SHAMBHUNATH INSTITUTE OF PHARMACY

Subject Code: BP-404T Subject: PHARMACOLOGY-I

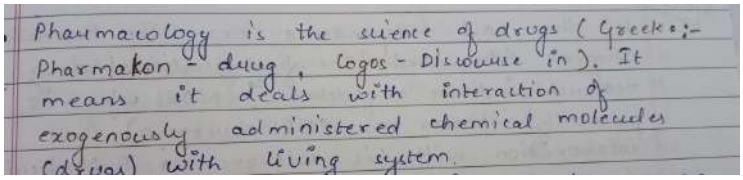
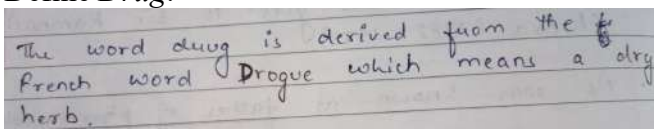
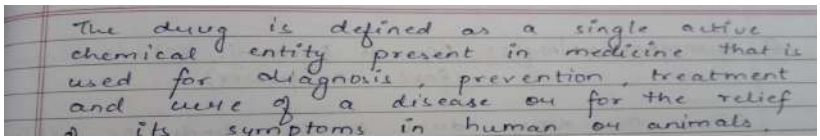
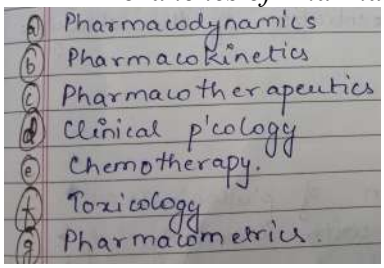
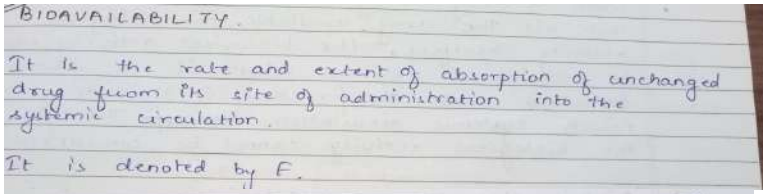
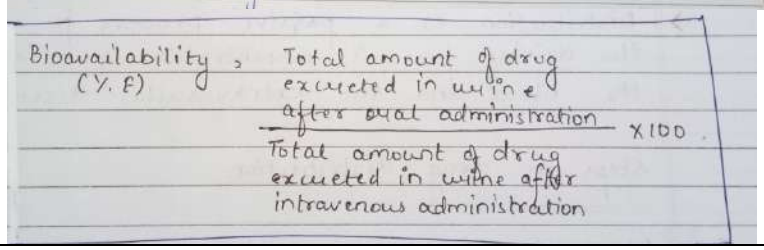
B.Pharm.-4th SEMESTER

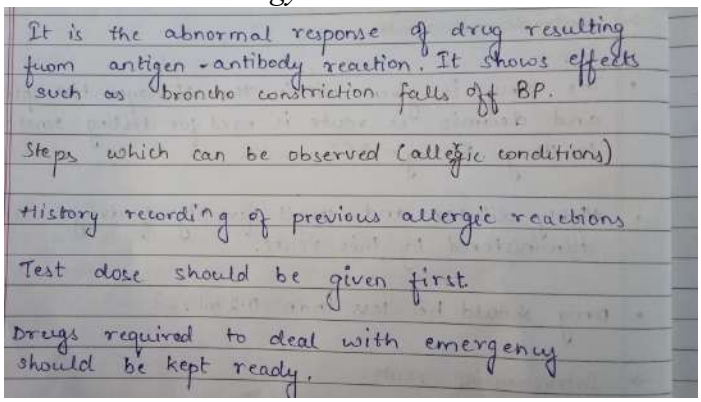
FIRST SESSIONAL EXAMINATION, EVEN SEMESTER, (2019-2020)

Solution

SECTION – A

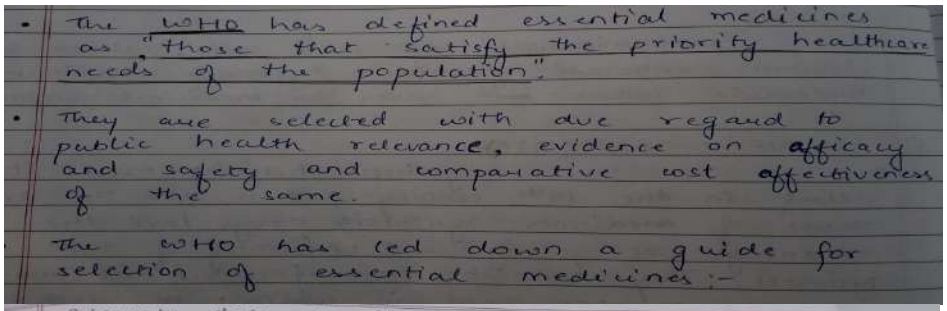
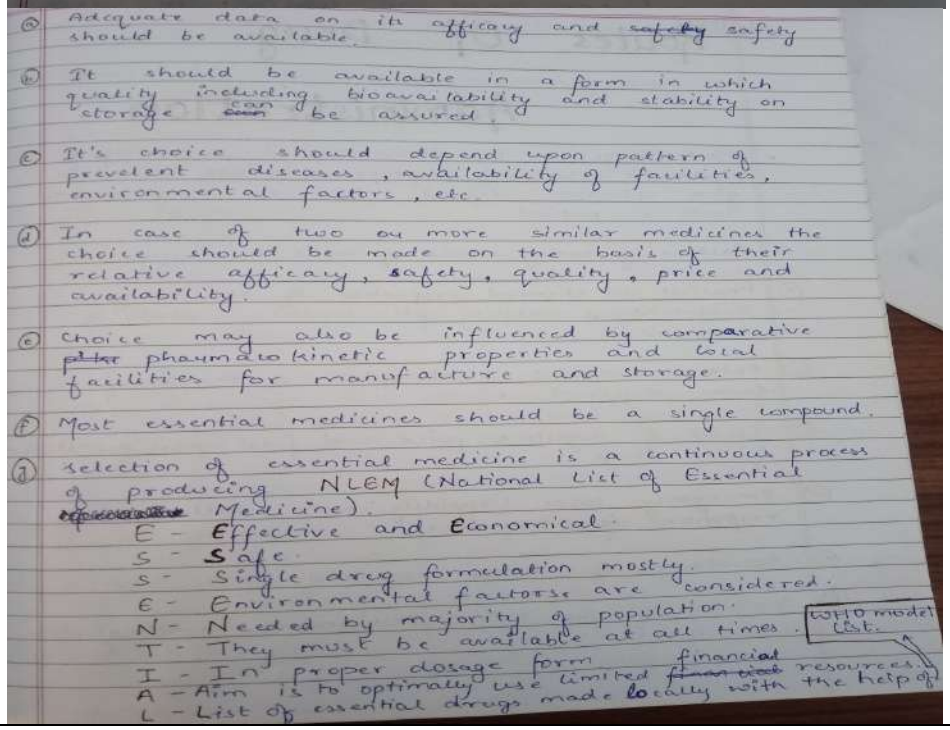
1. Attempt all questions in brief. **(1*5 = 5)**

Q. No.	QUESTION
a.	Define *Pharmacology*. 
b.	Define *Drug*.  
c.	State the *branches of Pharmacology*. 
d.	Write the formula and definition of *Bioavailability*.  

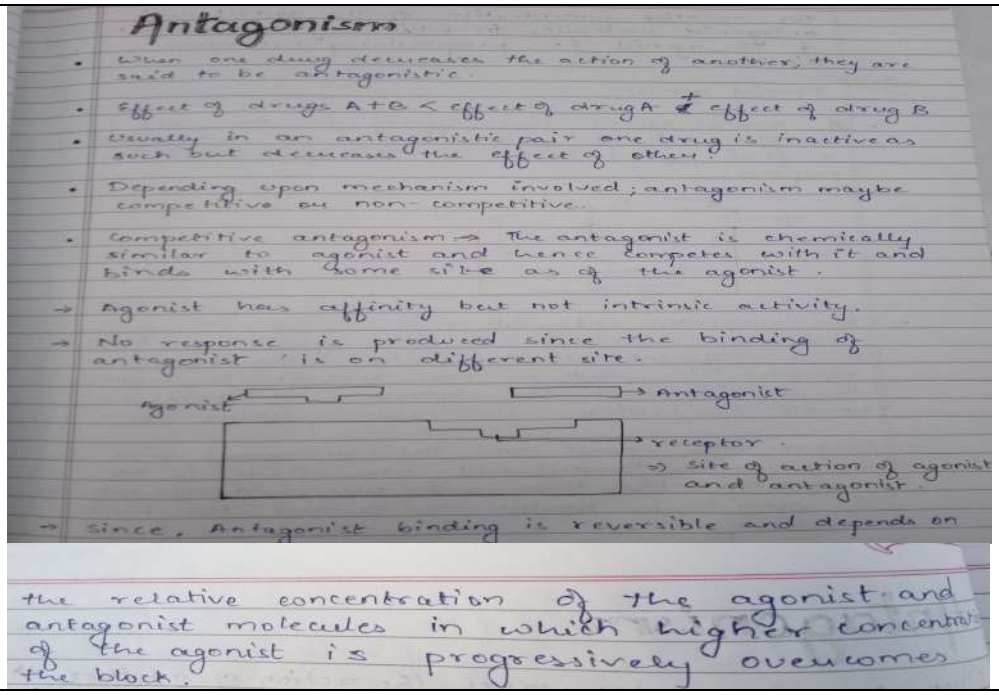
e.	Write a note on *allergy*.  It is the abnormal response of drug resulting from antigen-antibody reaction. It shows effects such as broncho constriction falls off BP. Steps which can be observed (allergic conditions) History recording of previous allergic reactions Test dose should be given first. Drugs required to deal with emergency should be kept ready.

SECTION - B

2. Attempt any <u>TWO</u> of the following. **(2*5 = 10)**

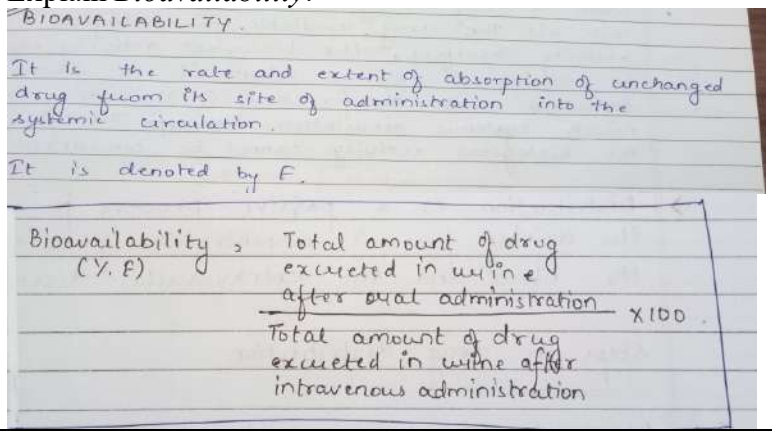
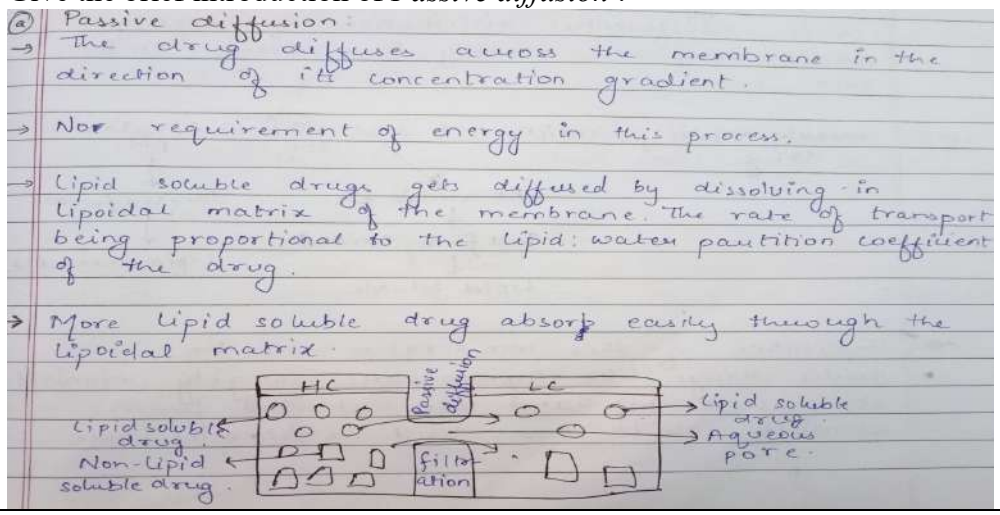
Q. No.	QUESTION
a.	Explain *essential medicines concept*.  • The WHO has defined essential medicines as "those that satisfy the priority healthcare needs of the population". • They are selected with due regard to public health relevance, evidence on efficacy and safety and comparative cost effectiveness of the same. The WHO has laid down a guide for selection of essential medicines :-  (a) Adequate data on its efficacy and ~~safety~~ safety should be available. (b) It should be available in a form in which quality including bioavailability and stability on storage ~~can~~ can be assured. (c) It's choice should depend upon pattern of prevelent diseases, availability of facilities, environmental factors, etc. (d) In case of two or more similar medicines the choice should be made on the basis of their relative efficacy, safety, quality, price and availability. (e) Choice may also be influenced by comparative ~~pha~~ pharmacokinetic properties and local facilities for manufacture and storage. (f) Most essential medicines should be a single compound. (g) Selection of essential medicine is a continuous process ~~of~~ producing NLEM (National List of Essential ~~of~~ Medicine). E - Effective and Economical S - Safe S - Single drug formulation mostly. E - Environmental factorss are considered. N - Needed by majority of population. T - They must be available at all times. WHO model list. I - In proper dosage form A - Aim is to optimally use limited ~~financial~~ financial resources. L - List of essential drugs made locally with the help of
b.	Write a note on *Oral route of drug administration.*

	→ Oral route. • This is the most ancient, convinient and commonly used route of administration of drugs. Drugs administered by oral route have the following action ① Local action - Kaolin (in diarrhoea) is used as local absorbent. Streptomycin for local antibiotic action on intestine, such actions are referred to as local actions obtained from oral route. ② Reflex action - Gentian (used in loss of Appetite) is a bitter reflex which increases secretion of saliva and gastric juice. Ammonium chloride is a reflex expectorant (expell cough outside by decreasing the viscosity of cough). ③ Systemic action - Drugs like Aspirin, Baubiturates, etc are used to provide systemic effect. These drugs are either destroyed or altered in the GIT or liver to some extent and this is known as first pass metabolism. Advantages of oral route • It is economical. • Convenient for the patient • Safe • Self medication is possible. • Doesnot need any assistance • Often painless.
	Write a note on *Synergism.* Synergism (Greek word; syn = together, ergon - work) When the action of one drug is increased by the other they are said to be ~~syn~~ synergistic. In a synergistic pair both the drugs can have action in the same direction or given alone one may be inactive but still enhance the action of the other when given together. • Synergism can be additive or supra - additive. * Additive - The effect of two drugs is in the same direction and simply adds up. Effect of drug a+b equals to effect of drug A + B (1+1=2). Eg:- Aspirin + Paracetamol = Analgesic / Antipyretic. Ephezine + Theophylline = Bronchodialator. Nitrous oxide + Halothane = General Anesthetic Side effects of the components of an additive pair maybe different - do not add up. Thus, the combination is better tolerated than higher dose of one component (dose of both drug ↓, side effect ↓ Therapeutic effect ↑) Supra - additive (Potentiation) - The effect of combination is greater than the individual effects of the components. Effect of drug A+B > Effect of drug A + Effect of drug B (1+1>1+1). Eg: Acetylcholine + Physostigmine = Parasympathomimetic Sulfamethoxazole + Trimethoprim = Sequential Blockade.
c.	
d.	State the *mechanism of Antagonism*.

	 Antagonism • When one drug decreases the action of another, they are said to be antagonistic. • Effect of drugs A+B < effect of drug A + effect of drug B. • Usually in an antagonistic pair one drug is inactive as such but decreases the effect of other. • Depending upon mechanism involved; antagonism maybe competitive or non-competitive. • Competitive antagonism → The antagonist is chemically similar to agonist and hence competes with it and binds with same site as of the agonist. → Agonist has affinity but not intrinsic activity. → No response is produced since the binding of antagonist is on different site. Agonist → Antagonist receptor → site of action of agonist and antagonist. → Since, Antagonist binding is reversible and depends on the relative concentration of the agonist and antagonist molecules in which higher concentration of the agonist is progressively overcomes the block.

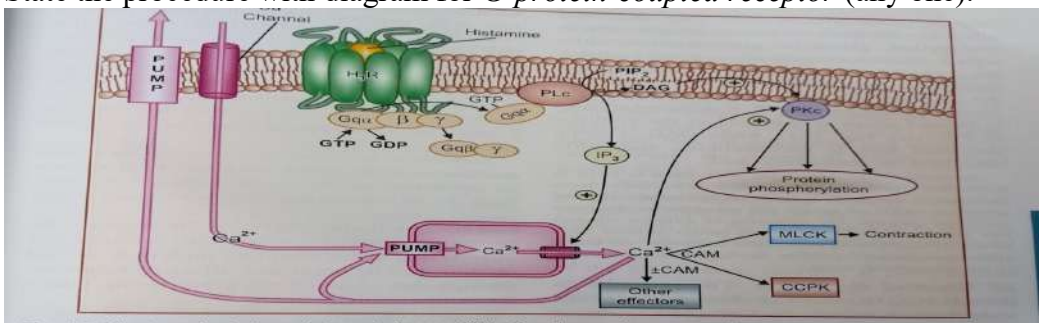
SECTION - C

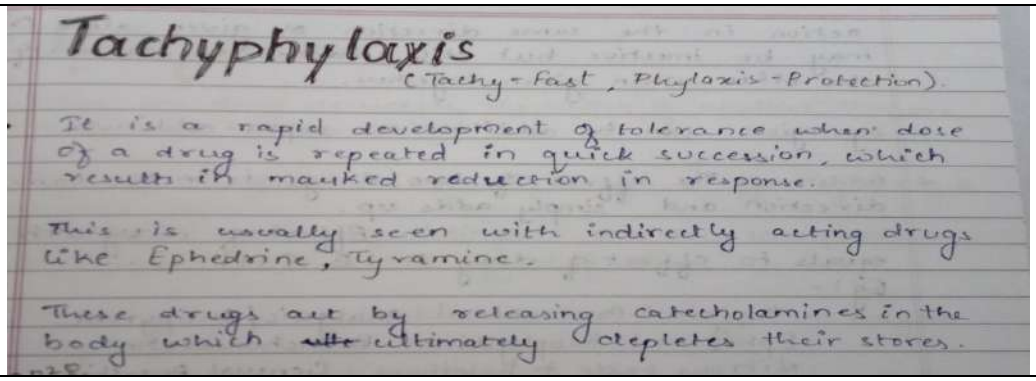
3. Attempt any ONE part of the following : **(1*5 = 5)**

Q No.	QUESTION
a.	Explain *Bioavailability*.  BIOAVAILABILITY. It is the rate and extent of absorption of unchanged drug from its site of administration into the systemic circulation. It is denoted by F. Bioavailability (Y.F) = Total amount of drug excreted in urine after oral administration / Total amount of drug excreted in urine after intravenous administration × 100.
b.	Give the brief introduction of *Passive diffusion* .  (a) Passive diffusion → The drug diffuses across the membrane in the direction of its concentration gradient. → Nor requirement of energy in this process. → Lipid soluble drugs gets diffused by dissolving in lipoidal matrix of the membrane. The rate of transport being proportional to the lipid: water partition coefficient of the drug. → More lipid soluble drug absorb easily through the lipoidal matrix. HC Passive diffusion LC Lipid soluble drug Aqueous pore Lipid soluble drug Non-lipid soluble drug filtration

	largely ionised and are absorbed only when they reach the intestine. • The unionised form of acidic drugs which crosses the surface of gastric mucosal cells reverts to the ionised form within the cell (pH=7) and then only slowly passes to the extracellular fluid. This is called ion trapping. This may cause gastric mucosal cell damage caused by Aspirin. Filtration → Filtration is ~~passive~~ passage of drugs through aqueous pores in the membrane or through paracellular spaces. → Majority of cells have very small pores (4 A°) and drugs with molecular weight greater than 100 or 200 are not able to penetrate. However, capillaries (except those in brain) have large paracellular spaces (40 A°) and most drugs can filter through this. As such diffusion of drugs across capillaries is dependent on rate of blood flow through them rather on lipid solubility of the drug or pH of the medium

4. Attempt any ONE part of the following : **(1*5 = 5)**

Q. No.	QUESTION
a.	State the procedure with diagram for *G-protein-coupled receptor* (any one).  Fig. 4.7: The important steps of phospholipase cβ(PLcβ) pathway of response effectuation (in smooth muscle) The agonist, e.g. histamine binds to its H_1 receptor (H_1 R) and activates the G-protein $G_{q/11}$. Its α subunit binds GTP in place of GDP, dissociates from the receptor as well as from βγ dimer to activate membrane bound PLcβ that hydrolyses phosphatidyl inositol 4, 5-bisphosphate (PIP_2), a membrane bound phospholipid. The products inositol 1, 4, 5-trisphosphate (IP_3) and diacylglycerol (DAG) act as second messengers. The primary action of IP_3 is facilitation of Ca^{2+} mobilization from intracellular organellar pools, while DAG in conjunction with Ca^{2+} activates protein kinase C (PKc) which phosphorylates and alters the activity of a number of functional and structural proteins. Cytosolic Ca^{2+} is a veritable messenger: combines with calmodulin (CAM) to activate myosin light chain kinase (MLCK) inducing contraction, and another important regulator calcium-calmodulin protein kinase (CCPK). Several other effectors are regulated by Ca^{2+} in a CAM dependent or CAM- independent manner. Cytosolic Ca^{2+} is recycled by uptake into the endoplasmic reticulum as well as effluxed by membrane Ca^{2+} pump.
b.	Explain *Tolerance and Tachyphylaxis*. Tolerance • It refers to the requirement of a higher dose of a drug to produce a given response. Loss of therapeutic efficacy results due to tolerance Drug tolerance maybe of ~~two~~ three types:- ~~Acquired~~ Acquired tolerance - This occurs by repeated use of a drug in an individual who was initially responsive. Eg:- Tolerance developed due to ~~tolerance~~ sedative action of Chlorpromazine but not to its Anti-psychotic action. Natural tolerance - The species or individual is inherently less sensitive to the drug. Eg:- Rabbits are tolerant to Atropine. Cross tolerance - It is development of tolerance of pharmacologically related drugs. For eg:- Alcoholics are relatively tolerant ~~to~~ to barbiturates and general anesthetics.



Tachyphylaxis

(Tachy = fast, Phylaxis = Protection).

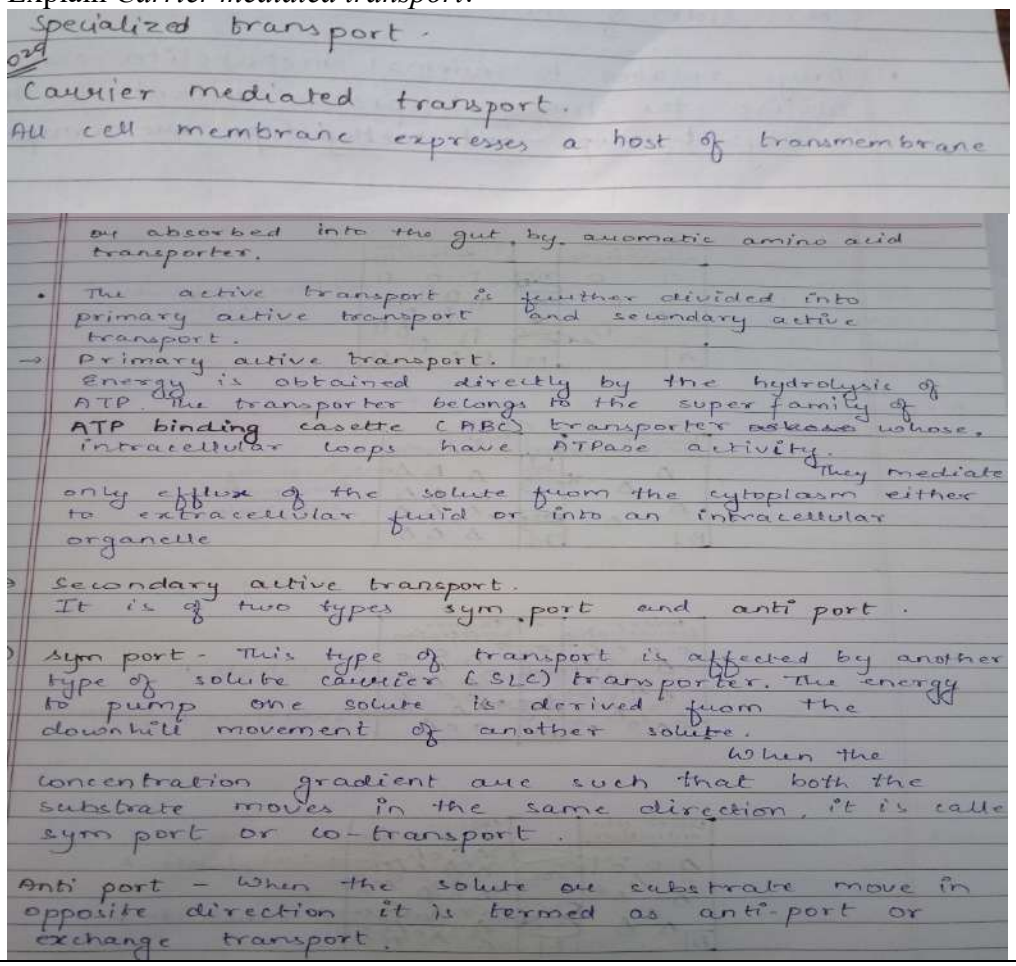
It is a rapid development of tolerance when dose of a drug is repeated in quick succession, which results in marked reduction in response.

This is usually seen with indirectly acting drugs like Ephedrine, Tyramine.

These drugs act by releasing catecholamines in the body which ultimately depletes their stores.

5. Attempt any ONE part of the following : **(1*5 = 5)**

Q. No.	QUESTION
a.	Explain *Carrier mediated transport*.



Specialized transport.

029

Carrier mediated transport.

All cell membrane expresses a host of transmembrane

are absorbed into the gut by aromatic amino acid transporter.

- The active transport is further divided into primary active transport and secondary active transport.

→ Primary active transport.

Energy is obtained directly by the hydrolysis of ATP. The transporter belongs to the super family of ATP binding cassette (ABC) transporter whose intracellular loops have ATPase activity. They mediate only efflux of the solute from the cytoplasm either to extracellular fluid or into an intracellular organelle

Secondary active transport.

It is of two types sym port and anti port.

Sym port - This type of transport is affected by another type of solute carrier (SLC) transporter. The energy to pump one solute is derived from the downhill movement of another solute. When the concentration gradient are such that both the substrate moves in the same direction, it is calle sym port or co-transport.

Anti port - When the solute or substrate move in opposite direction it is termed as anti-port or exchange transport.

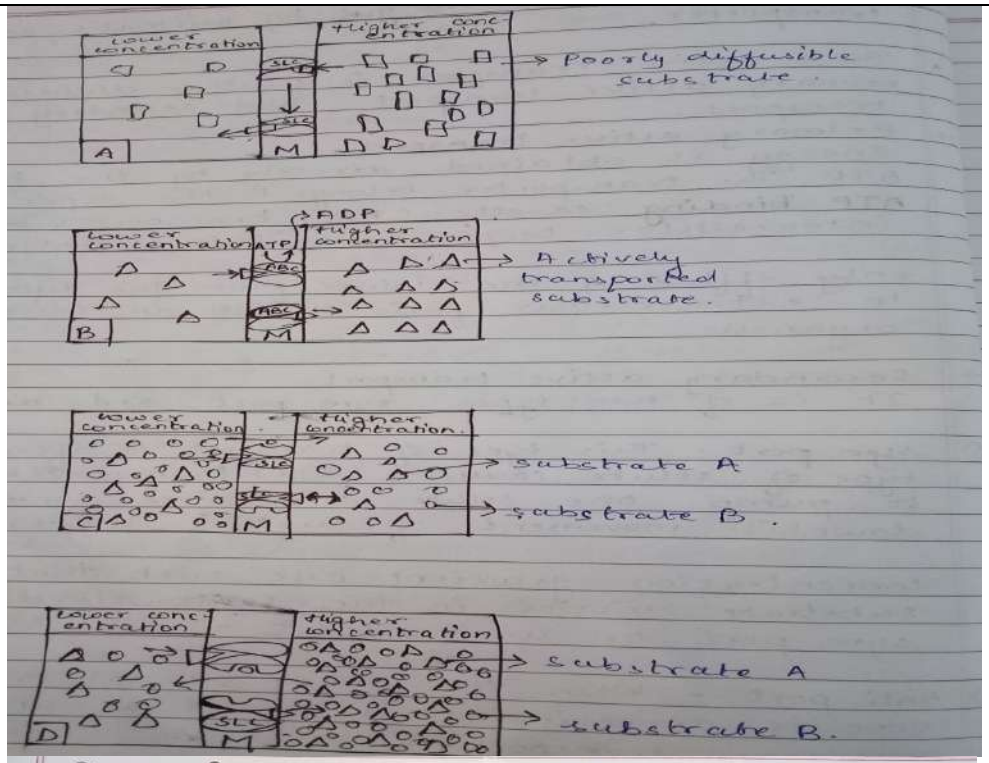


Fig A :- Facilitated diffusion - The carrier binds and moves the poorly diffusible substrate along its concentration gradient and does not require energy.

Fig B :- Primary active transport - The carrier (ABC) derives energy directly by hydrolysing ATP and moves the substrate against its concentration gradient

Fig C :- Sym port - The carrier moves the substrate A against its concentration gradient by utilising energy from downhill movement of ~~and~~ another substrate B in the same direction.

Fig D :- Anti port - The carrier moves the substrate A against the concentration gradient and is energised by the downhill movement of another substrate B in the opposite direction.

b. Write a note on *Source of drugs.*

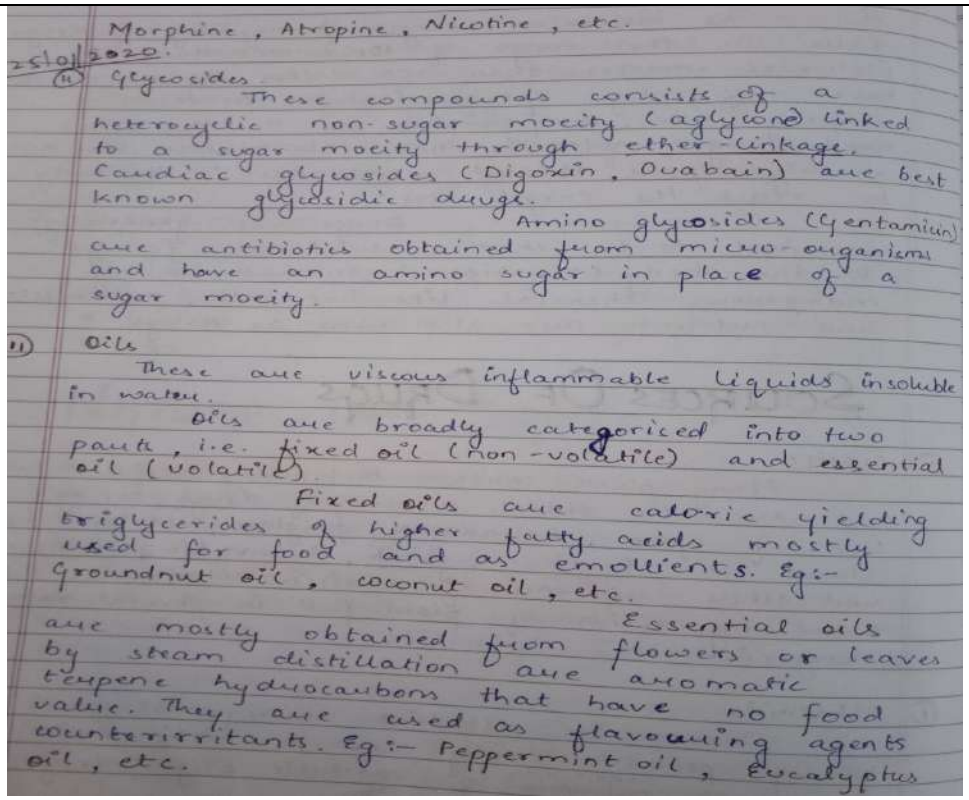
SOURCES OF DRUGS

(a) PLANTS.

Many plants contain biologically active substances and are the oldest source of drugs. For eg:- Use of opium, belladonna, foxglove, etc has been shown in Egyptian, ~~Greek~~ Greek, Ayurvedic, Chinese and other systems of medicine. Chemically the active ingredients of plants fall in several ~~categ~~ categories.

(1) Alkaloids

These are alkaline nitrogenous bases having potent activity and are the most important ~~category~~ category of vegetable origin drugs. Eg:



Morphine, Atropine, Nicotine, etc.

25/01/2020.

(10) Glycosides

These compounds consists of a heterocyclic non-sugar moeity (aglycone) linked to a sugar moeity through ether-linkage. Caudiac glycosides (Digoxin, Ouabain) are best known glycosidic drugs.

Amino glycosides (Gentamicin) are antibiotics obtained from micro-organisms and have an amino sugar in place of a sugar moeity.

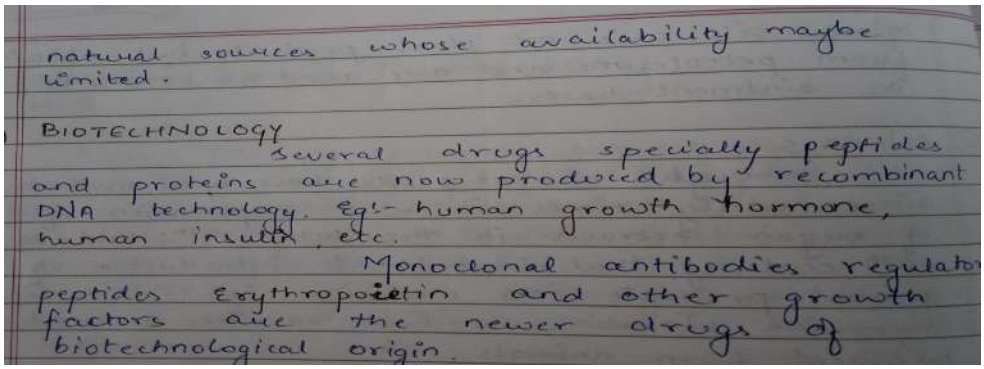
(11) Oils

These are viscous inflammable liquids insoluble in water.

Oils are broadly categoriced into two parts, i.e. fixed oil (non-volatile) and essential oil (volatile).

Fixed oils are calorie yielding triglycerides of higher fatty acids mostly used for food and as emollients. Eg:- Groundnut oil, coconut oil, etc.

Essential oils are mostly obtained from flowers or leaves by steam distillation are aromatic terpene hydrocarbons that have no food value. They are used as flavouring agents counterirritants. Eg:- Peppermint oil, Eucalyptus oil, etc.



natural sources whose availability maybe limited.

BIOTECHNOLOGY

Several drugs specially peptides and proteins are now produced by recombinant DNA technology. Eg:- human growth hormone, human insulin, etc.

Monoclonal antibodies regulator peptides Erythropoietin and other growth factors are the newer drugs of biotechnological origin.