

7) Add water to the mixture to make up the volume of the mixture to 100mls and shake the bottle again.

8) Use a suitable cap to cap the bottle.

9) Label the mixture as a suspension.

10) A direction to shake the bottle before use should be given on the label.

11) A direction on the dose i.e. 10mls to be taken with tablespoon should be on the label.

12) Advice should be given to the patient on the label such as the "The mixture" may be taken alone or with meal.

Also, the mixture should not be used for longer than a few days without medical advice.

B) FORMULATION OF AMMONIUM CHLORIDE AND MORPHINE MIXTURE.

FORMULA FOR PREPARATION.

Ammonium chloride .....30g.

Chloroform and morphine tincture.....30mls.

Ammonium bicarbonate.....20g.

Liquorices Liquid Extract.....50mls.

Water for Preparation.....to 1000mls.

Calculation for preparation of 100mls of Ammonium chloride and morphine mixture

Ammonium chloride.

1000mls of the mixture contain 30g of Ammonium chloride.

: - 100mls of the mixture will contain 30/1000 x 100 = 3g.

Chloroform and morphine tincture.

1000mls of the mixture contain 30mls of chloroform and morphine mixture.

: - 100mls of the mixture will contain 30/1000 x 100mls =3mls

Ammonium bicarbonate.

1000mls of the mixture contain 20g of Ammonium bicarbonate.

: -100mls of the mixture will contain 20/1000 x 100 = 2g.

Liquorices Liquid Extract.

1000mls of the mixture contain 50mls of liquorices liquid extract.

: -100mls of the mixture will contain 50/1000 x 100 = 5mls.

Water for preparation.....to 100mls.

METHOD.

1). Weigh 2gm of Ammonium bicarbonate on a chemical balance into a mortar and triturate.

2) Weigh 2gm of Ammonium chloride on a chemical balance and triturate bit by bit with Ammonium bicarbonate in a mortar until we get homogenous powder.

3) Using a measuring cylinder, measure 50mls of water and add it to the homogenous powder in a mortar to form a pour-able mixture.

4) Transfer the mixture into a 100mls graduated bottle.

5) Using a measuring cylinder, measure 30mls of the chloroform and morphine tincture in a bottle containing the mixture and shake the bottle.

6) Using a measuring cylinder, measure 5mls of liquorices liquid extract into the mixture in the bottle and shake the contents well.

7) Add more purified water to make up the 100mls in the bottle.

8) Label the product as mixture.

9) Give directions for its uses: Two 5mls teaspoonful to be taken three times daily.

10) Store the product in a cool place.

3). SYRUPS.

Preparation of syrups.

FORMULA.

Sucrose.....667g.

Purified water.....to 1000g.

To prepare 100mls of sucrose syrup.

1000g of syrup contain 667g of sucrose.

: -100g of sucrose syrups will contain 667/1000 x 100 = 66.7g

Purified water to.....to 100mls.

NEW FORMULA

Sucrose.....66.7.

Purified water.....to 100mls.

METHOD.

1) Weigh 66.7g of sucrose into a beaker.
2) Boil 50mls of water and add 66.7g of sucrose until it fully dissolved.
3) Add sufficient purified water to make up the volume to 100mls.
4) Pour the sucrose syrups into a bottle calibrated to 100mls mark and cap it.
5) Label the product as syrup.

4). INJECTION.

Preparation of Tubocurarine injection.

FORMULA.

TUBOCURARINE INJECTION.

Tubocurarine chloride.....1g

Water for injection, free from dissolve air.....to 100ml.

METHOD.

To prepare 100ml of tubocurarine injection.

1) Weigh 1gm of tubocurarine chloride into a beaker already sterilized.
2) Measure 100mls of water for injection, free from dissolved air and add 50mls into the beaker.
3) Add sufficient water to produce the required volume of 100mls.
4) Distribute the solution into 1ml ampoules each (to 100 ampoules)
5) Replace the are in the ampoules by nitrogen or other suitable gas
6) Seal the ampoules immediately and sterilized by heating in an autoclave.
7) Each ampoule will contain 10mg of tubocurarine chloride in 1ml.
8) Label the product as tubocurarine chloride injection 10mg/ml

5). POWDER.

Preparation of powder: Oral and Dusting powder.

a) Preparation of Oral powder.

Preparation of Oral Rehydration salts B.P

FORMULA

Glucose anhydrous.....20.0g

Sodium chloride.....3.5g

Tri sodium Citrate dehydrate B.P.....2.9g

Potassium chloride B.P.....1.5g

27.9g

METHOD.

To prepare 27.9g of oral dehydrators salts B.P.

1) Weigh 1.5g of potassium chloride B.P into a mortar.
2) Weigh 2.9g of trisodium citrate dihydrate B.P into the mortar and triturate

3) Weigh 3.5g of sodium chloride B.P and triturate gradually with other content in the mortar

4) Weigh 20.0g glucose anhydrous into the mortar and triturate gently until homogenous smooth powder in obtained

5) Wrap the powder in a clean paper and lable as powder

6) Direction for use: Dissolve the entire contents of the packet in one litre of drinking water.

7) Warning : discard the remaining solution after 24 hours.

b) Dusting Powder

e.g. Zinc, Starch, and talc dusting powder

Formula for Preparation

Zinc oxide 250g

Starch in powder 250g

Purified talc, sterilized 500g

To prepare 1000g of Zinc, starch and Tale powder

New formula; as above

Zinc oxide 250g

Starch in powder 250g

Purified talc, sterilized 500g

METHOD

1. Weigh 25g of Zinc oxide on a weighing balance into a beaker
2. Weigh 250g of starch in powder into another beaker
3. Weigh 500g of purified talc, sterilized into another separate beaker

4. Weight out 100g of each powder into a mortar and triturate gradually. Continuing doing this until all the powder have been fully incorporated into the mortar to give homogenous powder.
5. The homogenous powder is then packed into an Aluminum tin and well capped with a perpetrated plastics cap.
6. Label the product us a dusting powder for external use only
7. Direction for use the dusting powder should be dusted lightly onto the affected are.
8. Caution: It should not be applied to open rounds or to raw surfaces of a large area.

6. PREPARATION OF SOLUTION

9. PAINTS

e.g. Crystal violet pants (GV. Pants)

Formula to preparation

Crystal Violet 5g

Water for preparations .....to 1000ml

To prepare 60mls of crystal violet pants

Calculation

1000mls of crystal violet pants crystal violet

: - 60ml of crystal violet will contain 5/100 x 60/1 C 0.3g

New formula for preparation

Crystal violet 0.3g

Water of preparation .....60mls.

METHOD

1) Weigh 300mg of crystal violet powder into a mortar and triturate with pestle
2) Add 30mls of purified water into the mortal to give a pourable mixture
3) Transfer the mixture into an amber bottle graduated to 60mls bottle
4) Make up the volume to 60mls by adding the purified water
5) Label the product as a gentian violet paint for external use only

Uses: Crystal violet is an antiseptic with a selective action on Gram positive organism. If does not 30 late the skin. A 0.5% solution is used in the treatment of burn; buts, carbuncles, and Mycotic skin infection.

A solution containing 0.5% each of crystal violet and brilliant green has been used for disaffecting the skin

b) Preparation of chloroform water

Formula

Chloroform 2.5mls

Purified water,

Freshly boiled and cooled .....1000ml.

To prepare 100ml chloroform water

1000mls of the chloroform water contain 2.5mls of chloroform

: - 100mls will contain 2.5/100 x 100 = 0.25mls

News formula

Chloroform 0.25mls

Purified water, freshly

Boiled cooled .....100mls.

Steps of preparation

1) Measuring 0.25mls of chloroform into an amber bottle graduated to 100mls mark
2) Add 20mls of purified water, freshly boiled and cooled into the bottle each time and shake the bottle to form homogenous mixture until 100mls mark is attained
3) Label the products as chloroform water
4) Direction 0.25 % as a useful preservative for pharmaceutical.

7 EYE DROPS

e g. Chloramphenicol eye drops

formula for preparation:

Chloramphenicol 05g

Phenly mercuric acetate or nitrate 0.002g

Borax 0.3g

Boric acid 1.5g

Purified water .....to 100mls

To prepare 10mls of chloramphenicol eye drops

Calculation

100mls of the chloramphenicol eye drops contain 0.5g of chloramphenicol

: - 100mls with contain 0.5/100 x 10 = 0.05g

100ml of the chloramphenicol eye drop contain 0.002g % phenyl mercuric acetate or nitrate.

: - 10mls will contain 0.0021/100 x 10 0.0002g.

100ml of Chloramphenicol eye drop contain 0.3g of borax

: - 10mls will contain 0.3/100 x 10 = 0.03g

100ml. of chloramphenicol eye drop contain 1.5g of Borax and

: - 10 ml will contain 1.5/100 x 10 = 0.15g

Purified water to ..... 10mls.

METHOD;

1) Weigh 0.03g (30mg) of Borax into a beaker
2) Weigh 150mg of Boric acid into the contents in some beaker
3) Weigh 0.2mg of phenylmercuric acetate or nitrate on a class A balance into the beaker and dissolve together with the aid of heat;
4) Adjust the temperature of the solution to 60°C.
5) Add 50mg of weighed chloramphenicol powder into the beaker and maintain the temperature at 60°C until the chloramphenicol is dissolved.
6) Cool the solution and add sufficient purified water to produce the required volume and mix well.
7) Sterilize the solution by titration and transfer by means of an aseptic techniques to sterilized container graduated to 10mls which is then closed so as exclude micro-organisms.

8) Clarified the solution by filtration. Transfer it to the final containers which are then closed to exclude micro-organisms and sterilize it by maintaining at 98°C to 100°C for 30 minutes.

9) The eye drops should not be issued for use later than 30 minutes from the date of preparation when stored at room temperature in an opened container.

10) Label the product for external use only on the affected part

11) Direction for use: Apply a drops on the affected eye.

8) PREPARATION OF OINTMENTS.

FORMULA FOR PREPARATION

Compound benzoic Acid ointment (WHITFIELD'S OINTEMENT)

Benzoic acid, in fine powder 60g

Salicylic acid, in fine powder 30g

Emulsifying ointment 910g

Prepare the emulsifying ointment fresh.

Formula for preparing emulsifying ointment

Emulsifying wax 300g

White soft paraffin 500g

Liquid paraffin 200g

1000g

---

1). Weigh 300g of emulsifying was in a beaker

2). Weigh 50g of white soft paraffin into the same beaker and mix together until it fully incorporated.

3) Weigh 200g of liquid paraffin and add it to the contents of the beaker

4). Melt together and stir until cold.

The emulsifying ointment can be use to prepare Compound Benzoic acid ointment as follows:

To prepare 1000g of compound Benzoic acid ointment.

1). Weigh 30g of salicylic acid in fine powder into a mortar

2). Weigh 60g of Benzoic acid in fine powder into a mortar containing 30g of Salicylic acid powder and triturate together

3). Weigh 600g of emulsifying ointment into the mortar and triturate until smooth and gradually incorporate the remainder of the ointment until the weight is 1000gm.

4). The smooth ointment is then packed into a plastic jar and label

5). The direction for use in placed on the label as an ointment to be applied sparingly on the affected area

6) Caution: prolonged used should be avoided and its use should be discontinued if excessive dryness or Irritation of the skin occurs.

9 CREAM

HYDROCORTISONE CREAM

Formula for preparation

Hydrocortisone or hydrocortisone acetate in ultra fine powder 10g

Chlorocresol 1g

Cetomacrogol emulsifying ointment 300g

Purified water, freshly boiled and cooled 689g

1000g

Formula for preparing cetomacrogol emulsifying ointment

Cetomacrogol emulsifying wax 300g

Liquid paraffin 200g

White soft paraffin 500g

Method to prepare 1000g of cetomacrogol emulsifying wax

1). Weigh 300g of cetomacrogal emulsifying wax into a beaker.

2). Weigh and add 200g of Liquid paraffin into the same beaker

3). Weigh and add 500g of white soft paraffin into the beaker and melt together.

4). Stir the contents until cool.

The cetomacrogol emulsifying wax obtained can then be used to prepare hydrocortisone creams as follows.

To prepare 20g of hydrocortisone cream.

1000g of hydrocortisone cream contain 10g of hydrocortisone in ultra-fine powder

: - 20g of hydrocortisone will contain 10/1000x 20/1 = 0.2g ·

1000g of hydrocortisone cream contain 1g chlorocresol

: - 20g of hydrocortisone cream with contain 1/100 x 20/1 = 0.02g

1000g of Hydrocortisone cream contain 300g of cetomacrogol emulsifying ointment

: - 20g of hydrocortisone will contain 300/1000 x 20/1 = 6g

1000g of hydrocortisone cream contain in 689g of purified and freshly boiled water

: - 20g will contain 689/1000 x 20/1= 13.78g

METHOD

a) Weigh 0.02g of chlorocresol into the beaker and add water,melt with the aid of gentle heat.

b) Melt the cetomacrogol emulsifying ointment on a water both

c) Add the chlorocresol solution at the same temperature

d) Stir the content until cold and incorporate the hydrocortisone or hydrocortisone acetate. A phosphate buffer may be included.

e) Pour the content into a plastic jar and label.

f) Label the product as for external use only.

LOTION

e.g. Benzyl Benzoate Application (B.B Lotion)

Formula for preparation

Benzyl benzoate 250g

Emulsifying wax.....20g

Purified water, freshly

Boiled and cooled .....to 1000ml.

To prepare 100ml of benzyl benzoate application

Calculation

1000ml of the benzyl benzoate lotion 250g of benzyl benzoate

: - 100ml of the Benzyl benzoate lotion will contain 250/100 x 100 =25g

1000ml of the benzyl benzoate lotion contain 20g of emulsifying water

: - 100ml of the Benzyl benzoate lotion will contain 20/1000 x 100/1 = 2g

add purified water, freshly boiled and cooled to 100ml.

METHOD

1) Weigh 2g of emulsifying wax into a beaker and melt at a lower temperature
2) Weigh 25g % Benzyl benzoate and mix gradually with the 5g of emulsifying wax until fully mix
3) Warm the mixture together.
4) Pour the warm mixture into most of the water, previously warmed to the same temperature
5) Stir the content thoroughly:
6) Add sufficient water to produce the required volume and mix.
7) Pure the content into a 1000mls graduated bottle and cap.
8) Label the product as lotion
9) Direction for use: Applied on the affected body with the aid of a suitable brush and allowed to dry.
10) Caution: not to be applied to broken or inflamed skin.

2) CALAMINE LOTION

Formula for preparation

Calamine 150g

Zinc oxide 50g

Sodium citrate 5g

Bentonite 30g

Liquefied phenol 5ml

Glycerol 50ml

Purified mater, freshly

Boiled and cooled to .....1000ml.

To prepare 100ml of calamine lotion

Calculation

1000mls of calamine lotion contain 150g of calamine

: - 100mls of calamine lotion will contain 150/1000 x 100/1 = 15g

1000mls of calamine lotion contain 5g of sodium literate

: - 100g of calamine lotion will contain 5/1000 x 100/1 = 0.5g

1000mls of calamine lotion 30g of bentonite

:- 100mls of calamine lotion will contain 30/1000x100/1 =3g

1000mls of calamine lotion will contain 5mls of liquefied phenol

: - 100mls of calamine lotion will contain 5/1000 x 100 = 0.5mls

1000mls of calamine lotion contain 50ml of glycerol

: - 100mls of calamine lotion will contain 50/1000 x 100 = 5mls

Purified water freshly boiled and cooled to 100mls

METHOD

1). Weigh 0.5g of sodium citrate into a mortar.

2). Weigh and add 3g of bentonite into the same mortar and triturate

3). Weigh and add 5g of zinc oxide into the same mortar and triturate

4). Weigh and 15g of calamine into the same mortar and triturate until homogenous power is obtained

5). Add 70mls of purified white, freshly boiled and cooled to make a pour able mixture

6). Add 5mls of glycerol and triturate well.

7). Pour the mixture into a calibrated 100mls bottle

8). Add 0.5mls of liquefied Phenol into the bottle and shake the content.

9). Make up the volume to 1000mls with purified water, freshly boiled and cooled.

10). Label the product as calamine lotion for external use only

Preparation of Capsules

1). Most hard capsule shells are made on automatic machines in which the shells are molded on steel pins then dried, stripped, trimmed, and assembled.

2). The empty shell can be filled with weighed 250mg or 500mg of chloramphenicol, in powder which may be mixed with a suitable inert diluent using high speed equipment used in the pharmaceutical industry or on semi automatic or hard operated fillers for small scale production.

3). The capsule shells may be colored. Available as capsules containing 250mg of chloramphenicol

4). Label on the container should state the directions for storage and the date after which the capsules are not intended to be used

12. EYE LOTIONS

e.g. Sodium chloride lotion

Formula	**New Formula**
Sodium chloride 9g	sodium chloride 0.9g
Purified water ..... to 1000ml	puried water to 100mls

Calculation, to prepare 100mls

1000mls of sodium chloride contain 9g of sodium chloride

: - 100mls of Sodium chloride will contain 9/1000x100/1 = 0.9g

Purified water to ..... 1000mls.

Method:

1. Weigh 0.9g or 900mg to sodium chloride on a weigh balance into a beaker.
2. Measure 50mls of purified water into the beaker containing the 0.9g of sodium chloride
3. Pour the solution into a calibrated 100mls bottle and shake the content.

4. Make up the volume to 100mls by adding

5. Label the product as eye lotion.

13. AEROSOL INHALATIONS

The aerosol dispenser is fitted with a adaptor in order to facilitate the transfer of the preparation into the body through the mouth.

One form of oral adapter consists of a plastic tube open at both ends, containing an integral spray nozzle is designed so that when the valve is actuated, the close is delivered from open end of the plastic tube which forms the mouth piece; the nozzle end of the plastic tube may be shaped so that it supports the aerosol dispenser in the correct position in the adapter, the tube usually being angled in the centre so that when the mouth piece is correctly new in the month, the aerosol dispenser is held vertically, either in an inverted position, which is usual, or in an upright position, in accordance with the manufacturers instructions.

The orally inhaled medicaments is usually intended to be deposited in the bronchial or upper pulmonary regions.

Method:

Salbutamol aerosol inhalations consists of a suspension of salbutamol, in powder of a suitable particle size, in a suitable mixture of aerosol propellants, which may contain a surface active agent, stabilizing agents, and other adjutants.

It is available as an Aerosol inhalations delivering 100micrograms of Salbutamol to he patent each time the valve is actuated

Labeling:

The label on the pressurized container should indicate:

1) The name of the preparation and where applicable, the strength of the preparation, expressed as the weight of active ingredient (s) per milliliter
2) The amount(s) of active ingredient(s) available to the patient each time the valve is actuated
3) The warning indicating that the container is pressurized and must be kept away from the heat, including sun
4) A direction to shake the container before use, if applicable
5) A warning that the patient should adhere strictly to and not exceed the prescribed dosage
6) A direction to read the instructions on the enclosed card or leaflet before use
7) An indication of the correct aspect of the container.

14. PREPARATION OF EAR DROPS

Ear drops are preparation that are used in the treatment of otits media and of boils in the ear caused by bacteria infections. Example of ear drops are Chlorampenicol, Gentamycin Sulphacetamide etc..

Preparations of phenol ear drops

Formula for preparation

Phenol glycerin 40ml

Glycerol ..... to 100ml

Calculation

To prepare 10mls of Phenol ear drops from the formula above

100ml of Glycerol contain 40ml of pharos glycerin

: - 10ml of Glycerol will contain 40/100 x 10 = 4ml of phenol

Glycerol added ..... to 10mls

New Formula

Phenol glycerin 4mls

Glycerol ..... to 10mls

Method of Preparation

1) Dissolve 4mls of Phenol glycerin in 4ml of glycerol
2) Mix the two liquid well
3) Make up the volume to 10mls by adding 2mls of glycerol
4) Pour the liquid into a graduated 10mls amber bottle and cap
5) Label the products as ear drops
6) Direction for use: Apply a drop of the phenol ear drops on the affected ear
7) Stir the product in a cool place.

CHAPTER THREE.

3.0. DRUG FORMULATION.

3.1. EXPERT SYSTEM IN DRUG FORMULATION.

Expert system in drug formation is a software developed which specialities in the field of pharmacy.

The system was design to supplement the human pharmacist effort in drug formulation process, the drug usage and possible side effects.

The system is a menu driven, which means the user of the system have to go through the menu to be able to work effectively with the system.

The system menu is listed below:

1) File menu.
2) Drug formulation menu.
3) Side effect menu
4) Dosage menu.
5) Uses menu.
6) Help menu.

Each of the above menu, have submenu attached to them. These menu, submenus and their functions are enumerated below: -

(1) File menu : The file menu comprises of three submenu namely:

Register

Close

Exit

The Register submenu allows the user to enter his/ her personal data if he /she is a new user of the software. The aim is to trapped and keep all the records of the software user in a database file.

The close menu just as the name implies, allows the user to close any existing work the program is currently doing.

The Exit option allows the user to quit the program .If the user choose the exit option a question would be asked if he/she is sure to quit the program. If the user choose "yes" the program terminates, and if the user choose "No" the program continues to executes.

(2) DRUG FORMULATION: - The Drug Formulation Menu comprise of fourteen (14) Submenu, namely: -

- Tablets
- Liquid
- Capsules
- Solution
- Mixture
- Creams
- Lotion
- Ear Drop
- Eye Drop
- Syrup
- Ointment
- Powders
- Injection
- Aerosols

On choosing any of the above option, the program responds by displaying steps by steps how you can prepare the desired drug of choice

(3) SIDE EFFECTS: This menu also consist of the submenu displayed in (2) above. But in this case, with different function. On chosen each of the submenu, the computer responds by telling you about each of this side effect of the drug formed on (3) above

(4) DOSAGE: - This menu displayed the dosage of each drug formed in (2) above.

(5) USES: - It also lay emphasis on the usage of each of the drug listed or formulated in (2) above.

(6) Help: - The help menu is divided into two sub menu namely: -

- About program
- About Author

The sub menu about program tells you about the various operation of the program, and it also provide an insight for some difficult term you may not be accustomed with.

The sub-menu about author displays everything about the developers of the software, and any information concerning him could be got form his place.

3.2 GOALS OF THE SYSTEM DESIGN

Since Expert system are software that try to provide the type of advice that would normally come from human expect, the main goal of the system designed is to give an insight on drug formulation processes. Other goals of the system designed are summarized below: -

(1) To provide adequate information on drug formulation process.

(2) To rendered an expect advice on side effect of drugs

(3) To provides a comprehensive ways of keeping the uses of biodata

(i) To rendered expert advice on drug dosage and Uses.

(ii) Having necessary material, enable lay men to prepare drug in a cheaper rate.

3.3 THE LANGUAGE OF THE SYSTEM DESIGN

The language used in the system designed is Dbase iv. Dbase is used basically in this project for the design and development for this very system because its very flexible and efficient having database operation. It allows an easy file Harding and allows the user to query with ease

It also posses the following advantage which eliminate the above mentioned database problem.

1. Reduces data redundancy that is it helps is guide against duplication the same record.
2. avoid inconsistently: - It avoid or guide against of obtaining wrong information from database
3. shares date: - It allows sharing of data within different user for example, in a distributed database
4. Help to enforce security.: - it ensures only one means of access the data base
5. Maintain integrity - It ensure that the data is accurate
6. Data independence: It ensures that the data in particular application is independent of application program.

Dbases iv a new Version of Dbase, such as Dbase2, Dbase 3 and Dbase 3+. Dbase retains the basic flavour of the x dbase. Interaction environment and programming language, it also incorporates significant enhancements that will have a major impact on the structure of typical application.

For most among these are the introduction of help features, the pop menu and bar menu option, the control centre which provides assistance for non-programmers and programmers alike.

Dbase runs under Dos environment, though the newer version of Dbase such as Dbase V for windows and visual Dbase 7 runs under the windows environment. Like its predecessor, D base iv has three distinct operation modes namely:

(1) Control centre

(2) Dot prompt mode or command mode

(3) Programming mode.

i) CONTROL CENTRE

The Dbase in control centre allows you to interact with the program in most of the areas where such interaction is necessary to design, analyze, and print reports labels and files. It serves as the gateway to accessing the Dbase or menu system.

The control centre provides you with a substantial amount of information. The top left part of the screen is known as the menu bar. There are three menu items in this bar namely: Catalog, Tool, Exit.

CATALOG: - A catalog is a group of related files that include database, view, reports, forms, labels and program. For instance, all the files created for a particular application are stored in a catalog. Therefore, the catalog menu allows you to select and modify data files and other related files to be used in the application.

TOOL: - The tools menu provides you with useful utility for data management, for import and export of data, for control of files through a DOS (Disk Operating System) functions and for the way to interact with the program.

EXIT: - The exit menu allows you the option of quitting Dbase IV or jumping to the Dot prompt.

A prominent feature of the screen is the series of six connected column referred to as the panel. The six panels of the control center list the types of files available in Dbase iv and as you create new files, they are added to the panels.

Below the panel are information on the current files. This area shows the name of the currently active file, and possible description of the file as well.

At the bottom of the screen is the navigation line. This tells you how to move menu and what some of the function keys can be used for. These lists of keys foster quick and better understanding of various operations you can perform.

2) DOT PROMPT MODE

The dot prompt mode or command mode allows the user to type different commands to achieve a particular purpose. The above task using the control centre could also be achieved by typing commands one at a time in the command or dot prompt mode.

3) PROGARMMING MODE

The programming mode allows the user to compiles most of the codes in bundles and run them at a time, the program written could be debugged during compilation for possible errors. The compiled version of the program could be run any were there is Dbase iv environment.

RUNING THE DATA BASE IV

On successful booting of the computer system user can loud dbase iv by typing a system prompt A:\> or C:\> Dbase and press enter key. This may. This

may require change of path in same case. After a short time, the ASSIST MENU appears. The cursor control keep are used to select option available in this menu.

CREATING A DATABASE FILE STRUCTURES

To crate a database file structure, from the ASSIST select create and the database file. You will then enter name of the database file.

Elements of the fields which constitute the database file structure are

FIELD NO	FIELD NAME	FIELD TYPE	WIDTH	INDENX
1e	Name	character	20	
2	D-O-B	date	8	
3	salary	Numeric	5	2

To save this structure press CTRL and END Key or CTRL and W key. You can then press Y to input record immediately or N otherwise. Use CTRL and N to insert new field and CTRL and U to delete field after positioning the cursor on the appropriate field .

3.4 METHODS EMPLOYED IN THE SYSTEM DESIGN

Experts system in drug formulation is a knowledge base system. In building the system, there is need to enrich the knowledge based with enough data so as to give adequate response to user who comes to find out how drug could be formulated.

Basically, the methods employed during the system designed are as follow:-

- Data Collection
- Building the Database
- Coding and Debugging
- Testing

(1) DATA COLLECTION: -

The process of data collection involved visiting most of the pharmaceutical companies. The companies visited includes Minna Pharmaceutical, Zagbayi Pharmacy Limited. These companies help in no small measure in supplying the necessary data to wants the enrichment of knowledge base of the system designed.

(ii) BUILDING THE DATABASE

After the necessary data has been gathered form the step are above. The second stage is the building of knowledge base. This enhances the building of a database file, which contain database file where the data collection are stored.

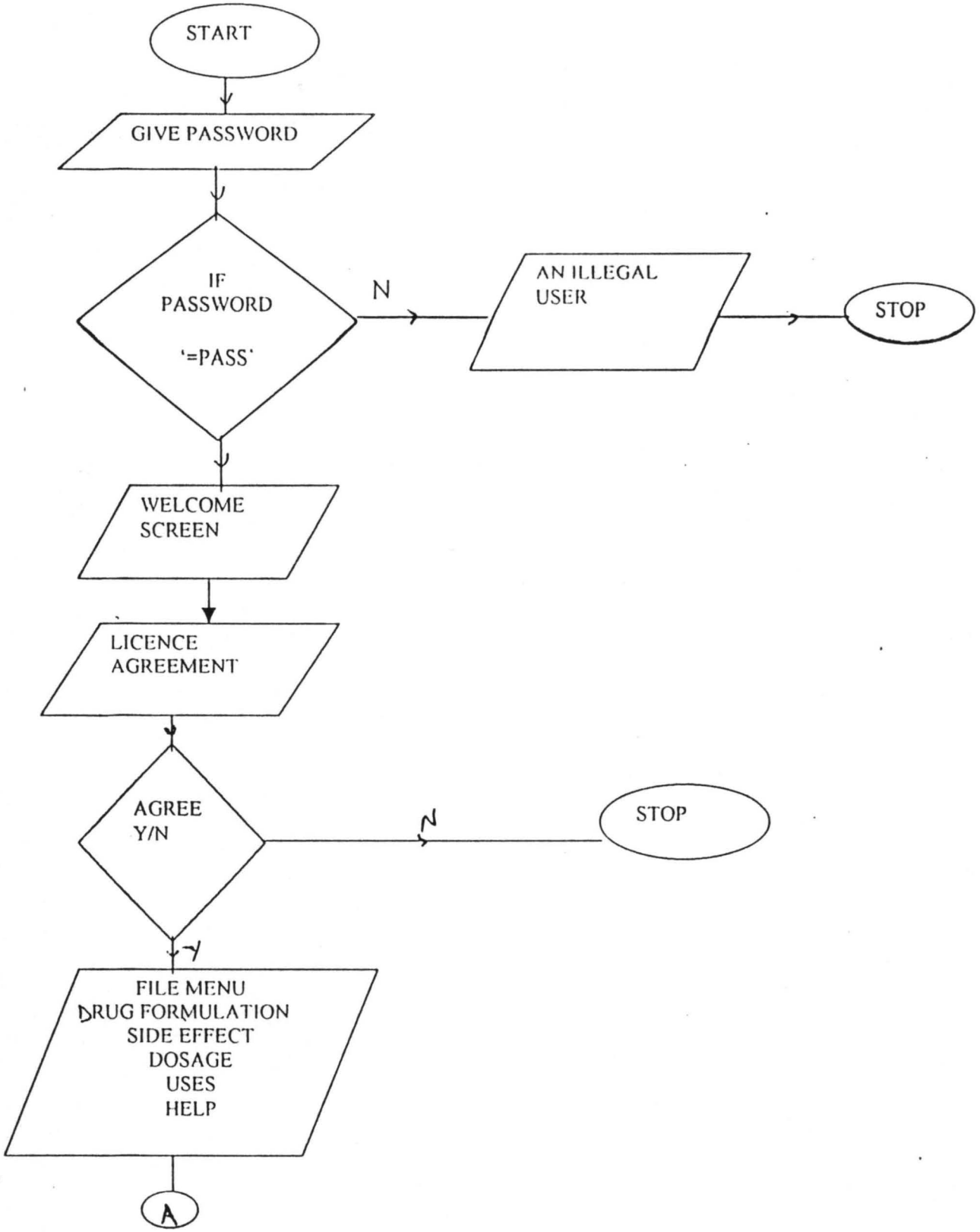
(iii) CODING AND DEBUGGING

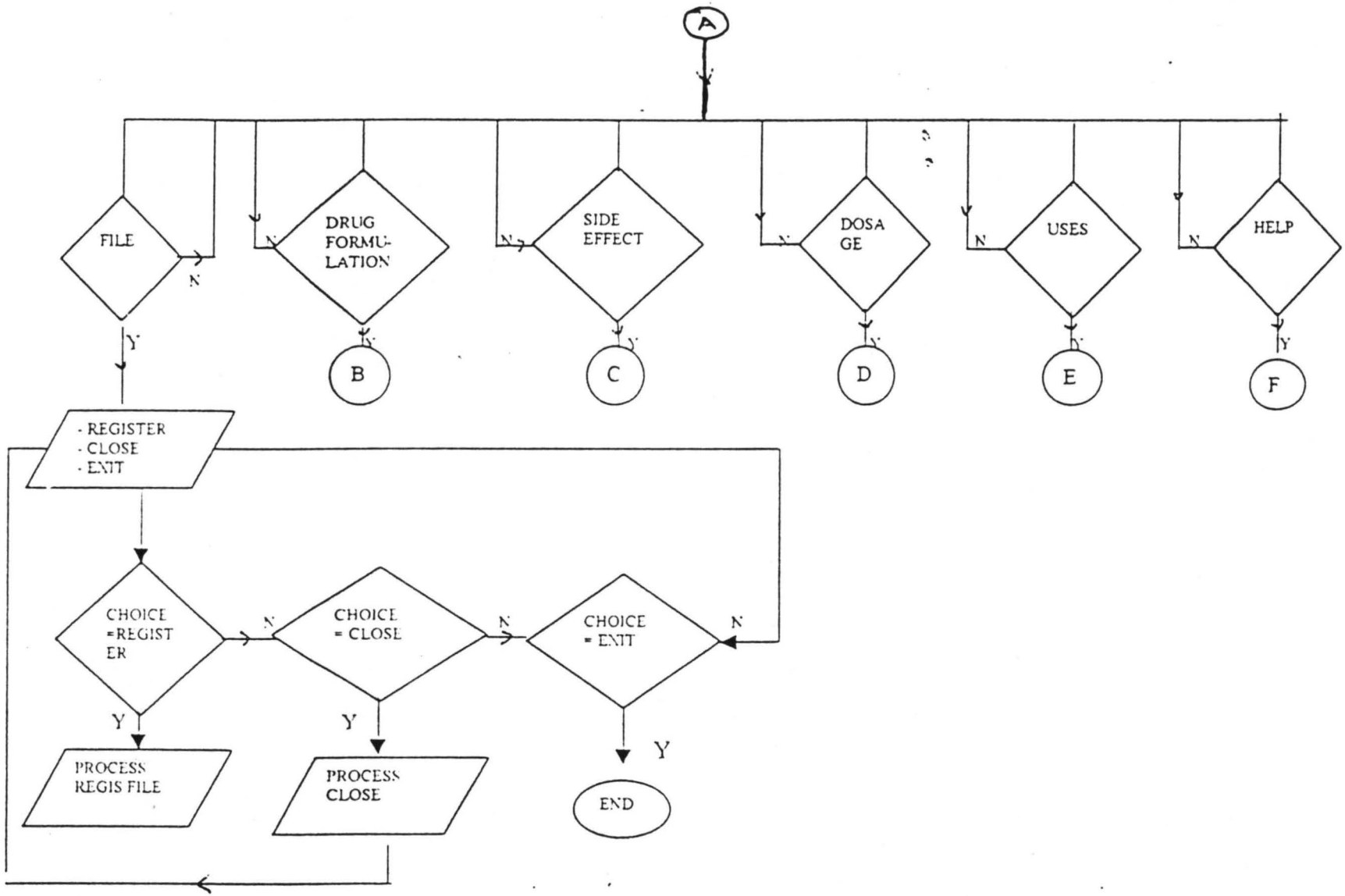
The coding of the system is the next stage after a building of successful database. The coding is the process of writing codes, the codes are written using Dbase IV. After the necessary coding in done, the program is run and the errors in them are corrected this process of error correction in program is referred to debugging.

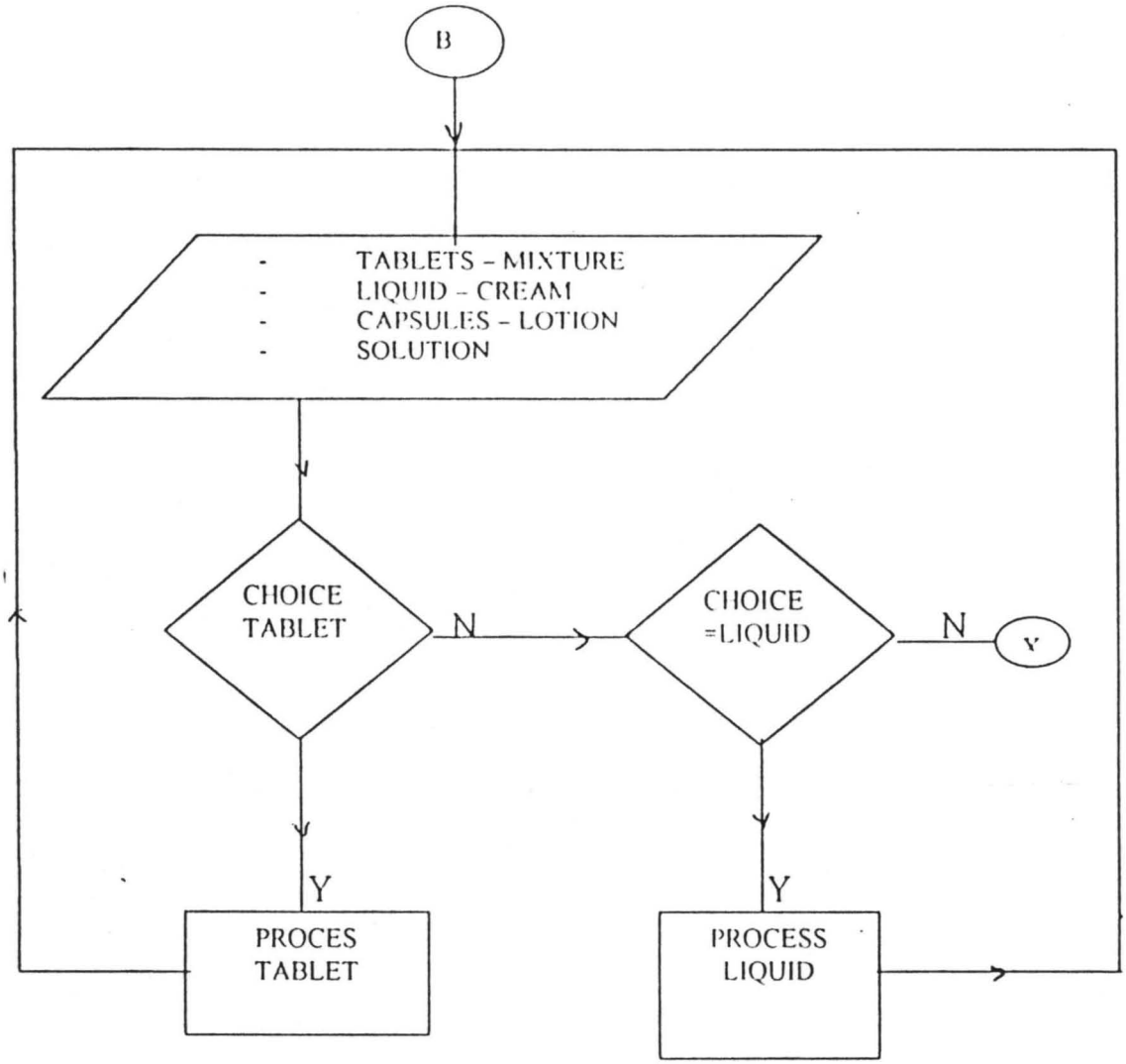
(IV) TESTING

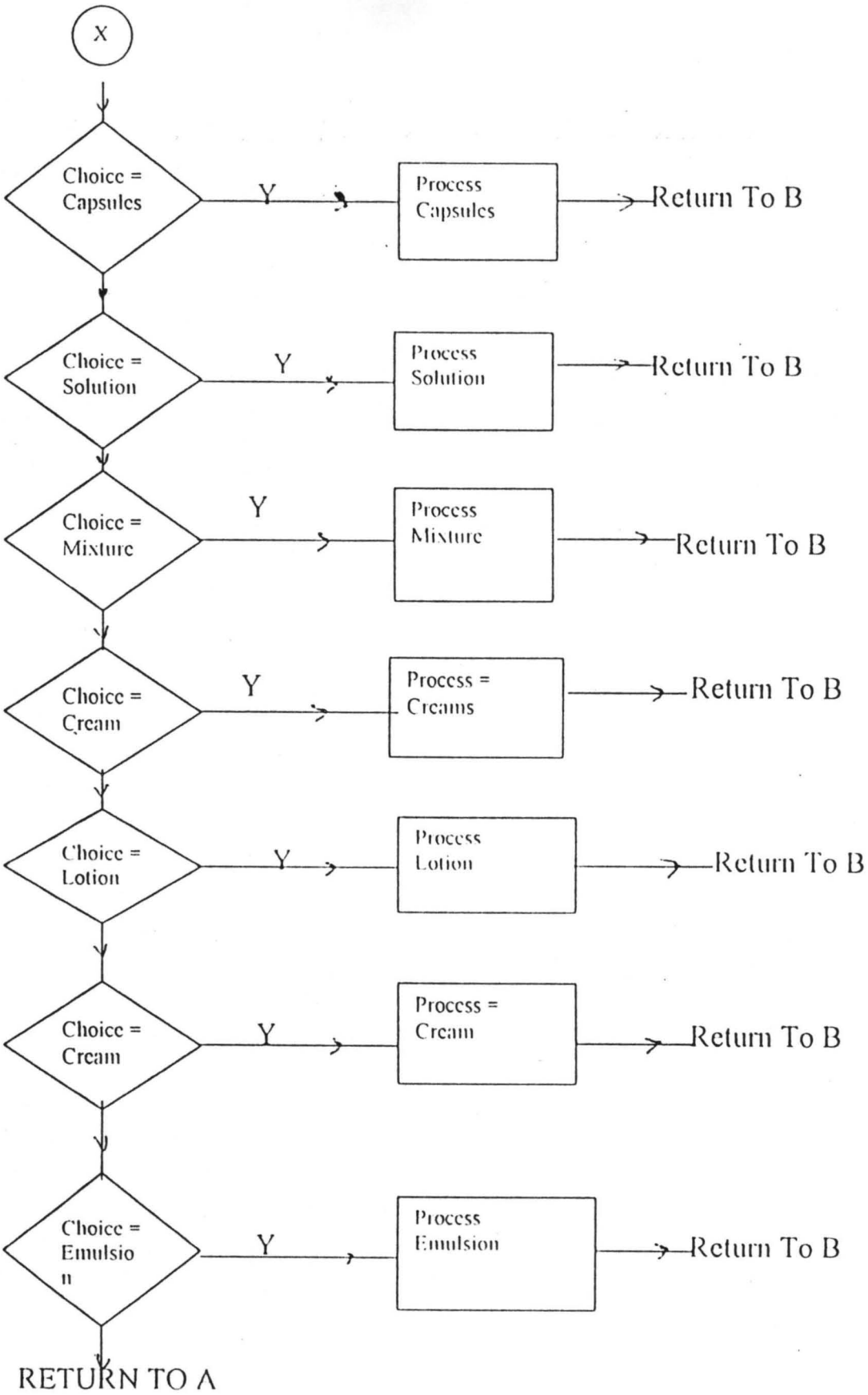
In the testing stage, the various modules or sub programs are link together so that a workable system is achieved. The various modules are tested and after certified that they are working correctly, they are all linked together and further tested in general so as to be sure they are error free.

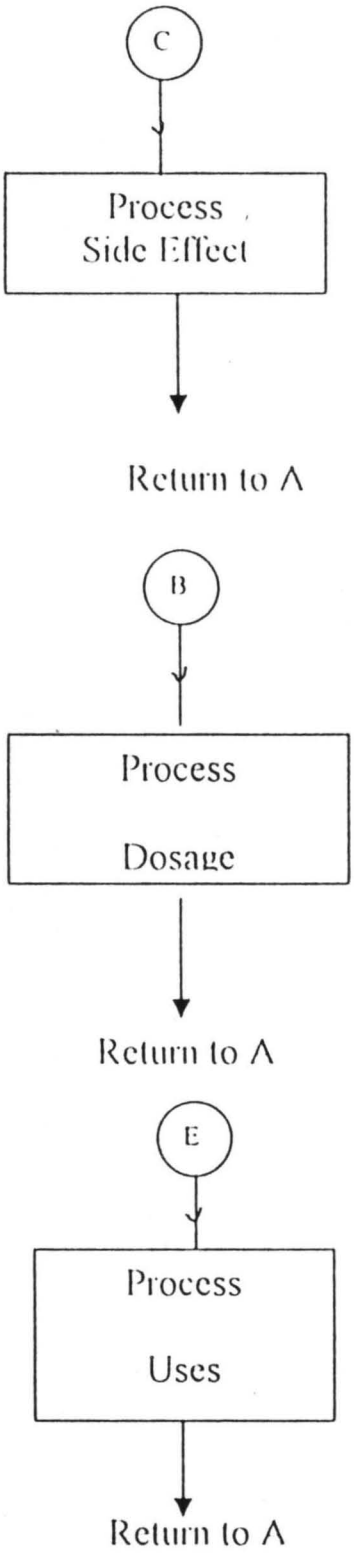
3.5 SYSTEM FLOWCHART

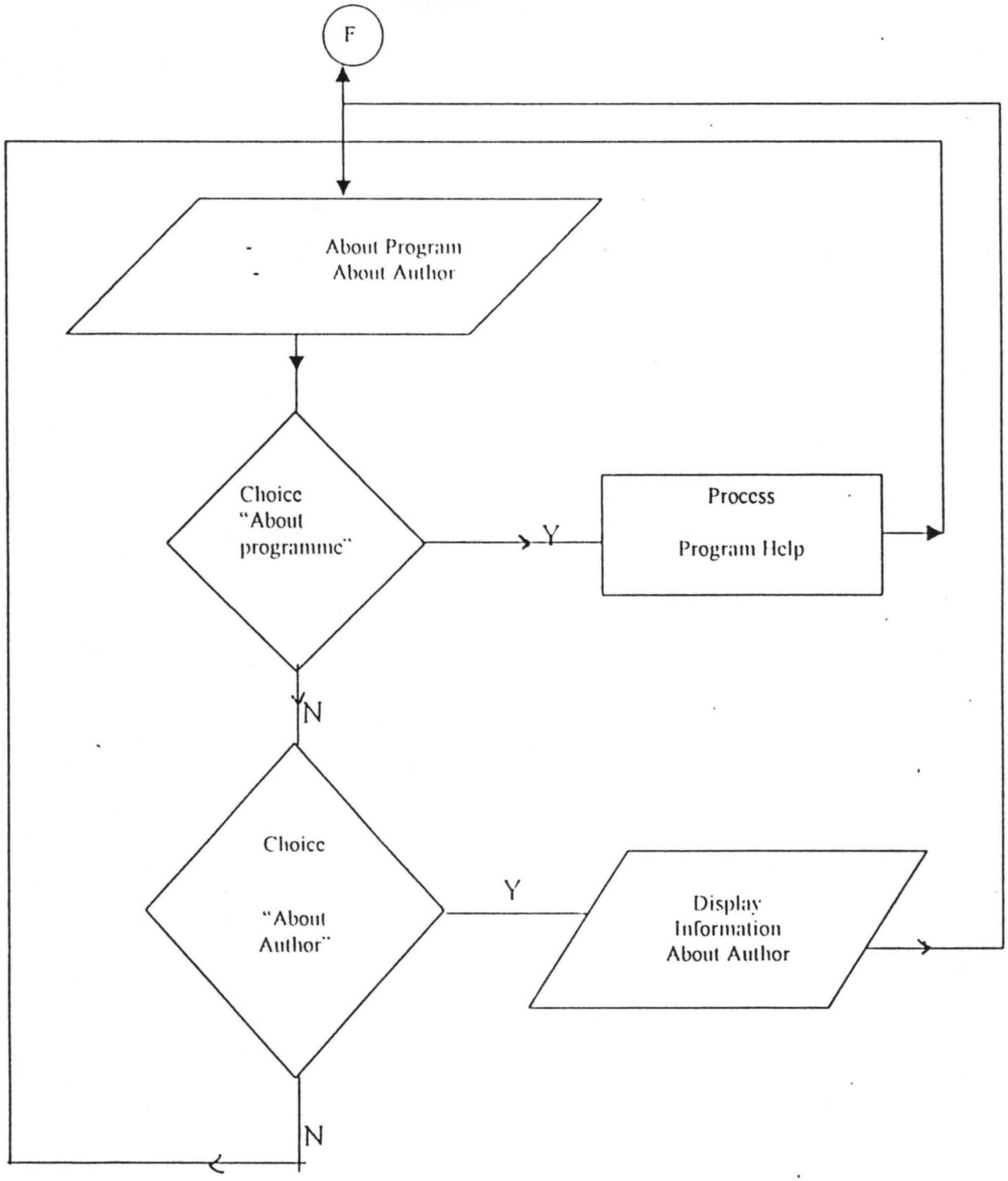



A
FILE
N
Y
DRUG FORMU-LATION
N
Y
B
SIDE EFFECT
N
Y
C
DOSA GE
N
Y
D
USES
N
Y
E
HELP
N
Y
F
- REGISTER
- CLOSE
- EXIT
CHOICE =REGIST ER
N
Y
PROCESS REGIS FILE
CHOICE = CLOSE
N
Y
PROCESS CLOSE
CHOICE = EXIT
N
Y
END


B
- TABLETS - MIXTURE
- LIQUID - CREAM
- CAPSULES - LOTION
- SOLUTION
CHOICE TABLET
N
CHOICE =LIQUID
N
Y
Y
PROCES TABLET
PROCESS LIQUID


X
Choice = Capsules
Y
Process Capsules
Return To B
Choice = Solution
Y
Process Solution
Return To B
Choice = Mixture
Y
Process Mixture
Return To B
Choice = Cream
Y
Process = Creams
Return To B
Choice = Lotion
Y
Process Lotion
Return To B
Choice = Cream
Y
Process = Cream
Return To B
Choice = Emulsio n
Y
Process Emulsion
Return To B
RETURN TO A


C
Process
Side Effect
Return to A
B
Process
Dosage
Return to A
E
Process
Uses
Return to A


F
- About Program
- About Author
Choice "About programme"
Y
Process
Program Help
N
Choice "About Author"
Y
Display Information About Author
N

CHAPTER FOUR

SYSTEM IMPLEMENTAION

4.1 IMPLEMENTATION OF THE SYSTEM

After the physical system has been designed as contained in the previous chapters, the next stage is to describe how the system works. This is very important because it is the area that user need to understand so as to allows proper interaction with the system. Therefore system implementation is the stage in system development where the process and procedure of working system are stated.

In implementing the new system the pharmaceutical company will have to acquire computers, employ the services of computer firm as consultant for co-ordination so as to get the proposed system into effective operation. By this study group as to be constituted or computer user committees, which include some key staff form consultancy firm

The implementation of the new system would cover the following stages in other to meet the objectives outline for it: -

1. Training of staff: - The human expert and other staff under this unit and other units that might need the use of computer have to be trained on the computing system being proposed by the builder of the system.
2. Change over procedure: - There are four basic method of changing over to a new system i.e. the one that very be applicable in this project work is parallel method.

Parallel Method : - in this method the old and the new system are run concurrently using the some input. The input in compare and measure for

different resolved. The output from the old system continued to distribute until new system as proved satisfactory. At this part the old system is discontinued and the new one take its place.

4.2 DOCUMENTATION

This newly developed expert system is developed to be user's interactive and friendly. One the program is activated using. Do Drugexp from Dbase dot prompt, a user is exerted to give the password, which must be given before having access to the programs.

When the password has been given the program display a welcome screen as follows:

```
                EXPERT SYSTEM IN DRUG FORMULATION

                        SOFTWARE DEVELOPED BY

                        ALAWODE SANJO JOSHUA

                        PGD/98/99/747

                    Supervised by: DR. S. A. REJU

        Press  C to continue or Q to quit
```

After the welcome screen has been displayed, the next thing is about the license agreement,this is shown below

Num 1:13:09

LICENCE AGREEMENT
==========

This software is protected under the copywright law, therefore it is not
iable to unnessary copy by anybody or cooperate organisation, as this is ille
al. If anybody is in need of this software, you should try to consult the
eveloper of the software.

For further information contact :

MR. ALAWODE SANJO JOSHUA
ZAGBAYI PHARMACY,
HOSPITAL ROAD, MINNA,
NIGER STATE.
NIGERIA.

Thanks for your patronage.

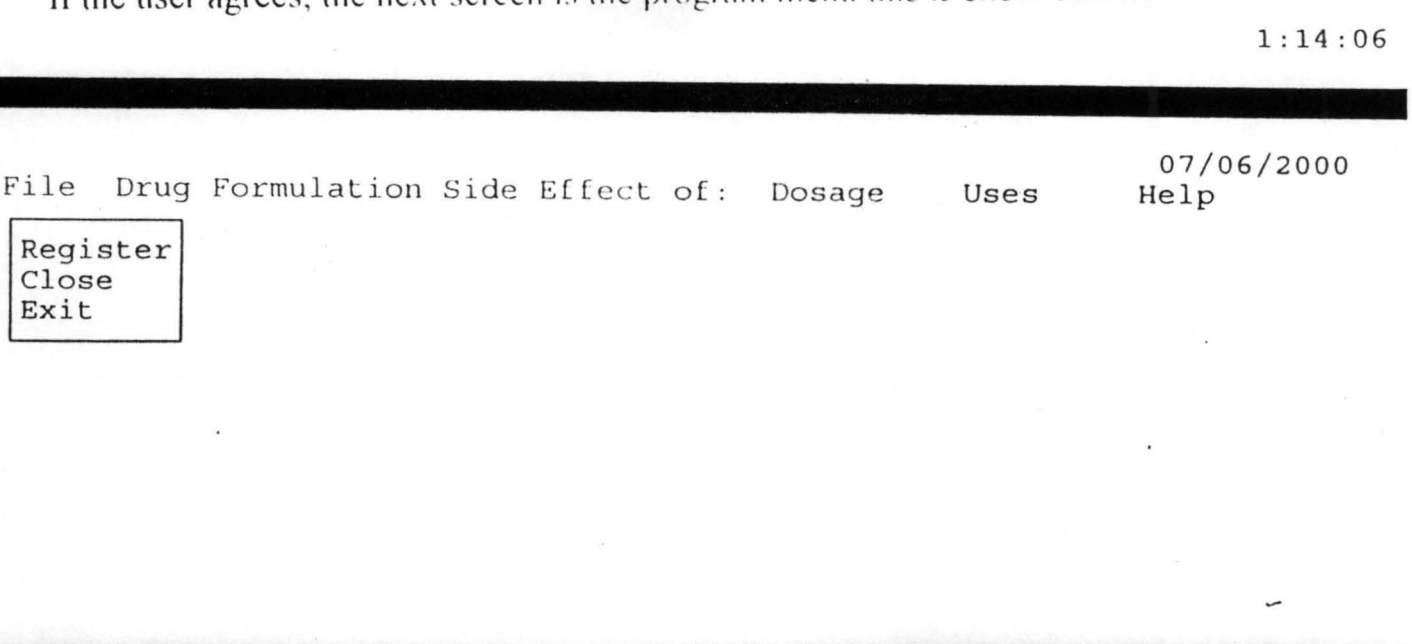
I agree with above agreement y/n

After the licence agreement show, the user will be prompt to either choose option "yes" signifying agreement and option "No" meaning he/She does not comply as shown below.

Num 1:23:25

Do you want to register now or later Y/N

If the user agrees, the next screen is the program menu this is show below.



Supplying the necessay information about yourself

The file menu consist of three options

- Register
- Close
- Exit

The close erases or closes any displayed in the screen, while the exit terminates the programs i.e. by quitting the program in its totality. Though, a question would

be asked if the user really want to quit or not. If he/she chooses "Yes", the program terminates, if he chooses No, the program returns to the dot prompt.

However, if the user chooses to register, by chosen the Register option, he/she can fill his/her biodata and the drug he/she wants to know how to prepared. The register file is as shown below.

```
                    DRUG USER REGISTER

13:15:18                                              07/06/2000

        NAME JOSHUA ALAWODE

      OFFICE ADDRESS DOKO PHARMACY, MINNA.

      DRUG TYPE PARACETAMOL

      AGE  35

      PROFESSION PHARMACY

      HOME ADDRESS TUNGA, MINNA, NIGER STATE.

      HOME TELEPHONE 066-2234521          OFFICE TELEPHONE 066-3565882
                                          More records Y/N Y
```

It the user chooses Drug formulation menu, here list of possible drug would be displayed. The drugs include tablets liquid, capsules, solution, mixture, creams, lotion ,ear drop, eye drop, syrup and ointment. If for instance, the user decides to known how to prepared tablets, and choose the options, computer response is thus shown below:

1:25:24

MORE ABOUT TYPES OF DRUG

A. Tablets
B. Syrups
C. Mixture
D. Lotions
E. Creams
F. Solution
G. Solution Tablets
H. Capsules
I. Paints
J. Eye Drops
K. Eye Lotions
L. Eye Ointment
M. Suspensions
N. Powders
O. Emulsion
P. Ear Drops
Q. Injections
R. Aerosol Inhalation

Enter your Choice

1:25:35

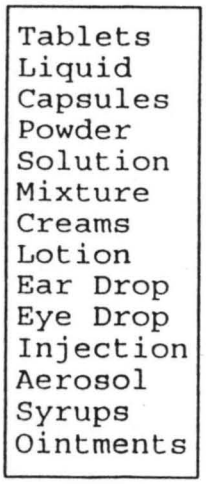
TABLETS
=======

Tablets are solid single - dose forms which comprise medicament(s), usually with excipients, compressed or moulded into circular shapes with flat or conve faces, or other suitable shapes. They are formulated to release the active ingrdients in a way that will achieve the desired effect, and their quality is controlled by a number of standard tests which may include uniformity of weigh and content, hardness, friablility, distingeration and dissolution.

TYPES OF TABLETS
================
(1) Compressed Tablets:- Compressed tablets are formed from a granulated preparation of the active ingredients by compaction using punches in suitable files. The medicinal substances may be converted into dry free-flowing granule by drug granulation or moist granulation.
(2) Moulded Tablets:- Moulded tablets are small disks which usually contain a potent medicament diluted with lactose, sucrose, dextrose or mannitol or a mixture of these diluents.

Press c to continue

File Drug Formulation Side Effect of: Dosage Uses Help



To know how to prepare tablets

1:17:43

PRODUCTION OF TABLETS

To produce tablets is not an easy task. There are many tablets in circulation, however, for the sake of simplicity, we shall discuss how to prepare 500 mg paracetamol tablets.

Press c to continue

1:17:53

Batch Processing Records/Instructions

Batch Number..... Manufacturing date.....

Batch Size..... Edited by.....

Product code.....

CLEANING

Last product Manufactured.....

Batch Number.....

Batch Size.....

Press c to continue

1:18:39

FORMULA

S/NO	MATERIAL	QTY(kg)	Gross	Net	Tare	Dat
1.	Paracetamol powder B. P.	100	0.0	0.0	0.0	
2.	Starch B. P.	17.6	0.0	0.0	0.0	
3.	Microcrystalline Cellulose B. P.	1.8	0.0	0.0	0.0	
4.	Benzoic acid B. P.	0.06	0.0	0.0	0.0	
5.	Tak B. P. 0.5%	565g	0.0	0.0	0.0	
6.	Magnessium Stenate B. P. 0.5%	565g	0.0	0.0	0.0	

1:18:56

PREPARATION

(A) STARCH PASTE

(i) To each of the 3.6kg starch weighed seperately into two plastic containers add 4 bottle of water to make a slurry.
(ii) To this, add the benzoic acid powder.
(iii) Measure out 9 litres of water into each of the cooking pots powder.
(iv) Heat the water into the shinny and allow to set. Turn to ensure that a paste is formed.

Time processing stated..... Time ended.....
Repeat the procedure and allow to set and cool.

(B) GRANULATION

(i) Check the cleaniless of the mixer granulators

Checked by..... Confirmed by.....

Press c to continue

(4) Select on the controller any entry temperature of between 20 - 30 degree centigrade and initiate fluidation for 10 minutes.

Time started..... Time completed.....

(5) Observed that the wet product is lifted up after 1 or 2 minutes of blowing air. If the product moves too much either at the start or late on during drying reduced air floor by putting butterfly valve in position 1 or 3. If the product is not lifted up place the knob on position 2 and press "Fermenture" and release. If product is not lifted up, remove and reduced the quantity of the lumps that may have formed and continue the process.
(6) After 10 minutes start heating at 60 degree centigrade.

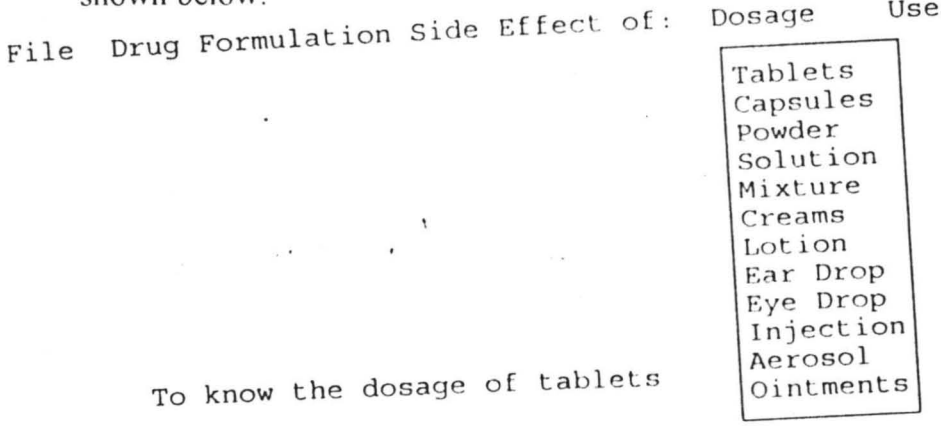
Time heating Started..... Time ended.....

(7) At the end of the drying time of 30 - 45 minutes, unlock the clamps, lower the container and trolley to discharge the product.

Time drying completed.....

Press c to continue

In addition , if the user wants to know what and what you can use tablets for ,and he choose USES menu and selects "Tablet" option ,the computer response is shown below.



The Help menu provides the help about author or about program. If the user is interested to know about the program, and chooses it The computer respond by displaying some option for user to choose from . The option choose by a certain user is as shown below.

1:24:41

ABOUT THE PROGRAM
****

This software: EXPERT SYSTEM IN DRUG FORMULATION was developed by ALAWODE SANJ JOSHUA who is a Pharmacist by Profession. The aim of the software is to provid help in drug formulation, drug dosage, side effect of drug and drug usage. It divide into various menu with several options to choose from.

Before we go on, it is important to know about drug, this brings us to an important question on WHAT IS DRUG?

A drug is a chemical substances that has medicinal value or active principle i a medicinal preparation that can be used for curative and diagnostic purposes

WHAT ARE THE TYPES OF DRUG?

The the types of drug are: Tablets, Capsules, Solution, Mixtures, Emulsion, Eye drops, eye lotion, ear drops, lotions, cream, linment, ointment, Inhalation e. t. c.

Press c to continue

Lastly, if the user is interested to know about the software developer, and decides to choose the option, the computer responds thus.

5.4 RECOMMENDATION.

What is essential difference between existing computer science and what is called "Artificial Intelligence?" what is the basis for the widespread interest in the subject today? These are different question, which may be asked by anyone considering the investment of resources in developing or incorporating AI technology.

A primary feature of AI application is an attempt to utilize formal and informal expect potential of AI technology is based on increasing the availability and usefulness of expert knowledge. It is this potential, which affect many divers areas: Education, Commerce, Government, Medicine and Manufacturing. Additionally, this technology is being used to enhance the understanding of human process and is facilitating the generation of new knowledge.

The problem that arises considering the widespread interest in AI and its potentials is that of acceptability into society – the Nigeria society. The expert in his field of pharmacy sometimes feels the needs. No more criticism and challenge from any human during consultation, talk not of machine that has no brain and cannot think.

It is recommended that expert system should be accepted by the society immediately they are introduced into it. Such acceptance would encourage more research into AI and development of expert system.

Currently, research to AI has form no based in Nigeria. No known one has been initiated. Expert systems are presently being used along side most human expert in developed countries performing different industrial operations. Research into expert system and AI in general should be initiated immediately. Funds should be generated and budget allocation made towards the development of AI in the country.

There is a need for the system change over from the old to the new system. this system may take place when the expert system has been proved to the satisfactory of the systems analyst and the other implementation activities have been completed. Also the user manages should be satisfy with the results of the system tests, staff training and reference manual and when the date for change over is due.

This changeover may by achieved in a number of ways. The most common methods are direct, parallel running, pilot running and stages changeover.

For this project work, parallel running is recommended. In parallel running the current data are process by both the old and new system to cross check the results. The main attraction is that the old system is kept alive and operational with the new system has been proved for at least one system cycle using full live data in the real operational environment of place people, equipment and time. It will allow the result of the new system to be compare with the old system before acceptance by the user, thereby promoting user confidence. Although parallel running in extra cost, difficult and (some times) the impracticability, of user staff have to carry out the different clerk operation for two system (old and new) one the time available for one.

Which one method is adopted for the change from old to a new method a high priority must be given to establishing controls, by value or quality, in other to maintain the quantitative integrity of the system. User should keep overall records incorporating both computer and clerical control figures in prove that the changeover has not corrupted this integrity.

There should also be are proper hand over once the system has been working for an agreed period of time, the system analyst will wish to withdrew. prolonged involvement of the system analyst with a working system should be avoided. The system become the responsibility of a maintenance group within

the computer department instead of the development staff. This handover point should be established as part of the implementation plan.

The users must be satisfied that the system works properly and meets all the requirement by the time handover takes place. It is essential, therefore that the handover takes place formally, with a clear understanding in all sides that the system analyst's involvement has come to an end

APPENDIX PROGRAMMING

```
set talk off
set status off
@ 10, 30 to 15, 55 panel color r+
pass=space(1)
@ 12, 35 say "Enter Pass word" get pass
read
if pass="Ù"
clear
do start
else
clear
@ 12, 24 say "You must be an illegal user"
@ 14, 24 say "Contact Mr. Joshua Alawode"
wait
do exit
endif
return



procedure start
SET TALK OFF
SET STATUS OFF
SET CLOCK ON
@ 1, 1 TO 24, 78 PANEL COLOR W+
SET COLOR TO GR+
@ 4, 25 SAY "EXPERT SYSTEM IN DRUG FORMULATION"
SET COLOR TO GB+*/W
@ 7, 32 SAY "SOFTWARE DEVELOPED BY"
SET COLOR TO B
@ 10, 33 SAY "ALAWODE SANJO JOSHUA"
SET COLOR TO GR+
@ 12, 36 SAY "PGD/98/99/747"
SET COLOR TO W
@ 15, 30 SAY "Supervised by: DR. S. A. REJU"
set color to r
ans=space(1)
@ 19, 15 SAY "Press  C to continue or Q to quit" get ans;
      valid ans $ "cqCQ" error "Press either C or Q"
read
if ans="C" .or. ans="c"
clear
do main1
endif
if ans="Q" .or. ans="q"
do exit
endif
return


procedure main1
clear
```

```
et color to gr+

EXT
                              LICENCE AGREEMENT
                              =================
     This software is protected under the copywright law, therefore it is not
iable to unnessary copy by anybody or cooperate organisation, as this is ille-
al. If anybody is in need of this software, you should try to consult the
leveloper of the software.
       For further information contact :
                                    MR. ALAWODE SANJO JOSHUA
                                    ZAGBAYI PHARMACY,
                                    HOSPITAL ROAD, MINNA,
                                    NIGER STATE.
                                    NIGERIA.
       Thanks for your patronage.
endtext
res=space(1)
 @ 24, 25 say "I agree with above agreement y/n" get res;
      valid res $ "YNyn" error "Press either y or n"
read
if res="y" .or. res="Y"
clear
do main2
else
clear
wait
do exit
endif
return


procedure main2
clear
@ 5, 2 to 17,65 panel color gr+
set color to gb
res=space(1)
@ 8, 14 say "Do you want to register now or later Y/N" get res;
     valid res $ "YnNy" error "Press Y or N"
read
if res="Y" .or. res="y"
clear
do register1
else
if res="N" .or. res="n"
clear
do main3
endif
endif
return
```

```
PROCEDURE MAIN3
SET TALK OFF
SET STATUS OFF
SET SCOREB OFF
set century on
SET DATE TO BRIT
SET CLOCK ON
CLEAR

@ 2,2 to 22, 78 PANEL  color Gr+
@ 4, 65 say date()
DEFINE MENU PHARM
DEFINE PAD FILE OF PHARM Prompt "File"  AT 5,5
DEFINE PAD DRUG OF PHARM PROMPT "Drug Formulation" AT 5,11
DEFINE PAD EFFECT OF PHARM PROMPT "Side Effect of:" AT 5,28
DEFINE PAD REPORT OF PHARM PROMPT "Dosage" AT 5,45
DEFINE PAD UTILITY OF PHARM PROMPT "Uses " AT 5,55
DEFINE PAD HELP OF PHARM PROMPT "Help" AT 5,64

**
DEFINE POPUP FILEPOP FROM 6,5
DEFINE BAR 1 OF FILEPOP PROMPT "Register" MESSAGE "Supplying the necessay
information about yourself"
DEFINE BAR 2 OF FILEPOP PROMPT "Close" MESSAGE "Close all the open files"
DEFINE BAR 3 OF FILEPOP PROMPT "Exit" MESSAGE "Quitting Expert system in Drug
Formulation"

ON SELECTION POPUP  FILEPOP DO PROCEED1
**
DEFINE POPUP DRUGPOP FROM 6,11
DEFINE BAR 1 OF DRUGPOP PROMPT "Tablets" MESSAGE "To know how to prepare tablets
"
DEFINE BAR 2 OF DRUGPOP PROMPT "Liquid" MESSAGE "To know how to prepare Liquid
formulation"
DEFINE BAR 3 OF DRUGPOP PROMPT "Capsules" MESSAGE "To know how to prepare
Capsules"
DEFINE BAR 4 OF DRUGPOP PROMPT "Powder" MESSAGE "To know how to prepare Powder"
DEFINE BAR 5 OF DRUGPOP PROMPT "Solution" MESSAGE "To know how to prepare
Solutions"
DEFINE BAR 6 OF DRUGPOP PROMPT "Mixture" MESSAGE "To know how to prepare
Mixture"
DEFINE BAR 7 OF DRUGPOP PROMPT "Creams" MESSAGE "To know how to prepare Creams"
DEFINE BAR 8 OF DRUGPOP PROMPT "Lotion" MESSAGE "To know how to prepare Lotion"
DEFINE BAR 9 OF DRUGPOP PROMPT "Ear Drop" MESSAGE "To know how to prepare Ear
Drop"
DEFINE BAR 10 OF DRUGPOP PROMPT "Eye Drop" MESSAGE "To know how to prepare Eye
Drop"
DEFINE BAR 11 OF DRUGPOP PROMPT "Injection" MESSAGE "To know how to prepare
Injection"
```

```
DEFINE BAR 12 OF DRUGPOP PROMPT "Aerosol" MESSAGE "To know how to prepare
Aerosol"
DEFINE BAR 13 OF DRUGPOP PROMPT "Syrups" MESSAGE "To know how to prepare Syrups"
DEFINE BAR 14 OF DRUGPOP PROMPT "Ointments" MESSAGE "To know how to prepare
Ointment"
**


DEFINE POPUP EFFECTPOP FROM 6,28
DEFINE BAR 1 OF EFFECTPOP PROMPT "Tablets" MESSAGE "To know the  side effect of
tablets "
DEFINE BAR 2 OF EFFECTPOP PROMPT "Capsules" MESSAGE "To know the side effect of
Capsules"
DEFINE BAR 3 OF EFFECTPOP PROMPT "Powder" MESSAGE "To know the  side effect of
Powder"
DEFINE BAR 4 OF EFFECTPOP PROMPT "Solution" MESSAGE "To know the side effect of
Solutions"
DEFINE BAR 5 OF EFFECTPOP PROMPT "Mixture" MESSAGE "To know the  side effect of
Mixture"
DEFINE BAR 6 OF EFFECTPOP PROMPT "Creams" MESSAGE "To know the  side effect of
Creams"
DEFINE BAR 7 OF EFFECTPOP PROMPT "Lotion" MESSAGE "To know the side effect of
Lotion"
DEFINE BAR 8 OF EFFECTPOP PROMPT "Ear Drop" MESSAGE "To know the  side effect of
Ear Drop"
DEFINE BAR 9 OF EFFECTPOP PROMPT "Eye Drop" MESSAGE "To know the side effect of
Eye Drop"
DEFINE BAR 10 OF EFFECTPOP PROMPT "Ointments" MESSAGE "To know the side effect
of Ointment"

**
DEFINE POPUP REPORTPOP FROM 6,45
DEFINE BAR 1 OF REPORTPOP PROMPT "Tablets" MESSAGE "To know the dosage of
tablets "
*DEFINE BAR 2 OF REPORTPOP PROMPT "Liquid" MESSAGE "To know the  dosage of
liquid formulation"
DEFINE BAR 2 OF REPORTPOP PROMPT "Capsules" MESSAGE "To know the dosage of
Capsules"
DEFINE BAR 3 OF REPORTPOP PROMPT "Powder" MESSAGE "To know the  dosage of
Powder"
DEFINE BAR 4 OF REPORTPOP PROMPT "Solution" MESSAGE "To know the dosage  of
Solutions"
DEFINE BAR 5 OF REPORTPOP PROMPT "Mixture" MESSAGE "To know the  dosage of
Mixture"
DEFINE BAR 6 OF REPORTPOP PROMPT "Creams" MESSAGE "To know the dosage of Creams"
DEFINE BAR 7 OF REPORTPOP PROMPT "Lotion" MESSAGE "To know the dosage of Lotion"
DEFINE BAR 8 OF REPORTPOP PROMPT "Ear Drop" MESSAGE "To know the dosage of Ear
Drop"
DEFINE BAR 9 OF REPORTPOP PROMPT "Eye Drop" MESSAGE "To know the dosage of Eye
Drop"
DEFINE BAR 10 OF REPORTPOP PROMPT "Injection" MESSAGE "To know the dosage of
Injection"
DEFINE BAR 11 OF REPORTPOP PROMPT "Aerosol" MESSAGE "To know the dosage of
Aerosol"
*DEFINE BAR 13 OF REPORTPOP PROMPT "Syrups" MESSAGE "To know the dosage  of
Syrups"
```

```
DEFINE BAR 12 OF REPORTPOP PROMPT "Ointments" MESSAGE "To know the dosage of
Ointment"


**
DEFINE POPUP UTILITYPOP FROM 6,55
DEFINE BAR 1 OF UTILITYPOP PROMPT "Tablets" MESSAGE "To know the uses  of
tablets "
*DEFINE BAR 2 OF UTILITYPOP PROMPT "Liquid" MESSAGE "To know the  uses of liquid
formulation"
DEFINE BAR 2 OF UTILITYPOP PROMPT "Capsules" MESSAGE "To know the uses of
Capsules"
DEFINE BAR 3 OF UTILITYPOP PROMPT "Powder" MESSAGE "To know the  uses of Powder"
DEFINE BAR 4 OF UTILITYPOP PROMPT "Solution" MESSAGE "To know the uses of
Solutions"
DEFINE BAR 5 OF UTILITYPOP PROMPT "Mixture" MESSAGE "To know the  uses of
Mixture"
DEFINE BAR 6 OF UTILITYPOP PROMPT "Creams" MESSAGE "To know the  uses of Creams"
DEFINE BAR 7 OF UTILITYPOP PROMPT "Lotion" MESSAGE "To know the uses of Lotion"
DEFINE BAR 8 OF UTILITYPOP PROMPT "Ear Drop" MESSAGE "To know the  uses of Ear
Drop"
DEFINE BAR 9 OF UTILITYPOP PROMPT "Eye Drop" MESSAGE "To know the uses of Eye
Drop"
DEFINE BAR 10 OF UTILITYPOP PROMPT "Injection" MESSAGE "To know the uses of
Injection"
DEFINE BAR 11 OF UTILITYPOP PROMPT "Aerosol" MESSAGE "To know the  uses  of
Aerosol"
*DEFINE BAR 13 OF UTILITYPOP PROMPT "Syrups" MESSAGE "To know the uses  of
Syrups"
DEFINE BAR 12 OF UTILITYPOP PROMPT "Ointments" MESSAGE "To know the uses  of
Ointment"


**
DEFINE POPUP HELPPOP FROM 6,64
DEFINE BAR 1 OF HELPPOP PROMPT "About Program" MESSAGE " About the Program"
DEFINE BAR 2 OF HELPPOP PROMPT "About Author" MESSAGE " About the Developer of
the software"

**

ON SELECTION PAD FILE OF PHARM ;
      ACTIVATE POPUP FILEPOP
ON SELECTION PAD DRUG OF PHARM;
      ACTIVATE POPUP DRUGPOP

      ON SELECTION PAD EFFECT  OF PHARM;
            ACTIVATE POPUP EFFECTPOP

            ON SELECTION PAD REPORT OF PHARM;
                  ACTIVATE POPUP REPORTPOP

            ON SELECTION  PAD UTILITY OF PHARM;
                  ACTIVATE POPUP UTILITYPOP

                  ON SELECTION PAD HELP OF PHARM;
```

```
                ACTIVATE POPUP HELPPOP

ON SELECTION POPUP FILEPOP DO PROCEED
ON SELECTION POPUP DRUGPOP DO PROCEED1
ON SELECTION POPUP EFFECTPOP DO PROCEED2
ON SELECTION POPUP REPORTPOP DO PROCEED3
ON SELECTION POPUP UTILITYPOP DO PROCEED4
ON SELECTION POPUP HELPPOP DO PROCEED5
ACTIVATE MENU PHARM


PROCEDURE PROCEED
DO CASE
 case bar()=1
   do REGISTER
 case bar()=2
   do close1
case bar()=3
 do exit
ENDCASE
RETURN


PROCEDURE PROCEED1
DO CASE
  CASE BAR()=1
     DO Tablets
  CASE BAR()=2
      DO liquid
  CASE BAR()=3
     DO Capsule
  CASE BAR()=4
    DO pow
  CASE BAR()=5
     DO solu
  CASE BAR()=6
      DO mixture
  CASE BAR()=7
     DO cream
   CASE BAR()=8
      DO lotion
  CASE BAR()=9
     DO ear
  CASE BAR()=10
      DO eye
  CASE BAR()=11
     DO inject
  CASE BAR()=12
    DO aero
  CASE BAR()=13
     DO syrup
  CASE BAR()=14
     DO OINTMENT
  ENDCASE
RETURN
```

```
PROCEDURE PROCEED2
do case
  CASE BAR()=1
     DO sideTab
   CASE BAR()=2
     DO sideCap
  CASE BAR()=3
    DO sidepow
  CASE BAR()=4
     DO sidesol
  CASE BAR()=5
    DO sidemixt
  CASE BAR()=6
     DO sidecream
   CASE BAR()=7
    DO  sidelot
  CASE BAR()=8
    DO  sideear
  CASE BAR()=9
    DO sideeye
 CASE BAR()=10
    DO sideOIN
endcase
RETURN

PROCEDURE PROCEED3
DO CASE
CASE BAR()=1
     DO dose1
    CASE BAR()=2
     DO dose3
  CASE BAR()=3
    DO dose12
  CASE BAR()=4
     DO dose7
  CASE BAR()=5
      DO dose2
  CASE BAR()=6
     DO dose9
   CASE BAR()=7
      DO dose6
  CASE BAR()=8
     DO dose5
  CASE BAR()=9
    DO dose10
  CASE BAR()=10
     DO dose4
  CASE BAR()=11
    DO dose11
   CASE BAR()=12
     DO dose8

ENDCASE
RETURN

PROCEDURE PROCEED4
      DO CASE
```

```
CASE BAR()=1
     DO use1
  CASE BAR()=2
      DO use3
  CASE BAR()=3
    DO use12
  CASE BAR()=4
     DO use7
  CASE BAR()=5
      DO use2
  CASE BAR()=6
     DO use9
   CASE BAR()=7
    DO use6
  CASE BAR()=8
     DO use5
  CASE BAR()=9
    DO use10
  CASE BAR()=10
     DO use4
 CASE BAR()=11
    DO use11
  CASE BAR()=12
       DO use8
      ENDCASE
RETURN

PROCEDURE PROCEED5
   DO CASE
      CASE BAR()=1
         DO aboutA
      CASE BAR()=2
       DO aboutb
      ENDCASE
      RETURN



PROCEDURE EXIT
CLEAR
CLOSE ALL
@ 4, 1 TO 15, 78 DOUBLE COLOR G
SET COLOR TO GB*/R
@ 6, 35 SAY "I am quitting...."
SET COLOR TO  B/W
ANS=SPACE(1)
@ 10, 10 SAY "Are you sure you want to quit Y/N? "·GET ANS
READ
IF ANS="Y"
CLOSE ALL
QUIT
```

```
ELSE
CLEAR
RETURN TO MASTER
ENDIF



PROCEDURE REGISTER
CLEAR
Set talk off
set status off
use regis.dbf
do while .t.
append blank
@ 1, 1 to 24, 79 panel color gr+
set color to b*/w
@ 3, 24 say "DRUG USER REGISTER"
set color to b+
@ 5, 4 say time()
@ 5, 60 say date()
@ 7, 10 say " NAME" get name
@ 9, 10 say "OFFICE ADDRESS" get add
@ 11, 10 say "DRUG TYPE" get drug
@ 13, 10 say "AGE" get age
@ 15, 10 say "PROFESSION" get prof
@ 17, 10 say "HOME ADDRESS" get home
@ 19, 10 say "HOME TELEPHONE" get tel1
@ 19, 45 say "OFFICE TELEPHONE" get tel2
read
more=space(1)
set color to r+
@ 22, 35 say "More records Y/N" get more;
   valid More $"YnNy" error "Press Y or N"
read
if more="Y" .or. more="y"
loop
else
exit
endif
enddo
return



PROCEDURE REGISTER1
CLEAR
Set talk off
set status off
use regis.dbf
do while .t.
append blank
@ 1, 1 to 24, 79 panel color gr+
set color to b*/w
@ 3, 24 say "DRUG USER REGISTER"
```

```
set color to b+
@ 5, 4 say time()
@ 5, 60 say date().
@ 7, 10 say " NAME" get name
@ 9, 10 say "OFFICE ADDRESS" get add
@ 11, 10 say "DRUG TYPE" get drug
@ 13, 10 say "AGE" get age
@ 15, 10 say "PROFESSION" get prof
@ 17, 10 say "HOME ADDRESS" get home
@ 19, 10 say "HOME TELEPHONE" get tel1
@ 19, 45 say "OFFICE TELEPHONE" get tel2
read
more=space(1)
set color to r+
@ 22, 15 say "Having Completed the registration, Press c to continue  C" get
more;
   valid More $"Cc" error "Press C to continue"
read
if more="C" .or. more="c"
clea
do main3
endif
enddo
return
```

```
procedure close1
clear
use
close all
return
```

```
procedure use1
clear
set color to w
text
```

ACTIONS AND USES OF TABLETS

```
                              ============================
E.g. Paracetamol

 Paracetamol has analgesic and antipyretic actions. It is used in the treatment
of pains, such as headache, toothache, rheumatism, and neuralgia.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return



procedure dose1
clear
set color to w
text
                                   DOSAGE OF TABLETS.
                                   ==================
E. g. Paracetamol

      Paracetamol is given by mouth in a dosage of 0.5 to 1grm every 3 or 4hrs
with a maximum of 4grams for 24hours.
      The usual dose for a child under 1 year is 120 milligrams, and for a child
of 1 to 5 years, 250 milligrams.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return


procedure use2
clear
set color to w
text
                              ACTIONS AND USES OF MIXTURE
                              ===========================
E. g. Magnessium Trisilicate

  Magnessium trisilicate has adsorbent antacid properties and is non-toxic even
in very large doses. It is used in the treatment of Dyspepsia, Gastric
hyperactivity and heart burn.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
```

```
return
endif
return



procedure dose2
clear
set color to w
text
                                DOSAGE OF MIXTURE
                                =================

E. g. Magnessium Trisilicate

    Magnessium trisilicate is usually given in a dosage of 0.5 to 2 grams,
repeated in accordance with the needs of the patient.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return



procedure use3
clear
set color to w
text
                        ACTIONS AND USES OF CAPSULES
                        ============================

E. g. Chloramphenicol

    Chloramphenicol is an antibiotics with a bacteriostatic action which has a
wide range of antimicrobial activity. It acts against salmonella typhi and
salmonella Paratyphi.
    It is used in the treatment of typhoid and paratyphoid fevers, Furunculosis,
Impetigo, eye and ear infections. It is used in the treatment of Haemophilus
influenza meningitis, chronic infections of the urinary tracts with a sensitive
strain of proteins vulgaris that is resistant to other antibiotics, and
rickettsial infection which do not respond to treatment with drugs.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return
```

```
procedure dose3
clear
set color to w
text
                        DOSAGE OF CAPSULES
                        ==================
E. g. Chloramphenicol

     Usually administered by mouth in a dose of 500mgs ever 6hours for an adult.
For a child, the usual daily dosage is 25 to 50mgs per kilogram body weight
given in a divided doss at intervals of 6hours.
     Chloramphenicol is usually administered in capsules, Patients unable to
swallow the capsules may be given the antibiotic by mouth as a suspension of
the palmitate.
    Chloramphenicol may be given to seriously ill patients by injection of
aqueous solutions of chloramphenicol sodium succinate.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return


procedure use4
clear
set color to w
text
                    ACTIONS AND USES OF INJECTIONS
                    ==============================
E. g. Tubocurarine

     Tubocurarine produces relaxation of voluntary muscle by reducing its
response to acetylcholine. When administered intravenously it produces first
fatigue, then weakeness, and finally, paralysis of voluntary muscles, begining
in the eyes and spreading to the face, neck, limbs; abdomen. Intercostal
muscles, and diaphragm; recovery of muscle functions occurs in the reverse
order.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return
```

```
procedure dose4
clear
set color to w
text
                              DOSAGE OF INJECTION
                              ===================

E. g. Tubocurarine

      Tubocurarine chloride is used chiefely as an adjunct to anaesthesia to
secure muscular relaxation in surgery. For this purpose, 10 to 20mgs of
Tubocurarine chloride is given by intravenous injection, followed if necessary,
as indicated by the degree of muscular relaxation, by further doses of 2 to 4mgs
provided that adequate methods for dealing with respiratory failure are at hand.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return



procedure use5
clear
set color to w
text
                          ACTIONS AND USES OF EAR DROP
                          ============================

E. g. Phenol Ear  Drop

      Phenol ear-drops are used inthe treatment of otitis media and of boils
in the ear.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return



procedure dose5
clear
set color to w
text
                              DOSAGE OF EAR DROP
                              ==================

E.g. Phenol
```

```
   Prescribed drops to be applied on the affected part of the ear.
endtext
ansl=space(1)
@ 23, 30 say "Press R to return to menu" get ansl
read
if ansl="R" .or. ansl="r"
clear
return
endif
return



procedure use6
clear
set color to w
text
                        ACTION AND USES OF LOTIONS
                        ==========================
E. g. Calamine Lotions

     Calamine has a mild astringent action on the skin and is used in dusting
powders, lotions and ointments to relieve the discomfort of dermatitis. Pruritus

**Calamine lotion cools the skin by evaporation and is useful for allaying the
  pain and swelling of sunburn.

**Oily calamine lotion is a soothing application for the treatment of eczema.

**To treat acute inflammatory skin diseases with vascular eruptions, exudation,
  oozing and crusting.

E. g.  Benzyl Benzoate Lotion

    Benzyl benzoate is an acaricide used in the treatment of scabis. It is also
used in the treatment of Pediculosis of the scalp, body and pubis.
endtext
ansl=space(1)
@ 23, 30 say "Press R to return to menu" get ansl
read
if ansl="R" .or. ansl="r"
clear
return
endif
return

procedure dose6
clear
set color to w
text
                          DOSAGE OF LOTIONS
                          =================
E. g. Calamine lotion

     Frequent application to the affected parts
```

```
E. g. Benzyl Benzoate

    Benzyl Benzoate application is applied over the whole bdy surface
below the neck and is allowed to dry.

endtext
ansl=space(1)
@ 23, 30 say "Press R to return to menu" get ansl
read
if ansl="R" .or. ansl="r"
clear
return
endif
return



procedure use7
clear
set color to w
text
                          ACTIONS AND USES OF SOLUTIONS
                          =============================
E. g.  Ammonium chloride

     Ammonium chloride is an ingredient of expectorant cough mixture. It is
used in the treatment of urinary infections.
     It also aids the elimination of lead poisoning.
     It  is occasionally used by intravenous infusionin the treatment of
     alkalosis.

Paint e.g Crystal violet paint (Gentian violet paint))

      Crystal violet is an antiseptic with a selective action on Gram-positive
organisms. 0.5% solution is used in the treatment of burns, boils, carbuncles,
mycotic skin infections.
      A solution containing 0.5% each of crstal violet and brillant green has
been used for disinfecting the skin.

E.g. Chloroform Water

It is used as a preservative for pharmaceutical mixtures and aqueous extracts
of vegetable and animal tissues.

endtext
ansl=space(1)
@ 23, 30 say "Press R to return to menu" get ansl
read
if ansl="R" .or. ansl="r"
clear
return
endif
return
```

```
procedure dose7
clear
set color to w
text
                              DOSAGE OF SOLUTION
                              ==================
E.g Crystal violet paint

     Apply on the affected part.

     Advice for Patient: The pain stains skin, hair and fabrics.

E. g. Chloroform Water

 10 - 30mls to be used in pharmaceutical mixtures.

endtext
ansl=space(1)
@ 23, 30 say "Press R to return to menu" get ansl
read
if ansl="R" .or. ansl="r"
clear
return
endif
return



procedure use8
clear
set color to w
text
                          ACTIONS AND USES OF OINTMENT
                          ============================

E.g. Compound Benzoic acid ointment (Whitfield Ointment)

      Benzoic acid has antibacteria and antifungal properties. It is used in
the treatment of fungal infections of the skin.
endtext
ansl=space(1)
@ 23, 30 say "Press R to return to menu" get ansl
read
if ansl="R" .or. ansl="r"
clear
return
endif
return



procedure dose8
clear
set color to w
```

```
text
                                DOSAGE OF OINTMENT
                                ==================

E.g. Compound Benzoic Acid Ointment (Whitfield's Ointment)

  To be applied sparingly to the affected area.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return



procedure use9
clear
set color to w
text
                              ACTION AND USES OF CREAMS
                              =========================

E. g. Hydrocortisone

  It is  an anti-inflammatory agents in a large number of disorders.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return


procedure dose9
clear
set color to w
text
                            DOSAGE OF CREAMS
                            ================

E. g.  Hydrocortisone

  Apply 3 or 4 times daily on the affected skin.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
```

```
endif
return



procedure use10
clear
set color to w
text

                          ACTION AND USES OF EYE DROP
                          ===========================
E. g. Chloramphenicol

It is used in occular infections

E. g. Eye Lotion (Sodium Chloride)

    Sodium Chloride is the most important salt for maintaining the osmotic
tensions of the blood and tissues.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return



procedure dose10
clear
set color to w
text
                        DOSAGE OF EYE DROP
                        ==================
E.g. Chloramphenicol

 1 - 2 drops to be applied 4 times daily; up to hourly in severe cases.

E. g. Eye Lotion (Sodium Chloride)

    To be apply on the affected eye,
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return
```

```
procedure use11
clear
set color to w
text
                        ACTIONS AND USES OF AEROSOL
                        ===========================
E. g. Salbutamol(ventolin)

      Salbutamol is a directly acting sympathomimetic amine. Its main action
is on the adrenagic receptors in the bronchi and the respiratory tract rather
than on the cardiac receptors. It induces bronchodilation and inhibits
bronchospasm in doses which do not produce marked cardiac acceleration.
     It is used in the treatment of asthma, chronic bronchitis emphysema, and
other bronchospasm disorders involving bronchi system.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return



procedure dose11
clear
set color to w
text
                              DOSAGE OF AEROSOL
                              =================
E. g. Salbutamol

   It is administered as aerosol inhalation in doses up to 200 micrograms 3
or 4 times daily. The usual dose for children is one inhalation of 100
micrograms 2 to 4 times daily.
endtext
ans1=space(1)
@ 23, 30 say "Press R to return to menu" get ans1
read
if ans1="R" .or. ans1="r"
clear
return
endif
return



procedure use12
clear
set color to w
```

```
Cleaning ofProduction area                Signature of officer involve
and Equipment                             and Date

-Ceilling                    ----------------------------
-Walls                             ----------------------------
-Windows                     ----------------------------
-Floor                             ----------------------------
-Container for weighing            ----------------------------
-Weighing Balances                 ----------------------------
-Quadro - Comit                    ----------------------------
-Mixer Granulation                 ----------------------------
-Fludised Bed Dryer                ----------------------------
-Cubic Mixer                       ----------------------------
-Communiting machine               ----------------------------
-Tableting machine                 ----------------------------
-Deduster                    ----------------------------
-Containers for collecting tablets ----------------------------
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab3
endif




procedure tab3
clear
text
Weigh accurately the ingredients as per the formulation checking before
processing operations.


                        -------------------------------
                              Production Manager Sign.
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab4
endif


procedure tab4
clear
set talk off
set status off
use pharm1.dbf
ans=space(1)
```

```
PROCEDURE TABLETS
CLEAR
set color to w
TEXT
                        PRODUCTION OF TABLETS
                        =====================
      To produce tablets is not an easy task. There are many tablets in
 circulation, however, for the sake of simplicity, we shall discuss how
to prepare 500 mg  paracetamol tablets.

endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab1
endif


procedure tab1
clear
text
Batch Processing Records/Instructions

Batch Number.................   Manufacturing
date.........................

Batch Size...................   Edited
by...............................

Product code.................

CLEANING
--------
Last product
Manufactured.............................................

Batch
Number.....................................................

Batch
Size.......................................................
endtext

more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab2
endif

procedure tab2
clear
text
```

```
do while ans<> "c"
@ 1, 1 to 21, 79 color r
@ 2, 35 say "FORMULA"
@ 3, 3 to 3, 77
@ 5, 4 say "S/NO"
@ 4, 8 to 20, 8
@ 5, 14 say "MATERIAL"
@ 4, 43 to 20, 43
@ 5, 45 say "QTY(kg)"
@ 4, 53 to 20, 53
@ 5, 55 say "Gross"
@ 4, 63 to 20, 63
@ 5, 65 say "Net"
@ 4, 69 to 20, 69
@ 5, 70 say "Tare"
@ 4, 74 to 20, 74
@ 5, 75 say "Date"
@ 7, 2 say "1."
@ 7, 10 say "Paracetamol powder B. P."
@ 7, 47 say "100"
@ 7, 57 get c1
@ 7, 65 get d1
@ 7, 70 get e1
@ 7, 75 get g1
@ 9, 2 say "2."
@ 9, 10 say "Starch B. P."
@ 9, 47 say "17.6"
@ 9, 57 get c2
@ 9, 65 get d2
@ 9, 70 get e2
@ 9, 75 get g2
@ 11, 2 say "3."
@ 11, 10 say "Microcrystalline Cellulose B. P."
@ 11, 47 say "1.8"
@ 11, 57 get c3
@ 11, 65 get d3
@ 11, 70 get e3
@ 11, 75 get g3
@ 13, 2 say "4."
@ 13, 10 say "Benzoic acid B. P."
@ 13, 47 say "0.06"
@ 13, 57 get c4
@ 13, 65 get d4
@ 13, 70 get e4
@ 13, 75 get g4
@ 15, 2 say "5."
@ 15, 16 say "Tak B. P. 0.5%"
@ 15, 47 say "565g"
@ 15, 57 get c5
@ 15, 65 get d5
@ 15, 70 get e5
@ 15, 75 get g5
@ 17, 2 say "6."
@ 17, 12 say "Magnessium Stenate B. P. 0.5%"
@ 17, 47 say "565g"
@ 17, 57 get c6
@ 17, 65 get d6
```

```
@ 17, 70 get e6
@ 17, 75 get g6
read
@ 23, 30 say "Press c to continue..." get ans;
   valid ans $ "cC" error "Press c to continue"
read
If ans="C" .or. ans="c"
clear
do tab5
endif
enddo
return



procedure tab5
clear
text
                                PREPARATION
                                ===========
 (A)  STARCH PASTE
      ------------
(i) To each of the 3.6kg starch weighed seperately into two plastic
containers,
    add 4 bottle of water to make a slurry.
(ii) To this, add the benzoic acid powder.
(iii) Measure out 9 litres of water into each of the cooking pots
powder.
(iv) Heat the water into the shinny and allow to set. Turn to ensure
that a
     paste is formed.

Time processing stated.....   Time
ended.....
Repeat the procedure and allow to set and cool.

  (B) GRANULATION
      -----------
(i) Check the cleaniless of the mixer granulators

    Checked by.....     Confirmed by.....
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab6
endif



procedure tab6
```

```
clear
text
(ii) Introduce the paracetamol powder, microcrystalline cellulose and
the corn
     starch into the mixer granulator and mix using speed iv for 10
minutes.
(iii) Introduce the starch paste and mix, using speed ii for both mixer
and
      granulation for 7 minutes.
(iv) Collect the wet granules into the clean fluidised bed dryer
container by a
   fraction of about 60kg.
(C) DRYING
    ------
(1) Check the clean lines of the thidised bed dryer

    Checked by.....   Confirmed by.....

(2) Load the fluidised bed dryer (FBD) container with a quantity of wet
 granules (about 60kg free of lumps). This container loading should be
 done just before drying to avoid settling. Break any lumps before
drying.
(3) Place the container on position in the dryer, fasten the 4 clamps.
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab7
endif

procedure tab7
clear
text
(4) Select on the controller any entry temperature of between 20 - 30
degree
centigrade and initiate fluidation  for 10 minutes.

Time started.....      Time
completed.....

(5) Observed that the wet product is lifted up after 1 or 2 minutes of
blowing air. If the product moves too much either at the start or late
on
during drying reduced air floor by putting butterfly valve in position
1 or 3.
If the product is not lifted up place the knob on position 2 and press
"Fermenture" and release. If product is not lifted up, remove and
reduced the
quantity of the lumps that may have formed and continue the process.
(6) After 10 minutes start heating at 60 degree centigrade.

Time heating Started.....  Time
ended.....
```

```
(7) At the end of the drying time of 30 - 45 minutes, unlock the
clamps,
lower the container and trolley to discharge the product.

Time drying completed.....................................
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab8
endif



procedure tab8
clear
text
(8) Call Quality control department to take samples for moisture
contents
determination. Re-dry if necessary.

(9) Repeat the above procedure for all the loaded containers.

Sampled by.....................................................

Moisture contents
            (1).............%
            (2).............%
            (3).............%
            (4).............%

    Average moisture content.............%
(10) Check the clean linen of the communiting machine

Checked by.....................    Confirmed by.....................
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab9
endif



procedure tab9
clea
text
(11) Pass the dried product through the communiting machine if
necessary.
```

```
Time started.....   Time
completed.....

(12) Call quantity control department to take and determine the
particle
size and moisture contents of the granules (standard=52%)

Average particle size.....  Average moisture
content.....

(13) If drying and size reduction are no longer required, trnsfer the
bulk dry
powder, is the certified clean dry cubic mixer in granulation mixer.

Transfered by.....    Checked
by.....

(14) Add the weighed magnesium stearate and take to the bulk in (12)
above
 and mix for 15 minutes.

Time started.....   Time
ended.....
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab10
endif



procedure tab10
clear
text
(15) Call quality control department to ascertain the uniformity of
mixing,
the final moisture content and average compression of the granules.

Sampled by.....        Time.....

Remark on mixing.....Sign/Date

Average particle sign.....Sign/Date

Average compression weight.....Sign/Date

TABLETTING
==========
(1) Check the cleaniless of the tabletting machines,deduster and
collection
trays/containers.
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
```

```
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab11
endif



procedure tab11
clear
text
Checked by.....   Confirmed
by.....

(2) Call the maintenance department to ascertain the state and
northiness of
the machine for the use in this operation.

Checked by.....   Approved for use
by.....

(3) Succesively start the tablet press, vaccum cleaner and the
deduster.
(4) Adjust the average weight to conform a value in (15) above.
(5) Adjust the hardness to conform to standard (5 - 8 Kgf)
(6) Start the labelling, checked and record at specified time interval
the
following parameters-Unitary and average weight, triability, Harness,
distingeration time of the tablets.
(7) Collect the tablets in the clean dry, polythene lined,plastic
containers
provided.
(8) Transfer the compressed tablets to quaranthine Room.
(9) Call Quality control departments to observed and place their
appropriate
labels.
(10) Remove the tablets certified ready for packing to the packaging
area and
set theem out.
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab12
endif



procedure tab12
clear
text
Sorted by  (1).....
```

```
          (2).............................

          (3).............................

(11) Check the cleanliness of the plastic containers, the polythene
bags,
and the counting machines.

Checked by.............................   Confirmed
by...................

(12) Pack the sorted out tablets in the required pack size into the
product
polythene bags using the pre-set counting machines and pack into
appropriate
containers.
          Operator.....................................

Time started.........................      Time
Completed.................
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  tab13
endif



procedure tab13
clear
text
(13) Cover the packed container with the snap - shot cover, label and
package
the products also into the outer action.
(14) using the masking tape, seal each completed carton and affix
carton labels.
endtext
morel = space(1)
@ 22, 35 say "Press R to return to menu" get morel;
    valid morel $ "Rr" error "Press R to continue"
read
if more="R" .or. more="r"
 clear
return
endif
return
```

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2)	Allay, J.	Understanding expert system using crystal, wiley New York (1807)
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5)	Black well Scientific publication	Expert system and its Benefit
6)	Demongest ,J.	Artificial intelligence and cognitive sciences Manchester University Press ,Great Britain (1988).
7)	Eleine, R.	Artificial intelligent, Megan International Aucland (1983)
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9)	Oliver , E	Data Processing and information Technology DP Publication, Great Britain (1999)
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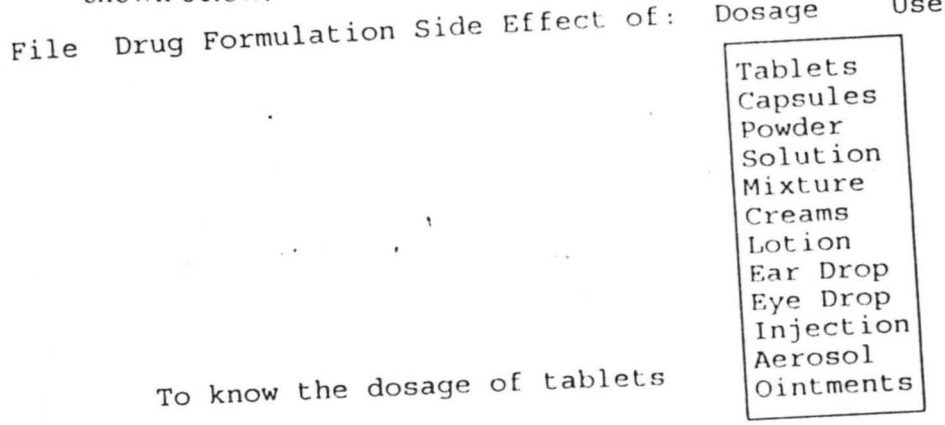
In addition , if the user wants to know what and what you can use tablets for ,and he choose USES menu and selects "Tablet" option ,the computer response is shown below.



The Help menu provides the help about author or about program. If the user is interested to know about the program, and chooses it The computer respond by displaying some option for user to choose from . The option choose by a certain user is as shown below.

1:24:41

ABOUT THE PROGRAM
****

This software: EXPERT SYSTEM IN DRUG FORMULATION was developed by ALAWODE SANJ JOSHUA who is a Pharmacist by Profession. The aim of the software is to provid help in drug formulation, drug dosage, side effect of drug and drug usage. It divide into various menu with several options to choose from.

Before we go on, it is important to know about drug, this brings us to an important question on WHAT IS DRUG?

A drug is a chemical substances that has medicinal value or active principle i a medicinal preparation that can be used for curative and diagnostic purposes

WHAT ARE THE TYPES OF DRUG?

The the types of drug are: Tablets, Capsules, Solution, Mixtures, Emulsion, Eye drops, eye lotion, ear drops, lotions, cream, linment, ointment, Inhalation e. t. c.

Press c to continue

Lastly, if the user is interested to know about the software developer, and decides to choose the option, the computer responds thus.

1:26:31

ABOUT THE AUTHOR
++++++++++++++++

The Author of this program is in person of MR. ALAWODE SANJO JOSHUA. Pharmacist by profession and a PGD student at the Federal University of chnology, Minna. In the department of Mathematics and Computer Science. This peace meal "EXPERT SYSTEM IN DRUG EXPERT FORMULATION" was one of s numerous work. Also, he is currently a pharmacist attached with GBAYI PHARMACY in Minna.

Press R to return to menu

1:27:01

CHAPTER FIVE.

SYSTEM REVIEW

5.1 ACHEIVEMENT OF THE PROJECT.

Expert system in drug formulation is a project designed to provide help in the field of pharmacy, particularly drug formulation processes. Due to the scarcity of human expert and unwilling nature of the expert to rendered this knowledge to others, with this system in placed, it will help in no small measure to render useful advice and suggestion to users of the system.

Also this project provides adequate way of keeping the biodata of the user of the software, thereby eliminating the manual process of using files. The necessary information can be process and retrieve fast, due to efficiency of computer system.

In fact, expert system in drug formulation equally helps by providing the necessary usage of most drugs, it gives a load to tell the user about the side effect and possible dosage of each of them.

In addition, the project also served as an encouragement to other people to see the possibility of building an expert in other area of human endeavor.

5.2 LIMITATI0N

However, as these are advantage of using the system, these are also limitation. The limitations are outlined below:

1) Expert system in drug formation could not provide the practical process needed in drug formation exercise.

2) The system does not pictorially present most of the apparatus needed in the drug formation process.

3) The field of expert system is new, and there is a shortage of knowledge Engineers who help in system building.

4) Expert system in drug formation could not cover all the drugs available, thereby limited in scope.

5) The knowledge acquisition process (i.e the learning process) is a major limitation of expert system. Since computer programs are prone at making analysis, most can not learn from experience.

5.3 CONCLUSION.

Like mycin, financial advisor, prospector etc. expert system still undergoes the same process of system overhaul, knowledge elicitation, reconstruction, further analysis and refinement. Expert system in drug formation would also undergo this process, as further enhancement could still be tenable.

Several surprising things may occur in the type of artificial intelligent technology this will develop In the near future. There will be a rapid growing use of small and imbedded AI based system in conventional software programs. These systems will improve the utility of large conventional programs and reduce Training requirements of their use.

It is also expected that these will be a trend from large purpose software used for development of AI application, instead suppliers of these types of program will focus on modular components that can easily customized into application specific. It seems likely that only such modularization will permit the building and maintenance of complete systems as computer operating systems, language and program development are upgraded and debugging.

It seems likely that the software will replace decision-making under certain capabilities of human in future. Rather the focus will be an enriching the decision making environments of human and improving the quality and uniformity of more routine decision-making. The next major leap in capability will most likely occur when our ability to write software can utilize massive parallelism matches our current ability to build it.

```
procedure liquid
clear
text

                                LIQUID FORMULATION
                                ==================
(1) Magnesium Trisilicate
Magnesium Trisilicate has adsorbed properties and is non-foxic even in
very large
doses. Its action is exerted slowly, so that it does not give such
rapid
symptomatic relict as alkali carbonates, bicarbonates and oxides.
Magnesium trisilicate is usually given in dosage of 0.5 to 2grams,
repeated in
accordance with the needs of the patient.

PREPARATION
===========
Magnesium trisilicate suspension
endtext
more = space(1)
@ 22, 35 say "Press c to continue" get more;
    valid more $ "Cc" error "Press C to continue"
read
if more="c" .or. more="C"
 do  liq2
endif


procedure liq2
clear
```