JEPPIAAR ENGINEERING COLLEGE
DEPARTMENT OF BIOTECHNOLOGY

BT 6006 Biopharmaceutical Technology

[Question Bank]

B.TECH. BIOTECHNOLOGY

III YEAR / V SEMESTER

REGULATION 2013

Compiled by
[Mr. V. Jeyamanikandan, Asst. Professor, Department of Biotechnology, Jeppiaar Engineering College]

VISION OF THE INSTITUTION

- To build Jeppiaar Engineering College as an institution of academic excellence in technological and management education to become a world class University

MISSION OF THE INSTITUTION

- To excel in teaching and **learning, research and innovation** by promoting the principles of scientific analysis and creative thinking.
- To participate in the production, **development and dissemination of knowledge** and interact with **national and international communities.**
- To equip students with **values, ethics and life skills n**eeded to enrich their lives and enable them to meaningfully contribute to the **progress of society.**
- To prepare students for **higher studies and lifelong learning,** enrich them with the **practical and entrepreneurial skills** necessary to excel as future professionals and contribute to **Nation's economy**

PROGRAM OUTCOMES (PO)

PO 1	**Engineering knowledge**: **Apply** the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: **Identify, formulate, review** research literature, and **analyze** complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: **Design solutions** for complex engineering problems and **design** system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO 4	**Conduct investigations of complex problems**: **Use** research-based knowledge and research methods including **design** of experiments, **analysis** and **interpretation** of data, and **synthesis** of the information to provide valid conclusions.
PO 5	**Modern tool usage**: **Create**, **select**, and **apply** appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: **Apply** reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: **Understand** the impact of the professional engineering solutions in societal and environmental contexts, and **demonstrate** the knowledge of, and need for sustainable development.
PO 8	**Ethics**: **Apply** ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: **Function effectively** as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: **Communicate effectively** on complex engineering activities with the engineering community and with society at large, such as, being able **to comprehend** and **write** effective reports and **design** documentation, **make** effective presentations, and **give** and **receive** clear instructions.
PO 11	**Project management and finance**: **Demonstrate** knowledge and understanding of the engineering and management principles and **apply** these to one's own work, as a member and leader in a team, to **manage** projects and in multidisciplinary environments.
PO 12	**Life-long learning**: **Recognize** the need for, and have the preparation and ability to **engage** in independent and life-long learning in the broadest context of technological change.

DEPARTMENT: BIOTECHNOLOGY

VISION OF THE DEPARTMENT

❖ To pursue excellence in producing bioengineers coupled with research attributes

MISSION OF THE DEPARTMENT

M1	To **impart** quality education and **transform** technical knowledge into career opportunities
M2	To **establish** a bridge between the **program and society** by **fostering** technical education
M3	To **generate societal conscious technocrats** towards **community development**
M4	To **facilitate higher studies** and research in order to have an **effective career** / entrepreneurship

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO - 1	To impart knowledge and produce competent graduates in the field of biotechnology
PEO - 2	To inculcate professional attributes and ability to integrate engineering issues to broader social contexts.
PEO - 3	To connect the program and community by fostering technical education.
PEO - 4	To provide a wide technical exposure to work in an interdisciplinary environment
PEO - 5	To prepare the students to have a professional career and motivation towards higher education.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1	**Professional Skills:** This programme will provide students with a **solid foundation** in the field of Biological Sciences and Chemical engineering enabling them to work on engineering platforms and applications in Biotechnology as per the requirement of Industries, and facilitating the students to pursue higher studies.
PSO 2	**Problem-solving skills:** This programme will assist the students to **acquire fundamental** and **problem solving knowledge** on subjects relevant to Biotechnology thereby encouraging them to **understand** emerging and advanced concepts in modern biology.
PSO 3	**Successful Career and Entrepreneurship:** Graduates of the program will have a **strong successful career** and **entrepreneurial ability** with the blend of inputs from basic science, engineering and technology, thereby enabling them to **translate the technology and tools** in various industries and/or institutes.

COURSE OUTCOMES (CO)	
C306: BT6006 – BIOPHARMACEUTICAL TECHNOLOGY	
C306.1	Ability to **define, understand** and **explain** the Knowledge on basic pharmaceutical industry, therapeutic agents uses, regulatory issues.
C306.2	Ability **to understand** and **explain** the mechanism of drug action and the principle of physico-chemical properties of drugs
C306.3	Ability **to the knowledge** the process involved in manufacture of drugs, **analyse** the special requirements, reaction process and applications
C306.4	Ability **to understand and apply the knowledge** on principles of manufacturing requirements, tools used, **evaluate** the drug properties using analytical methods and quality management of different forms of drugs
C306.5	Ability to **understand** the biopharmaceuticals like vitamins, hormones, contraceptives, biologics, etc. for the current and future biotechnology related products on the market

ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS - SYLLABUS
R - 2013
B.TECH. BIOTECHNOLOGY

BT6006 BIOPHARMACEUTICAL TECHNOLOGY L T P C
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OBJECTIVES:

The aim of the course is to give strong foundation and advanced information on biopharmaceutical aspects in relation to drug development.

- This course provides core responsibilities for the development and monitoring of the drug and the preparation of medicines according to the norms.
- To gain knowledge in physicochemical properties, pharmacology and the formulation of commonly used biopharmaceuticals.

UNIT I INTRODUCTION 7

Pharmaceutical industry & development of drugs ; types of therapeutic agents and their uses; economics and regulatory aspects .

UNIT II DRUG ACTION, METABOLISM AND PHARMACOKINETICS 9

Mechanism of drug action; physico-chemical principles of drug metabolism; radioactivity; pharmacokinetics.

UNIT III MANUFACTURE OF DRUGS, PROCESS AND APPLICATIONS 7

Types of reaction process and special requirements for bulk drug manufacture.

UNIT IV PRINCIPLES OF DRUG MANUFACTURE 15

Compressed tablets; dry and wet granulation; slugging or direct compression; tablet presses; coating of tablets; capsule preparation; oval liquids – vegetable drugs – topical applications; preservation of drugs; analytical methods and other tests used in drug manufacture; packing techniques; quality management; GMP.

UNIT V BIOPHARMACEUTICALS 7

Various categories of therapeutics like vitamins, laxatives, analgesics, contraceptives, antibiotics, hormones and biologicals.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Finkel, Richard, etal., “Lippincott’s Illustrated Reviews Pharmacology” 4th Edition.Wolters Kluwer / Lippincott Williams & Wilkins, 2009.
2. Shayne Cox Gad. Pharmaceutical Manufacturing Handbook, Published by John Wiley & Sons, Inc., 2008.
3. Bernd Meibohm. Pharmacokinetics and Pharmacodynamics of biotech drugs, Published by Wiley-VCH, 2006.

REFERENCES:

1. Gareth Thomas. Medicinal Chemistry. An introduction. John Wiley. 2000.
2. Katzung B.G. Basic and Clinical Pharmacology, Prentice Hall of Intl. 1995.

JEPPIAAR ENGINEERING COLLEGE			
DEPARTMENT OF BIOTECHNOLOGY			
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BT6006 - BIOPHARMACEUTICAL TECHNOLOGY (REGULATION 2013)			
III YEAR V SEMESTER			
UNIT I	**INTRODUCTION**	**Reference**	**Page No.**
	Pharmaceutical industry & development of drugs	RB2	69-73
	types of therapeutic agents and their uses	TB3	295-321
	economics and regulatory aspects	RB2	73-77
UNIT II	**DRUG ACTION, METABOLISM AND PHARMACOKINETICS**		
	Mechanism of drug action	RB2	1-34
	physico-chemical principles of drug metabolism	RB1	439-476
	radioactivity	TB2	59-96
	pharmacokinetics	RB1	403-438
UNIT III	**MANUFACTURE OF DRUGS, PROCESS AND APPLICATIONS**		
	Types of reaction process and special requirements for bulk drug manufacture.	TB2	139-157
UNIT IV	**PRINCIPLES OF DRUG MANUFACTURE**		
	Compressed tablets	TB2	1133-1163
	dry and wet granulation	TB2	977-1008
	slugging or direct compression	TB2	1133-1163
	Tablet presses		
	coating of tablets	TB2	244-245 1099-1121
	capsule preparation	TB2	245-251
	oval liquids – vegetable drugs – topical applications	TB2	313-343
	preservation of drugs	TB2	1165-1190
	analytical methods and other tests used in drug manufacture		
	packing techniques	TB2	159-200
	quality management; GMP	TB2	3-26

UNIT V	**BIOPHARMACEUTICALS**		
	Various categories of therapeutics like vitamins,	TB1	534-537
	laxatives,		
	analgesics,	TB1	202-277 810-840
	contraceptives,	TB1	476-480
	antibiotics,	TB1	549-621
	hormones and biologicals	TB1	487-500

TB1 - Finkel, Richard, etal., "Lippincott's Illustrated Reviews Pharmacology" 4th Edition.Wolters Kluwer / Lippincott Williams & Wilkins, 2009..

TB2 - Shayne Cox Gad. Pharmaceutical Manufacturing Handbook, Published by John Wiley & Sons, Inc., 2008.

TB3 – Bernd Meibohm. Pharmacokinetics and Pharmacodynamics of biotech drugs, Published by Wiley-VCH, 2006.

RB1 – Gareth Thomas. Medicinal Chemistry. An introduction. John Wiley. 2000.

RB2 – Katzung B.G. Basic and Clinical Pharmacology, Prentice Hall of Intl. 1995.

Reg. No. : | | | | | | | | | | | | |

QUESTION PAPER CODE : 50171

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fifth Semester
Biotechnology
BT 6006 – BIOPHARMACEUTICAL TECHNOLOGY
(Regulation 2013)

Time : Three hours **Maximum : 100 marks**

Answer ALL questions.

PART A – (10 X 2 = 20 marks)

1. Define drug.

A Chemical substance (known structure) other than a nutrient or an essential dietary ingredient, which, when administered to a living organism, produces a biological effect, A **drug** is **defined** as: A substance recognized by an official pharmacopoeia or formulary. A substance intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease. A substance (other than food) intended to affect the structure or any function of the body.

Example, insulin is a hormone that is synthesized in the body; it is called a hormone when it is synthesized by the pancreas inside the body, but if it is introduced into the body from outside, it is called a drug.

2. Write short notes on biopharmaceuticals.

Biopharmaceuticals are defined as substances produced in living systems by biotechnology and used for therapeutic purposes or in vivo diagnostics.

Because of the way they are made, these agents are often called biotech drugs and include therapeutic peptides and proteins, antibodies, oligonucleotides and nucleic acid derivatives, and DNA preparations.

Biopharmaceuticals are part of a broader category of therapeutic agents called biologics (or biologicals), defined as any therapeutic agent manufactured in living systems such as microorganisms, or plant and animal cells. Biologics not only include biopharmaceuticals, but also blood and blood components, vaccines, and other biomolecules extracted directly from natural (nonengineered) sources.

3. Define pharmacokinetics.

Pharmacokinetics, sometimes described as what the body does to a drug, refers to the movement of drug into, through, and out of the body—the time course of its absorption, bioavailability, distribution, metabolism, and excretion.

It is a branch of pharmacology dedicated to determining the fate of substances administered to a living organism.

4. What is radioactivity and give its role in drug evolution?

R adioactivity defined as the spontaneous emission of particles (alpha, beta, neutron) or radiation (gamma, K capture), or both at the same time, from the decay of certain nuclides that these particles are, due to an adjustment of their internal structure.

- Radioactive drugs, or radiopharmaceuticals, are used clinically for the diagnosis, investigation and occasionally for the therapy, of many human illnesses.
- Nuclear medicine uses radiation to provide diagnostic information about the functioning of a person's specific organs, or to treat them. Diagnostic procedures using radioisotopes are now routine.
- Radiotherapy can be used to treat some medical conditions, especially cancer, using radiation to weaken or destroy particular targeted cells.
- Over 40 million nuclear medicine procedures are performed each year, and demand for radioisotopes is increasing at up to 5% annually.
- Sterilization of medical equipment is also an important use of radioisotopes.

5. What is Pharmaceutical formulation?

It is the processes in which different chemical substances i.e., active chemical substances will combined together to produce a medical compound i.e., medical drug.
There are two types or classifications for Pharmaceutical Formulation, these types are the following:

Oral formulation- The most important characteristic for oral formulation it must be overcome the problems which associated with oral administration. The most critical problem is rate of drug solubility i.e., the active ingredient of the drug must be soluble in aqueous solution in a constant rate. This point can be controlled through some factors like particle size and crystal form. The oral formulation divided in two parts which are: A- Tablet form & B- Capsule form.

Topical medication forms- This type include several parts as the following: Cream, B- Ointment, C- Gel, D- Paste, and E- Powder.

6. Give the role of granulation in formulation.

Granulation is the act or process of forming into grains or granules. It is size enlargement process which converts small particles into physically stronger & larger agglomerates.

Granulating agent are binding agents added to bind the fine particles into granules they increase the attractive forces between individual particles. Ex: Water and Alcohol.

7. What is GMP?

- "GMP" - A set of principles and procedures which, when followed by manufacturers for therapeutic goods, helps ensure that the products manufactured will have the required quality.

- GMP is that part of Quality assurance which ensures that the products are consistently manufactured and controlled to the Quality standards appropriate to their intended use

8. What are vegetable drugs?

Derived from plants; includes alkaloids, glycosides, resins, gums and oils.

Various parts of plants like-leaves, flowers, seeds, roots, stems & bark etc. are used

e.g. –Belladonna leaves, Belladonna roots, Cinchona bark, Digitalis leaves, Nux vomica seeds, seed head of unripe opium poppy etc.

9. Write short notes on hormonal drugs.

Treatment of disease or symptoms with synthetic or naturally derived hormones.

The term is most commonly used to describe use of medications containing both estrogen and progestogen to reduce or stop short-term changes associated with the perimenopause.

10. Define antibiotics with examples.

Antibiotics are medicines that help stop infections caused by bacteria. They do this by killing the bacteria or by keeping them from copying themselves or reproducing.

For example, penicillin, a substance produced by fungi that appeared able to inhibit bacterial growth.

Tetracycline, a broad-spectrum agent effective against a wide variety of bacteria including *Hemophilus influenzae, Streptococcus pneumoniae, Mycoplasma pneumoniae, Chlamydia psittaci, Chlamydia trachomatis, Neisseria gonorrhoea*, and many others. The first drug of the tetracycline family, chlortetracycline, was introduced in 1948.

PART B – (5 X 13 = 65 marks)

11. (a) Explain briefly about therapeutic agents and their applications. [TB3: 295-321]

Or

11. (b) Explain the process involved in drug development. [RB2: 69-73]

12. (a) Write brief note on mechanism of drug action. [RB1: 1-32]

Or

12. (b) Write a brief note on pharmacokinetics. [RB1: 409-411]

13. (a) What are the types of reactions process adapted in pharmaceutical manufacturing plants. [TB2: 139-142]

Or

13.(b) What are the requirements in bulk drug manufacturing? [TB2: 4-21]

14. (a) What are the analytical methods and test used in drug manufacturing? [TB2: 1165-1190]

Or

14. (b) Write a detail note on tablet manufacturing process. [TB2: 977-1008, 1133-1163]

15. (a) What are the vitamins used as therapeutics? [TB1: 534-537; 202-277]

Or

15. (b) What are contraceptives? Mention the various types of contraceptives used. [https://www.nichd.nih.gov/health/topics/contraception/conditioninfo/types; https://www.zavamed.com/uk/types-of-contraceptives.html]

PART C – (1 X 15 = 15 marks)

16. (a) Schematically explain a drug manufacturing process and discuss the analytical methods used in drug manufacturing. [TB2: 1165-1190; [http://www.ilocis.org/documents/chpt79e.htm]]

Or

16. (b) Explain the importance and applications of biopharmaceutical technology in the field of biotechnology. [https://doi.org/10.3109/03639048509055593]

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III YR / V SEMESTER
BT6006 BIOPHARMACEUTICAL TECHNOLOGY
IMPORTANT QUESTIONS

UNIT I

INTRODUCTION

TWO MARKS:

1. What are the types of therapeutic agents? Apr may 2008 Nov Dec 2014
2. Name one agency and its role in regulating the drug industry. Nov Dec 2014
3. Define a drug. Nov Dec 2007
4. What are the stages of clinical trials in developing a drug? Nov Dec 2007
5. Define mutasynthesis and how it is used for the design of novel drugs. Nov Dec 2014
6. Define Prodrug. Nov Dec 2007
7. What is RLD?
8. What is spurious drug? Nov Dec 2009
9. What does pharmaco-economics deal with? Nov Dec 2009; Nov/Dec 2016
10. What is a Target in drug discovery?
11. What are the various sources of drugs? Nov Dec 2012; Nov Dec 2010
12. What is ICH? Nov Dec 2012; Nov Dec 2010
13. What is pharmacopoeia?
14. Write about Indian drugs and cosmetics act?
15. Briefly write about pharmacophore. Nov Dec 2011
16. What is the significance of serendipity in drug discovery?Ap May 2011
17. What is the need for regulating pharmaceutical manufacturing?Ap May 2011
18. What is the role of FDA?
19. What is meant by NDA?
20. Write a short note on drug design
21. What is a lead compounds? Comment on the sources of drugs
22. Comment on SAR
23. What is meant by NCE?
24. What is an IND?
25. What are the types of pharmacoeconomic evaluations?
26. Draw the flow chart to describe the drug discovery and development process.
27. What are the applications of pharmacoeconomics?

28. Write about cost benefit analysis. Nov Dec 2007
29. Write a short note on cost-effective analysis. Nov Dec 2007
30. Name the steps involved in discovery of lead compound.
31. Comment on SWOT analysis of an Indian pharmaceutical industry. (Nov/Dec, 2016)

PART B:

1. Explain the regulatory aspects of a pharma industry. (Dec 2013,Dec 2011) [RB2: 73-77]
2. What are therapeutic proteins? Explain the role and production of recombinant proteins as pharmaceutical drugs. (Dec 2013, Dec 2014, Dec 2011) [TB3: 295-321]
3. Explain the drug development process. (Dec 2009, May 2011) [RB2: 69-73]
4. Using graphical representation show the relationship between: (i) Plasma to tissue concentration. (ii) Drug concentration and drug effect at the receptor site. (iii) Tolerance to drug effect with repeated dosing. (iv) Relationship of drug concentration at the receptor site to percent maximum effect. [RB2: 16-20]
5. Discuss the evaluation methods of pharmaco-economics in detail. [RB2: 72-74]
6. What is a lead compound? How is it identified in drug development process? [RB1: 9-21]

PART C

1. Explain in detail about the various therapeutic agents with suitable examples. (Nov/Dec 2016) [TB3: 295-321]
2. Write a short notes on (i) Development of a new drug. [RB2: 69-73] (ii) Regulatory aspects of a pharmaceutical industry. (Nov/Dec 2016) [RB2: 73-77]
3. Write a note on Indian drugs and cosmetics act and Pharmacopoeia. (Nov/Dec, 2010) [TB2: 126-124]

UNIT II

DRUG ACTION, METABOLISM AND PHARMACOKINETICS

TWO MARKS:

1. What is the mechanism of action of aspirin? Nov Dec 2007
2. What is ‘system approach’ for dose response? Nov Dec 2014
3. What is the objectives of pharmacokinetic models? Nov Dec 2007
4. Differentiate between pharmacodynamics and pharmacokinetics.
5. What is API?
6. What are the various routes by which a drug can be administered? Nov Dec 2007
7. How radioactivity is used in determining pharmacokinetics of a drug? Nov Dec 2007
8. Define radiopharmaceuticals. (Nov/Dec, 2016)
9. Define bio equivalence. (Apr May 2011; Nov/Dec, 2016)

10. Define bio availability.Ap May 2011
11. What is first pass effect?
12. What is Placebo effect?
13. Define pharmacokinetics. Nov Dec 2009
14. List out the drugs used in hyperthyroidism. Nov Dec 2010
15. What is relative bioavailability? Nov Dec 2010
16. What is absolute absolute bioavailability? Nov Dec 2010
17. What is the effect of gastric emptying rate on bioavailability? Nov Dec 2010
18. What is cGMP?
19. What is phase I biotransformation?
20. What is phase II biotransformation?
21. Define Clearance.
22. Define volume of distribution. Nov Dec 2011
23. Define polymorphism.
24. Briefly write about Drug-drug interactions. Nov Dec 2011
25. What is meant by First-pass metabolism? Apr May 2008
26. "highly lipophilic drugs will have low apparent volume of distribution" validate and justify this statement?' apr may 2011
27. What is meant by depot action? Apr May 2011
28. What are liposomes? Apr May 2011
29. What are proton-pump inhibitors and where are they useful?
30. Explain any one receptor-mediated drug action. With a suitable example.
31. What is the half life of a drug given that its Kel is 0.15/hr.
32. Calculate Vd if the dose of drug administered is 500 mg and the plasma concentration of the drug is 100 mcg/mL.

PART B:

1. Discuss in detail about various factors affecting ADME process. (Dec 2013, May 2011) [RB1: 439-445]
2. Discuss the mechanisms of action of drug. (Dec 2014, May 2011, Dec 2009) [RB1: 1-32]
3. Describe the Phase I and Phase II biotransformation. (Dec 2011, Dec 2012, Dec 2010) [RB1: 446-457]
4. What is the objective of pharmacokinetic models? Discuss the compartmental models. [RB1: 409-411]
5. Discuss the applications of radioactive isotopes in biopharmaceutical technology. [TB2: 59-96]

6. Describe how the various pharmacokinetic properties of a drug can be evaluated. [RB2: 37-50]

PART C:

1. Explain in detail about the physiochemical principles involved during drug metabolism. (Nov/Dec 2016) [RB1: 439-445]
2. Write a short notes on: (i) Pharmacokinetic models. [RB1: 409-411] (ii) Renal and hepatic clearance of drugs. [RB2: 38-42] (iii) Factors that affect distribution of a drug within the body [RB2: 47-50] (iv) Steps to minimize the risk of drug inter action. (Nov/Dec 2016) [RB2: 16-20]
3. (i) What is the first pass effect of metabolism? Explain. [RB2: 43-44]
   ii) Differentiate between pro-drug and active drug. [RB2: 8]
   iii) Describe about compartment model of pharmacokinetics. [RB1: 409-411]

UNIT III

MANUFACTURE OF DRUGS, PROCESS AND APPLICATIONS

TWO MARKS:

1. What is bulk drug? Give an example. Nov Dec 2009; Nov Dec 2007
2. Define process validation. Nov Dec 2014
3. What are the approaches for process validation?
4. What is phase inversion? Nov Dec 2013
5. Write the reaction involved in synthesis of aspirin.
6. What is synthetic reaction? Give an example. Nov Dec 2012
7. What is a SOP?
8. What is the need of SOP?
9. Write about quality assurance.
10. How Is Quality Assessed?
11. Name some separation techniques employed in bulk drug manufacturing?
12. Write about pharmaceutical formulation.
13. Define Pharmaceutical Engineering.
14. Draw a flowchart describing the sequence of events in product development.
15. Name the chemical processing routes for synthesizing bulk drug?
16. Define GMP.
17. What are the main stages in bulk drug process development?
18. Explain Scale up tools.
19. Give some examples of equipment scale issues.
20. Define unit operations.

21. List some manufacturing operations.
22. Define Generic drug.
23. Recommendation of Hathi Committee – Explain.
24. Write about GATT.
25. What is meant by DMF?
26. What are the main activities in Process validation.
27. List the important documents in GMP.
28. Write about the principles of GMP.
29. Define Quality control.
30. What are the major risk in pharmaceutical production?
31. Comment on current scenario of an Indian pharmaceutical industry meant for bulk drug manufacture. (Nov/Dec, 2016)
32. What is mean by API? Give few examples. (Nov/Dec, 2016)

PART B:

1. Write a note on the special requirements for bulk drug manufacture. (Dec 2013, Dec 2012, Dec 2009, Nov/Dec, 2016) [TB2: 4-21]
2. What are the various mechanisms that should be in place for ensuring quality assurance in drug manufacture? [www.who.int/medicines/technical_briefing/tbs/05-Drug-Quality_final-08.ppt?ua=1]
3. Discuss the various standard operating procedures in drug manufacture. [http://www.pharmacopeia.cn/v29240/usp29nf24s0_c1075.html]
4. Give a flowchart and explain the manufacturing process in the pharma industry. [http://www.ilocis.org/documents/chpt79e.htm]
5. Explain the various types, applications and advantages of tablet coating. (Dec 2014, Dec 2010, Dec 2009) [TB2: 244-245; 1099-1121]
6. Write about tablets under the following heads. (Dec 2014, Dec 2010, Dec 2009) : Dry granulation ii. wet granulation [TB2: 977-1008]

PART C:

1. Explain in detail about the various types of reactions and reactors used in bulk drug manufacture. (Nov/Dec, 2016) [TB2: 139-142]
2. (i) Write down the flow chart of any bulk drug manufacturing. [http://www.ilocis.org/documents/chpt79e.htm]

   (ii) Describe the steps involved in the manufacturing of tablets by wet granulation. [TB2: 977-1008]
3. What are the important good manufacturing practices to be followed in a pharmaceutical manufacturing unit? (Apr/May, 2011) [TB2: 3-20]

UNIT IV

PRINCIPLES OF DRUG MANUFACTURE

TWO MARKS:

1. List any two topical applications. Nov Dec 2014
2. What is GMP? Nov Dec 2014
3. What is the use of cam tracks in tablet presses? Nov Dec 2007
4. What is the definition of tablet press/machine?
5. What are the components of the tableting machine?
6. What is cracking of emulsions? Nov Dec 2007
7. What are the common defects in film coated tablets?
8. Mention any two differences between lotion and liniment.
9. Write about: Mandl's Paint. Nov Dec 2013
10. Write about Milk of Magnesia. Nov Dec 2013
11. What is the important of tablet coating? Nov Dec 2009
12. How is pyrogen test carried out for sterile drug dosages? Nov Dec 2009
13. Differentiate flocculated suspension from deflocculated suspension.
14. Differentiate between w/o and o/w emulsions. Nov Dec 2010
15. What are the advantages of suppositories as dosage forms? Nov Dec 2010
16. Briefly write about endotoxin test. Nov Dec 2011
17. Briefly write about wet granulation. Nov Dec 2011
18. Briefly write about capsule preparation. Nov Dec 2011
19. Briefly write about stability test. Nov Dec 2011
20. What are the advantages of capsules over tablets?
21. Differentiate ointments from creams.
22. What is the importance of enteric coating tablets? Name atleast two enteric coating materials used in tablet coating.
23. How do table presses work?
24. Explain about Dry granulation.
25. Write about Enema.
26. Write about Preservatives.
27. What are the types of packing materials used?
28. Define Packaging.
29. Brief about Liquid dosage forms.
30. What is an Elixir?
31. Give examples for topical application preparation. (Nov/Dec, 2016)

32. Sort out the mechanical properties of the plastic packing materials. (Nov/Dec, 2016)

PART B:

1. Explain in detail the following analytical tests. (Dec 2011, May 2011) [TB2: 1165-1190]
   i. Sterility test
   ii. Disintegration test
2.
   i. How do tablet presses work? (May 2011, Dec 2012, Dec 2009) [TB2: 1133-1163]
   ii. Write a note on quality control for tablet manufacture. [TB2: 3-26]
3. Describe the packing techniques in drug manufacture. (Dec 2013, Dec 2012) [TB2: 159-200]
4. Explain in detail about preparation of hard gelatin capsules. [TB2: 245-251]
5. Write about tablets compression. [TB2: 1133-1163]
6. Explain how Preservation of drugs done in pharmaceutical industries? [TB2: 1165-1190]

PART C:

1. Write short notes on:. (Nov/Dec, 2016)
   i. Importance of granulation and coating (4) [TB2: 977-1008; 244-245]
   ii. Tablets manufacturing using direct compression method. (4) [TB2: 1133-1163]
   iii. Manufacturing of a soft gelatine capsule (8) [TB2: 245-251]
2. Write short notes on (Nov/Dec, 2016) [TB2: 313-343]
   i. Classification of liquid orals using suitable samples.
   ii. Vegetable drugs
   iii. Ideal properties and requirements for a semisolid preparation
   iv. Comment on basic principles of GMP. [TB2: 3-26]
3. (i) What is the significance of tablet coating? Describe the steps of steps coating of tablets. (Nov/Dec, 2009) [TB2: 244-245; 1099-1121]

   (ii) Give the formulation of film coating solution and discuss. (Nov/Dec, 2009) [TB2: 244-245]

UNIT V

BIOPHARMACEUTICALS

TWO MARKS:

1. What are macrolides group of antibiotics? Give two examples. Nov Dec 2012
2. Mention the steps involved in thyroid hormones synthesis. Nov Dec 2007
3. Are antibiotics a suitable treatment for the common cold? Justify. Nov Dec 2013
4. Give the meaning of the followings: Vasectomy & Expectorant. Nov Dec 2013
5. What are the risks of using hormones? Nov Dec 2013
6. What do you mean by natural birth control methods? Nov Dec 2013
7. What are therapeutic agents? Write any two recombinant therapeutic agent?
8. Define laxatives with examples. Nov Dec 2009
9. Write about lubricant laxatives.
10. Write about stimulant laxatives.
11. Explain emollients.
12. Classify analgesic drugs with examples.
13. Write the applications of Unna's paste.
14. Mention any two methods of fertility control. Nov Dec 2014
15. List the major endocrine glands.
16. What are bulk laxatives? Nov Dec 2009
17. List out the antibiotics used in cancer abnormalities. Nov Dec 2009
18. Classify antibiotics based on their antibacterial activity.
19. What are oral contraceptives? Give example.
20. What are osmotic laxatives? Give examples.
21. Give an example of a lubricant, a preservative used in solutions, an enteric coating material, surfactant.
22. Explain – NSAIDs. Nov Dec 2011
23. Briefly write about tissue plasminogen activator. Nov Dec 2011
24. Why are suspensions not given through intravenous route?
25. Write a short note on Bisimilars? Nov Dec 2014
26. Explain themechanism of action of Paracetamol.
27. Write about opioids.
28. What are the types of analgesics?
29. what are vitamins? Give its types. Nov Dec 2014
30. Write the types, sources and deficiency diseases of vitamins.
31. What are the various ways by which vitamin deficiency can occur? (Nov/Dec., 2016)

32. Give examples for biological s and non-steroidal contraceptives. (Nov/Dec., 2016)

PART B:

1. Define and classify laxatives with examples. Write a note on the irritant and lubricant laxatives. (Dec 2013, Dec 2011, May 2011) [TB1: 534-537]
2. Write on the mechanism of action, antibacterial activity, adverse reaction and therapeutic uses of the following antibiotics. (May 2011, Dec 2012, Dec 2010) [TB1: 549-621]
    i. Tetracycline
    ii. Streptomycin
    iii. Penicillin
3. Classify analgesic drugs with examples and discuss the pharmacological actions of any two. (Dec 2013, May 2011) [TB1: 202-277; 810-840]
4. List the major endocrine glands. (ii) Elaborate on their secretions and functions. [TB1: 487-500]
5. Write short notes on : (i) Biosimilars, (ii) Biological, (iii) Vitamins, (iv) Analgesics. [TB1: 487-500; 534-537; 202-277]
6. Describe types, uses and side effects of oral contraceptives. [TB1: 476-480]

PART C:

1. Write a note on (i) laxatives [TB1: 534-537] (ii) Analgesics. [TB1: 202-277] (Nov/Dec., 2016)
2. Write a note on (i) Antibiotics [TB1: 549-621] (ii) Hormones. [TB1: 487-500] (Nov/Dec., 2016).
3. Explain about hormones and biological. [TB1: 487-500]

UNIT I

INTRODUCTION

1. What are the types of therapeutic agents? Apr may 2008 Nov Dec 2014

Therapeutic agent is a substance capable of producing a curative effect in a disease state. Examples: Aspirin as a therapeutic agent in cardiovascular disease, anticarcinogenic agents, antibiotics, antimitotic agents, anti-inflammatory agents

a. Pharmacologic and Therapeutic Categories
b. Anti-infective Agents
c. Cancer Drugs
d. Hormones, Diabetes And Related Drugs
e. Heart And Circulatory Drugs
f. Respiratory Agents
g. Gastrointestinal Drugs
h. Genitourinary Drugs Central Nervous System Drugs
i. Pain Relief Drugs
j. Neuromuscular Drugs
k. Supplements
l. Blood Modifying Drugs
m. Topical Products
n. Miscellaneous Categories

2. Name one agency and its role in regulating the drug industry. Nov Dec 2014

USFDA(USA):

- responsible to enforce the rules and regulations and issue the guidelines to regulate drug development process, licensing, registration, manufacturing, marketing and labeling of pharmaceutical products.

World Health Organization (WHO):

- play essential role in all aspects of pharmaceutical regulations related to drug product registration, manufacturing, distribution, price control, marketing, research and development, and intellectual property protection.

3. Define a drug. Nov Dec 2007

A Chemical substance (known structure) other than a nutrient or an essential dietary ingredient, which, when administered to a living organism, produces a biological effect, A **drug** is **defined** as: A substance recognized by an official pharmacopoeia or formulary. A substance intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease. A substance (other than food) intended to affect the structure or any function of the body.

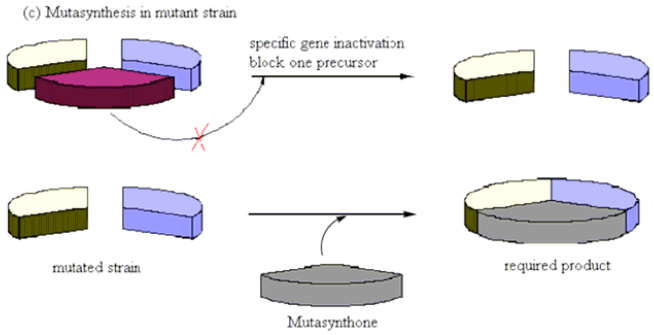
Example, insulin is a hormone that is synthesized in the body; it is called a hormone when it is synthesized by the pancreas inside the body, but if it is introduced into the body from outside, it is called a drug.

4. What are the stages of clinical trials in developing a drug? Nov Dec 2007

The stages of clinical trial in developing a new drug is divided into preclinical trials (phase I trials) and clinical trials (Phase II, III, IV trials). Preclinical trials are the test programmes conducted on animals, tissue samples and bacteria to determine whether a new drug can be tested on humans. Clinical trials are test programmes that are carried out on humans to determine the safety and behaviour of the new drug in situ.

5. Define mutasynthesis and how it is used for the design of novel drugs. Nov Dec 2014

Mutasynthesis: The synthesis of analogues of natural products by intercepting the biosynthesis with structural analogs of the natural product's precursors.



- Combines chemical synthesis with metabolic engineering.

Biosynthesis of only the required product by mutant strain by inactivating gene which regulate synthesis of a precursor. Only novel analogues are produced.

6. Define Prodrug. Nov Dec 2007

A prodrug is a pharmacological substance (drug) that is administered in an inactive (or significantly less active) form. Once administered, the prodrug is metabolised in vivo into an active metabolite. The rationale behind the use of a prodrug is generally for absorption, distribution, metabolism, and excretion (ADME) optimization. Prodrugs are usually designed to improve oral bioavailability, with poor absorption from the gastrointestinal tract usually being the limiting factor. An **active metabolite** is an **active** form of a drug after it has been processed by the body. Prodrugs[edit] Sometimes drugs are formulated deliberately so they will break down inside the body to form the **active** drug. These are called prodrugs.

7. What is RLD?

A **Reference Listed Drug** (**RLD**) is an approved drug product to which new generic versions are compared to show that they are bioequivalent. A drug company seeking approval to market a generic equivalent must refer to the **Reference Listed Drug** in its Abbreviated New Drug Application (ANDA).

8. What is spurious drug? Nov Dec 2009

Spurious or imitation drug products are drug formulations manufactured concealing the true identity of the product and made to resemble another drug, especially some popular brand, to deceive the buyer and cash on the popularity of original product. The product may or may not contain the active ingredients. Spurious drugs are usually manufactured by unlicensed anti-social elements but sometimes licensed manufacturers may also be involved. The adulterated drugs are those drugs which are found to contain an adulterant/substituted product or contaminated with filth rendering it injurious to health. Spurious Drugs are specified under counterfeit drugs. A drug shall be deemed to be spurious if it is manufactured under a name

which belongs to another drug, if it is an imitation of another drug or if it has been substituted wholly or partly by another drug or if it wrongly claims to be the product of another manufacturer.

9. What does pharmaco-economics deal with? Nov Dec 2009; Nov/Dec 2016

Pharmacoeconomics refers to the scientific discipline that compares the value of one pharmaceutical drug or drug therapy to another. It is a sub-discipline of Health economics. A pharmacoeconomic study evaluates the cost (expressed in monetary terms) and effects (expressed in terms of monetary value, efficacy or enhanced quality of life) of a pharmaceutical product. Pharmacoeconomic studies serve to guide optimal healthcare resource allocation, in a standardized and scientifically grounded manner.

10. What is a Target in drug discovery?

A functional definition of a drug target is any molecular target which, when modified by a therapeutic agent, may result in a pharmacologic change associated with a clinical benefit

11. What are the various sources of drugs? Nov Dec 2012; Nov Dec 2010

Drugs are obtained from six major sources:

Plant sources (leaves, stem, bark, fruits and roots)

Animal sources

Mineral/ Earth sources

Microbiological sources

Semi synthetic sources/ Synthetic sources

Recombinant DNA technology

12. What is ICH? Nov Dec 2012; Nov Dec 2010

ICH is the short form of **'International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use" (ICH)** is unique in bringing together the regulatory authorities and pharmaceutical industry of Europe, Japan and the US to discuss scientific and technical aspects of drug registration. ICH's mission is to achieve greater harmonization to ensure that safe, effective, and high quality medicines are developed and registered in the most resource-efficient manner.

13. What is pharmacopoeia?

A collection of recommended procedures for analysis and specifications for the determination of pharmaceutical substances, excipients, and dosage forms that is intended to serve as source material for reference or adaptation by any WHO Member State wishing to establish pharmaceutical requirements.

A book published usually under the jurisdiction of the government and containing a list of drugs, their formulas, methods for making medicinal preparations, requirements and tests for their strength and purity, and other related information.

14. Write about Indian drugs and cosmetics act?

The Drugs and Cosmetics Act, 1940 is an Act of the Parliament of India which regulates the import, manufacture and distribution of drugs in India.

The primary objective of the act is to ensure that the drugs and comestics sold in India are safe, effective and conform to state quality standards.

The related Drugs and Cosmetics Rules, 1945 contains provisions for classification of drugs under given schedules and there are guidelines for the storage, sale, display and prescription of each schedule.

15. Briefly write about pharmacophore. Nov Dec 2011

a part of a molecular structure that is responsible for a particular biological or pharmacological interaction that it undergoes.

A pharmacophore is the ensemble of steric and electronic features that is necessary to ensure the optimal supramolecular interactions with a specific biological target structure and to trigger (or to block) its biological response.

16. What is the significance of serendipity in drug discovery? Apr May 2011

Serendipity is one of the many factors that may contribute to drug discovery. It has played a role in the discovery of prototype psychotropic drugs that led to modern pharmacological treatment in psychiatry. It has also played a role in the discovery of several drugs that have had an impact on the development of psychiatry, “Serendipity” in drug discovery implies the finding of one thing while looking for something else.

17. What is the need for regulating pharmaceutical manufacturing? Apr May 2011

- Drugs play an important role in the health of both people and the economy of a country.
- Pharmaceutical drugs are available from a large number of sources.
- People and Governments willing to spend money on drugs for many reasons so, it must be safe, effective and good quality and used appropriately.
- This means, in turn, that development, production, importation, exportation and subsequent distribution of drugs must be regulated to ensure that they meet prescribed standards.
- Therefore, effective drug regulation in pharmaceutical manufacturing is required to ensure the safety, efficacy and quality of drugs as well as accuracy and appropriateness of the drug information available to the public

18. What is the role of FDA?

The Food and Drug Administration (FDA or USFDA) is an agency of the United States Department of Health and Human Services and is responsible for regulating and supervising the safety of foods, dietary supplements, drugs, vaccines, biological medical products, blood products, medical devices, radiation-emitting devices, veterinary products, and cosmetics. The FDA also enforces section 361 of the Public Health Service Act and the associated regulations, including sanitation requirements on interstate travel as well as specific rules for control of disease on products ranging from pet turtles to semen donations for assisted reproductive medicine techniques

19. What is meant by NDA?

The **New Drug Application** (NDA) is the vehicle in the United States through which drug sponsors formally propose that the FDA approve a new pharmaceutical for sale and marketing. The goals of the NDA are to provide enough information to permit FDA reviewers to establish the following:

Is the drug safe and effective in its proposed use(s) when used as directed, and do the benefits of the drug outweigh the risks?

Is the drug's proposed labeling (package insert) appropriate, and what should it contain?

Are the methods used in manufacturing (Good Manufacturing Practice, GMP) the drug and the controls used to maintain the drug's quality adequate to preserve the drug's identity, strength, quality, and purity?

20. Write a short note on drug design

Drug design is the inventive process of finding new medications based on the knowledge of the biological target. The drug is most commonly a organic small molecule which activates or inhibits the function of a biomolecule such as a protein which in turn results in a therapeutic benefit to the patient. In the most basic sense, drug design involves finding small molecules that are complementary in shape and charge to the biomolecular target to which they interact. Drug design frequently but not necessarily relies on computer modeling techniques.[2] This type of modeling often referred to as **computer-aided drug design**.There are two major types of drug design. The first is referred to as **structure-based drug design** (also known as **direct drug design**) that relies on knowledge of the three dimensional structure of the biological target obtained through methods such as x-ray crystallography or NMR spectroscopy

21. What is a lead compounds? Comment on the sources of drugs

A **lead compound** (i.e. the "leading" compound, not lead metal) in drug discovery is a chemical compound that has pharmacological or biological activity and whose chemical structure is used as a starting point for chemical modifications in order to improve potency, selectivity, or pharmacokinetic parameters.Lead compounds are often found in high-throughput screenings ("hits") or are secondary metabolites from natural sources. Newly invented pharmacologically active moieties may have poor drug likeness and may require chemical modification to become drug-like enough to be tested biologically or clinically.

22. Comment on SAR

Structure-activity relationships (**SAR**) are the traditional practices of medicinal chemistry which try to modify the effect or the potency (i.e. activity) of bioactive chemical compounds by modifying their chemical structure. Medical chemists use the chemical techniques of synthesis to insert new chemical groups into the biomedical compound and test the modifications in their biological effect.So by this we can change one drug to another by adding or deleting chemical groups. It consists of many steps.

23. What is meant by NCE?

New chemical entities (**NCEs**) are compounds which emerge from the process of drug discovery. These will have promising activity against a particular biological target thought to be important in disease; however, little will be known about the safety, toxicity, pharmacokinetics and metabolism of this NCE in humans. It is the function of drug development to assess all of these parameters prior to human clinical trials. A further major objective of drug development is to make a recommendation of the dose and schedule to be used the first time an NCE is used in a human clinical trial.

24. What is an IND?

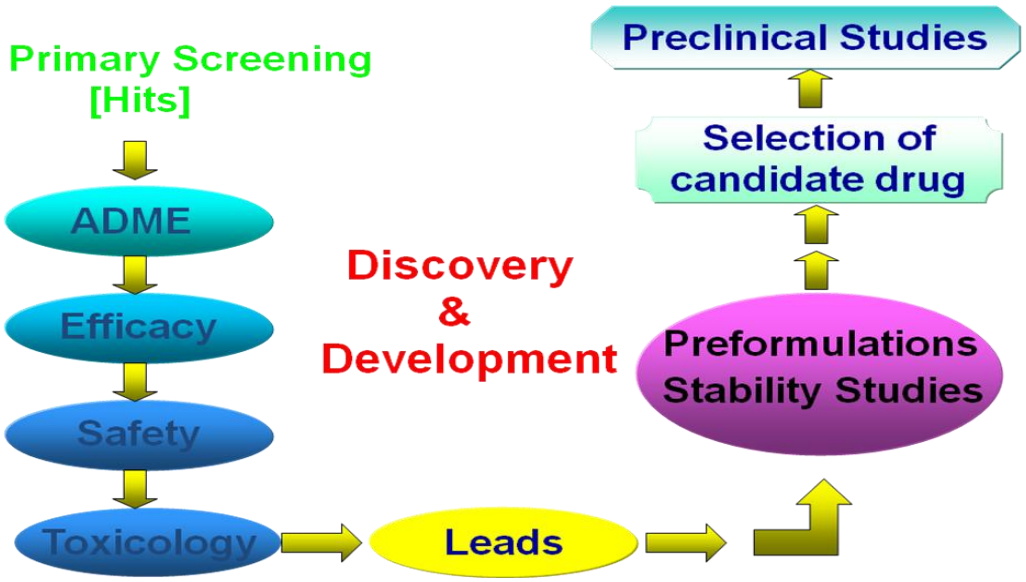
An Investigational New Drug Application (**IND**) is a request for authorization from the Food and Drug Administration (FDA) to administer an investigational drug or biological product to humans.

The IND application must contain information in three broad areas: Animal Pharmacology and Toxicology Studies, Manufacturing Information and Clinical Protocols and Investigator Information.

25. What are the types of pharmacoeconomic evaluations?

Method	Description	Application
Cost of Illness	Estimates cost of disease on a defined population	Used to provide baseline to compare prevention and treatment options against
Cost Minimization	Finds the least expensive cost alternative. Identifies intervention cost differences between similar alternatives	Use when benefits are same. Identify least costly alternative when outcomes/consequences are identical
Cost Benefit	Measures benefit in monetary units and computes net gain. Identifies net cost impact of an intervention.	For decision makers can compare programmes with different objectives or 1 program against a return on investment benchmark
Cost effectiveness	Compares alternatives with therapeutic effects measured in physical (natural) units	Compare treatment alternatives for a given condition that differ in outcomes and costs.

26. Draw the flow chart to describe the drug discovery and development process.



27. What are the applications of pharmacoeconomics?

Drug Therapy Evaluation-

- Selecting the most cost-effective drugs for an organizational formulary
- making a decision about an individual patient's therapy
- customizing a patient's pharmacotherapy.

Clinical Pharmacy Service Evaluation:

- Determining the value of an existing service,
- Estimating the potential worth of implementing a new service,
- Capturing the value of a "cognitive" clinical intervention
- Industry – marketing, pricing, performance guarantees
- Managed Care – protocols, guidelines, formularies
- Physicians – individual patient treatment decisions, prescribing, payor-performance
- Consumers – education, autonomy
- Government – pricing, approval, formularies, policy
- Institutions – protocols, guidelines, formularies
- Pharmacists – formularies, protocols, guidelines, pharmaceutical care services or program evaluation

28. Write about cost benefit analysis. Nov Dec 2007

It Measures benefit in monetary units and computes net gain

Cost-benefit analysis is concerned with issues of whether and to what extent should we pursue the objectives and policies.

It is thus a broader activity than cost-effectiveness analysis and puts monetary values on the quality as well as on the duration of life.

For decision makers can compare programmes with different objectives

29. Write a short note on cost-effective analysis. Nov Dec 2007

- Cost effectiveness of any therapeutic intervention may be expressed in terms of natural units such as Life Years Gained (LYG) or infection avoided.
- It may also be expressed in utility terms like Quality of Life (Quality adjusted Life years)
- is concerned with how to attain a given objective at minimum financial cost,
- In CEA the effectiveness is expressed in terms of monetary units that describes the desired objectives
- Analysis includes cost of materials, adverse effects, any supplementary tests, nursing and doctor time, duration of stay in hospital which may greatly exceed the cost of the drug.

30. Name the steps involved in discovery of lead compound.

- When a pharmaceutical company or university research group initiates a new medicinal chemistry project through to the identification of a lead compound, they will consider the following steps in order:
  - 1-Choosing the disease
  - 2-Choosing a drug target
  - 3-Identifying a bioassay
  - 4-Finding a lead compound
  - 4-Finding a lead compound
  - 5-Isolation and purification
  - 6-Structural determination
  - 7-Herbal medicine

30. Name the steps involved in discovery of lead compound.

1-Choosing the disease
2-Choosing a drug target
3-Identifying a bioassay
4-Finding a lead compound

- Screening of natural products (the plant kingdom, the microbial world, the marine world, animal sources, venoms and toxins)
- Medical folklore
- Screening synthetic compound " libraries"
- Existing drugs
- Starting from natural ligand or modulator (natural ligands for receptors, natural substrates for enzymes, enzyme products as lead compounds, natural modulators as lead compounds)
- Combinatorial synthesis
- Computer aided design
- Serendipity and prepared mind
- Computerized searching of structural databases

- Designing lead compounds by NMR

5-Isolation and purification
6-Structural determination
7-Herbal medicine

31. Comment on SWOT analysis of an Indian pharmaceutical industry.

Indian Pharma Industry: SWOT Analysis:

Strengths • Low manufacturing cost and quality standards • Speedy Clinical trials	**Weakness** • Volatile currency risks • Low R&D • Import dependence for bulk drugs
Opportunities • Patent cliff: Over USD 72 billion drugs patent is expiring in next 3 years in the US • Complex generics a new potential for Indian pharma exports	**Threats** • Growing threats from China's API market • IP regulations by developed countries are getting tougher • EU bans 700 Indian Generics • Short term impact on bar coding on drug packaging

PART B:

1. Explain the regulatory aspects of a pharma industry. (Dec 2013,Dec 2011) [RB2: 73-77]
2. What are therapeutic proteins? Explain the role and production of recombinant proteins as pharmaceutical drugs. (Dec 2013, Dec 2014, Dec 2011) [TB3: 295-321]
3. Explain the drug development process. (Dec 2009, May 2011) [RB2: 69-73]
4. Using graphical representation show the relationship between: (i) Plasma to tissue concentration. (ii) Drug concentration and drug effect at the receptor site. (iii) Tolerance to drug effect with repeated dosing. (iv) Relationship of drug concentration at the receptor site to percent maximum effect. [RB2: 16-20]
5. Discuss the evaluation methods of pharmaco-economics in detail. [RB2: 72-74]
6. What is a lead compound? How is it identified in drug development process? [RB1: 9-21]

PART C

1. Explain in detail about the various therapeutic agents with suitable examples. (Nov/Dec 2016) [TB3: 295-321]
2. Write a short notes on (i) Development of a new drug. [RB2: 69-73] (ii) Regulatory aspects of a pharmaceutical industry. (Nov/Dec 2016) [RB2: 73-77]
3. Write a note on Indian drugs and cosmetics act and Pharmacopoeia. (Nov/Dec, 2010) [TB2: 126-124]

UNIT II

DRUG ACTION, METABOLISM AND PHARMACOKINETICS

1. What is the mechanism of action of aspirin? Nov Dec 2007

Aspirin is a medication that has two main actions in the body.

- An anti-prostaglandin (anti-inflammation, fever-reducing, pain reliever) and
- An anti-platelet ('blood thinner') agent.

Both of these actions are the result of the effect of aspirin on an enzyme in the body called cyclo-oxygenase, or COX.

- Aspirin acts as an acetylating agent where an acetyl group is covalently attached to a serine residue in the active site of the cyclooxygenase (COX) enzyme (irreversible inactivation).
- Inhibition of COX leads to suppress the production of prostaglandins and thromboxanes and reduce inflammation, swelling, pain and fever

2. What is 'system approach' for dose response? Nov Dec 2014

Systems biology is defined as a comprehensive quantitative analysis of the manner in which all the components of a biology system interact functionally over time.
Systems biology approaches for modeling cellular signaling networks affected by chemical exposures should soon produce integrated methodologies capable of predicting dose-response relationships for developmental toxicants and for other toxic responses.
Simulation-based study can provide better linkage between dose response behavior and the underlying molecular mechanism.

3. What is the objectives of pharmacokinetic models? Nov Dec 2007

To models simulate the rate relationships between drug absorption, distribution, response and elimination in the various sections of the biological system. The accuracy of all pharmacokinetic models in describing the drug concentration changes and relating these changes to pharmacological and toxic responses depends on the accurate assay of drug concentrations in the plasma and tissues.

To enable the medicinal chemist to use mathematical equations to describe the relationships between the concentrations of a drug in different tissues and, as a result, predict the concentrations of a drug in a tissue for any drug regimen.

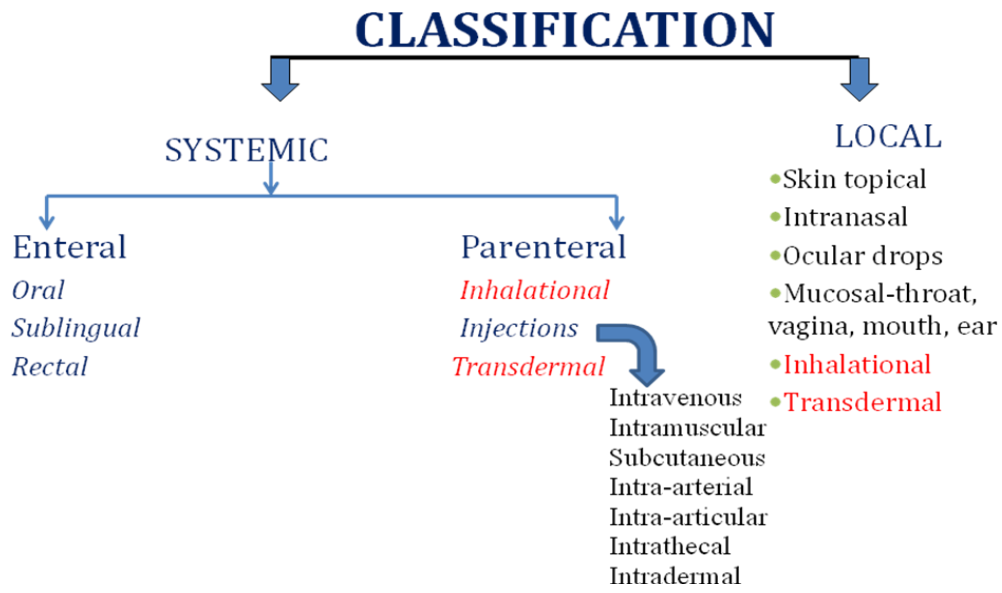
4. Differentiate between pharmacodynamics and pharmacokinetics.

Pharmacodynamics	Pharmacokinetics
Pharmacodynamics describes the relationship between pharmacokinetics and pharmacologic effect, either adverse or desired.	Pharmacokinetics is the study of the absorption, distribution, metabolism, and excretion of drugs.
The study of what a drug does to the body.	The study of what the body does to a drug.

5. What is API?

An active ingredient (AI) is the ingredient in a **pharmaceutical** drug or a pesticide that is biologically active. The similar terms **active pharmaceutical ingredient** (**API**) and bulk active are also used in medicine, and the term active substance may be used for pesticide formulations.

6. What are the various routes by which a drug can be administered? Nov Dec 2007



7. How radioactivity is used in determining pharmacokinetics of a drug? Nov Dec 2007

Radiopharmaceuticals are administered to the patients only once, or a few times at most, in their lifetime. They contain minute amounts of active ingredients, with a radionuclide somehow linked to or being the active ingredient itself, with the main purpose of obtaining an image or a measure of their biodistribution.

The techniques of quantitative whole-body autoradiography (QWBA) and microautoradiography (MARG), which rely on the use of radiolabeled drugs, are two techniques that are routinely used to examine tissue distribution of drugs in discovery and development.

8. Define radiopharmaceuticals. (Nov/Dec, 2016)

A radiopharmaceutical is any medicinal product which, when ready for use, contains one or more radionuclides (radioactive isotopes) included for a medicinal purpose. This generic definition of radiopharmaceutical thus includes both diagnostic and therapeutic radiopharmaceuticals.

A radiopharmaceutical can be as simple as a radioactive element such as ^{133}Xe, a simple salt such as ^{131}INa, a small labeled molecule such as $_{L}$-(*S*-[^{11}C]methyl)methionine, or a protein labeled with a radionuclide such as ^{99m}Tc-labeled albumin or ^{90}Y-labeled monoclonal antibodies.

9. Define bio equivalence. (Apr May 2011; Nov/Dec, 2016)

Bioequivalence is a term in pharmacokinetics used to assess the expected in vivo biological equivalence of two proprietary preparations of a drug. Bioequivalence means that two drugs release their active ingredient into the bloodstream in the same amounts and at the same rate.

10. Define bio availability. (Apr May 2011)

Bioavailability is defined as the fraction of the dose of a drug that enters the general circulatory system. It is a subcategory of absorption in which the proportion of a drug or other substance which enters the circulation when introduced into the body and so is able to have an active effect.

$$F = \frac{\text{Amount of drug that enters the general circulatory system}}{\text{Dose administered}}$$

11. What is first pass effect?

The first-pass effect (also known as first-pass metabolism or presystemic metabolism) is a phenomenon of drug metabolism whereby the concentration of a drug is greatly reduced before it reaches the systemic circulation.

The intestinal and hepatic degradation or alteration of a drug or substance taken by mouth, after absorption, removing some of the active substance from the blood before it enters the general circulation.

12. What is Placebo effect?

A remarkable phenomenon in which a placebo -- a fake treatment, an inactive substance like sugar, distilled water, or saline solution -- can sometimes improve a patient's condition simply because the person has the expectation that it will be helpful. Also called the placebo response. A placebo is anything that seems to be a "real" medical treatment -- but isn't. It could be a pill, a shot, or some other type of "fake" treatment.

13. Define pharmacokinetics. Nov Dec 2009

Pharmacokinetics (**PK)**, is a branch of pharmacology dedicated to the determination of the fate of substances administered externally to a living organism. Pharmacokinetics includes the study of the mechanisms of absorption and distribution of an administered drug, the rate at which a drug action begins and the duration of the effect, the chemical changes of the substance in the body (e.g. by enzymes) and the effects and routes of excretion of the metabolites of the drug.

14. List out the drugs used in hyperthyroidism. Nov Dec 2010

Hyperthyroidism is the term for overactive tissue within the thyroid gland, resulting in overproduction and thus an excess of circulating free thyroid hormones: thyroxine (T4), triiodothyronine (T3), or both. The prescribed drugs include antithyroid drugs, surgery (subtotal thyroidectomy) and radio iodine for recurrence following surgery.

Two common drugs in this category are methimazole (Tapazole) and propylthiouracil (PTU), both of which actually interfere with the thyroid gland's ability to make its hormones (T3 and T4).

15. What is relative bioavailability? Nov Dec 2010

Relative bioavailability may be used to compare the relative absorptions of the different dosage forms of the same drug and also the relative availabilities of two different drugs with the same action when delivered using the same type of dosage form. It is defined for equal doses as:

$$\text{Relative bioavailability} = \frac{\text{AUC for drug A (or dosage form A)}}{\text{AUC for drug B (or dosage form B)}}$$

A correction must be made if different drug doses are used. In which case, equation becomes:

$$\text{Relative bioavailability} = \frac{(\text{AUC for drug A or dosage form A})/\text{Dose A}}{(\text{AUC for drug B or dosage form B})/\text{Dose B}}$$

16. What is absolute absolute bioavailability? Nov Dec 2010

Absolute bioavailability is used as a measure of the efficiency of the absorption of the drug. It is defined in terms of the total dose of the drug the body would receive if the drug was placed directly in the general circulation by an IV bolus injection, that is:

$$\text{Absolute bioavailability(F)} = \frac{\text{AUC for oral dosage form/oral dose}}{\text{AUC for IV dosage form/IV dose}}$$

17. What is the effect of gastric emptying rate on bioavailability? Nov Dec 2010

The gastric emptying rate (GER) is the rate at which the drug leaves the stomach and enters duodenum, affects the overall rate of drug absorption, and thereby the onset pf the therapeutic action. Delayed drug absorption usually is the result of a food associated slower gasteric empyting rate or increasing gastric pH. This delay may or may not lead to clinically significant delays in onset of therapeutic action, depending on the drug in question. The GER affects the absorption of the drug that is susceptible to chemical or enzyme degradation in the stomach.

18. What is cGMP?

cGMP refers to the Current Good Manufacturing Practice regulations enforced by the US Food and Drug Administration (FDA). CGMPs provide for systems that assure proper design, monitoring, and control of manufacturing processes and facilities.

Adherence to the CGMP regulations assures the identity, strength, quality, and purity of drug products by requiring that manufacturers of medications adequately control manufacturing operations. This includes establishing strong quality management systems, obtaining appropriate quality raw materials, establishing robust operating procedures, detecting and investigating product quality deviations, and maintaining reliable testing laboratories

19. What is phase I biotransformation?

Phase I reactions function to convert lipophilic molecules into more polar molecules by introducing or unmasking a polar functional group, such as "OH or "NH2. Phase I metabolism may increase, decrease, or leave unaltered the drug's pharmacologic activity.

- Includes oxidative, reductive, and hydrolytic reactions.
- In these type of reactions, a polar group is either introduced or unmasked, so the drug molecule becomes more water-soluble and can be excreted.
- Reactions are non-synthetic in nature and in general produce a more water-soluble and less active metabolites.
- The majority of metabolites are generated by a common hydroxylating enzyme system known as Cytochrome P450.

$$Drug + O_2 + NADPH + H^+ \rightarrow Drug_{modified} + H_2O + NADP^+$$

20. What is phase II biotransformation?

- This phase consists of conjugation reactions.
- These reactions involve covalent attachment of small polar endogenous molecule such as glucuronic acid, sulfate, or glycine to form water-soluble compounds.
- The final compounds have a larger molecular weight.

It generally serve as a detoxifying step in drug metabolism. Phase II drug metabolising enzymes are mainly transferases.

Phase II drug metabolizing enzymes play an important role in biotransformation of endogenous compounds and xenobiotics to more easily excretable forms as well as in the metabolic inactivation of pharmacologically active compounds. Reduced metabolising capacity of Phase II enzymes can lead to toxic effects of clinically used drugs. Gene polymorphism/ lack of these enzymes may often play a role in several forms of cancer.

21. Define Clearance.

Clearance is the volume of blood in a defined region of the body that is cleared of a drug in unit time. Clearance of a drug is the factor that predicts the rate of elimination in relation to the drug concentration:

$$CL = \frac{\text{Rate of elimination}}{C}$$

Elimination of drug from the body may involve processes occurring in the kidney, the lung, the liver, and other organs.

$$CL_{renal} = \frac{\text{Rate of elimination}_{kidney}}{C}$$

$$CL_{liver} = \frac{\text{Rate of elimination}_{liver}}{C}$$

$$CL_{other} = \frac{\text{Rate of elimination}_{other}}{C}$$

Dividing the rate of elimination at each organ by the concentration of drug presented to it yields the respective clearance at that organ.

$$CL_{systemic} = CL_{renal} + CL_{liver} + CL_{other}$$

Added together, these separate clearances equal total systemic clearance

"Other" - lungs and additional sites of metabolism, eg, blood or muscle

It is related to the volume in which the drug is dissolved and the rate at which it is eliminated. Therefore it may be defined as the product of volume of distribution and the elimination rate constant.

22. Define volume of distribution. Nov Dec 2011

- Volume of distribution (V_d) relates the amount of drug in the body to the concentration of drug (C) in blood or plasma

$$V_d = \frac{\text{Amount of drug in body}}{C}$$

- The volume of distribution may be defined with respect to blood, plasma, or water (unbound drug), depending on the concentration used in equation ($C = C_b$, C_p, or C_u).

23. Define polymorphism.

The term defines monogenetic traits that exist in the normal population in at least two phenotypes, for example the ABO blood groups. In the context of pharmacokinetics, genetic polymorphism of drug metabolising enzymes gives rise to distinct subgroups in the population that differ in their ability to perform a certain drug biotransformation.

24. Briefly write about Drug-drug interactions. Nov Dec 2011

- Occur when 1 drug and a 2nd drug or element such as food may have an effect on each other.
- These interactions may ↑ or ↓ the therapeutic effect of 1 or both drugs, create a new effect or ↑ incidence of adverse effects
- **Additive effects**: 2 or more "similar effect" drugs are combined. The result equals the sum of the individual agents Each drug is given in a lower dose for an equal effect of either drug given separately. **1+1=2**.
  Ex: Percodan (oxycodone + acetominophen) improves pain relief
- **Synergism**: The harmonious action of two "unlike" drugs producing an effect which is greater than the total effects of each drug acting by itself. **1+1=3**.

Ex: Advicor (niacin + statin drugs) improves lipid lowering action.

- **Potentiation**: One drug improves the performance of the other drug. This is a particular type of synergistic effect. **½ + 1 = 2**

Ex: amoxicillen + probenecid (anti-gout) prolongs serum levels of the antibiotic

- **Idiosyncratic Reactions**: Unusual, unexpected reactions to a drug, which may be genetically caused. Sometimes the person will react with the opposite effect to the desired one. (Also called paradoxical reaction)

Ex: Genetic G6PD enzyme deficiency (prevents RBC hemolysis) idiosyncratic reactions to ASA, sulfonamides
(African American and Kurdish Jewish populations)

25. What is meant by First-pass metabolism? Apr May 2008

A process in which a drug administered by mouth is absorbed from the gastrointestinal tract and transported via the portal vein to the liver, where it is metabolized. As a result, in some cases only a small proportion of the active drug reaches the systemic circulation and its intended target tissue. First-pass metabolism can be bypassed by giving the drug via sublingual or buccal routes.

26. "highly lipophilic drugs will have low apparent volume of distribution" validate and justify this statement?' Apr May 2011

Some drugs have large apparent volumes because of partitioning rather than binding. Partitioning into fat can make the apparent volume of distribution larger in obese people.

Ex. Fat - Lipophilic drugs - Increased V

– thiopentone

27. What is meant by depot action? Apr May 2011

Depot is a body area in which a substance, e.g., a drug, can be accumulated, deposited, or stored and from which it can be distributed.

A depot injection is an injection, usually subcutaneous, intradermal, or intramuscular, that deposits a drug in a localized mass, called a depot, from which it is gradually absorbed by surrounding tissue. Such injection allows the active compound to be released in a consistent way over a long period. Zoladex is an example of a medication delivered by depot for prostate cancer treatment or therapy.

28. What are liposomes? Apr May 2011

A minute spherical sac of phospholipid molecules enclosing a water droplet, especially as formed artificially to carry drugs or other substances into the tissues.

29. What are proton-pump inhibitors and where are they useful?

Proton pump inhibitors (PPIs) reduce the production of acid by blocking the enzyme in the wall of the stomach that produces acid. Acid is necessary for the formation of most ulcers in the esophagus, stomach, and duodenum, and the reduction of acid with PPIs prevents ulcers and allows any ulcers that exist in the esophagus, stomach, and duodenum to heal.

Available proton pump inhibitors include:

- omeprazole (Prilosec, Prilosec OTC),
- lansoprazole (Prevacid, Prevacid 24-Hour),
- dexlansoprazole (Dexilent, Kapidex)
- rabeprazole (Aciphex),
- pantoprazole (Protonix),
- esomeprazole (Nexium), and

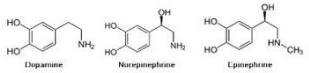
- Zegarid, a rapid release form of omeprazole.

30. Explain any one receptor-mediated drug action. With a suitable example.

Drugs usually do not bind directly with enzymes, channels, transporters or structural proteins, but act through specific macromolecules – RECEPTORS. It is defined as a macromolecule or binding site located on cell surface or inside the effector cell that serves to recognize the signal molecule/drug and initiate the response to it, but itself has no other function, e.g. Muscarinic (M type) and Nicotinic (N type) receptors of Cholinergic system

Evidences of Drug action via receptors – Historical

1. Drugs exhibit structural specificity of action: example - Catecholamines



2. Competitive Antagonism: Between agonists and antagonists (Atropine - M type receptors) – by Langley
3. Acetylcholine - 1/6000th of cardiac cell surface – maximal effect – by Clark

31. What is the half life of a drug given that its Kel is 0.15/hr.

Elimination Rate Constant, (*K*el), is a crucial pharmacokinetic parameter which measures the rate of elimination of drugs from the body. *K*el is specific for a given drug, and has the units of time−1. When the *K*el is greater, the drug is eliminated rapidly.

$$K_{el} = 0.693/t_{1/2}$$

Therefore, Half life of a drug = 0.693/Kel = 0.693/0.15 = 4.62 hr.

32. Calculate Vd if the dose of drug administered is 500 mg and the plasma concentration of the drug is 100 mcg/mL.

- The apparent volume of distribution, V_d, is defined as the volume of fluid required to contain the total amount, Q, of drug in the body at the same concentration as that present in the plasma, C_p.

$$V_d = \frac{Q}{C_p}$$

1 mcg = 0.0001 mg; 100 mcg = 0.1 mg. 500 mg = 500,000 mcg

Vd = 500000 mcg/100 mcg/mL = 5 L.

PART B:

1. Discuss in detail about various factors affecting ADME process. (Dec 2013, May 2011) [RB1: 439-445]

2. Discuss the mechanisms of action of drug. (Dec 2014, May 2011, Dec 2009) [RB1: 1-32]
3. Describe the Phase I and Phase II biotransformation. (Dec 2011, Dec 2012, Dec 2010) [RB1: 446-457]
4. What is the objective of pharmacokinetic models? Discuss the compartmental models. [RB1: 409-411]
5. Discuss the applications of radioactive isotopes in biopharmaceutical technology. [TB2: 59-96]
6. Describe how the various pharmacokinetic properties of a drug can be evaluated. [RB2: 37-50]

PART C:

1. Explain in detail about the physiochemical principles involved during drug metabolism. (Nov/Dec 2016) [RB1: 439-445]
2. Write a short notes on: (i) Pharmacokinetic models. [RB1: 409-411] (ii) Renal and hepatic clearance of drugs. [RB2: 38-42] (iii) Factors that affect distribution of a drug within the body [RB2: 47-50] (iv) Steps to minimize the risk of drug inter action. (Nov/Dec 2016) [RB2: 16-20]
3. (i) What is the first pass effect of metabolism? Explain. [RB2: 43-44]

   ii) Differentiate between pro-drug and active drug. [RB2: 8]

   iii) Describe about compartment model of pharmacokinetics. [RB1: 409-411]

UNIT III

MANUFACTURE OF DRUGS, PROCESS AND APPLICATIONS

1. What is bulk drug? Give an example. Nov Dec 2009; Nov Dec 2007

A bulk drug — also called active pharmaceutical ingredient (API) — is the chemical molecule in a pharmaceutical product that lends the product the claimed therapeutic effect.

Major bulk drugs include antibiotics, sulpha drugs, vitamins, steroids, and analgesics.

2. Define process validation. Nov Dec 2014

The collection and evaluation of data, from the process design stage through commercial production, which establishes scientific evidence that a process is capable of consistently delivering quality products. (FDA)

- Process Validation (PV) is the **documented evidence** that the process, operated within established parameters, can perform effectively and reproducibly to produce an intermediate or API meeting its predetermined specifications and quality attributes

3. What are the approaches for process validation?

- **Prospective validation** performed on an API process should be completed before the commercial distribution of the final drug product.
- **Concurrent validation** can be conducted when data from replicate production runs are unavailable because only a limited number of API batches have been produced, API batches are produced infrequently .
- **retrospective validation** for well established processes that have been used without significant changes to API quality due to changes in raw materials, equipment, systems, facilities, or the production process.

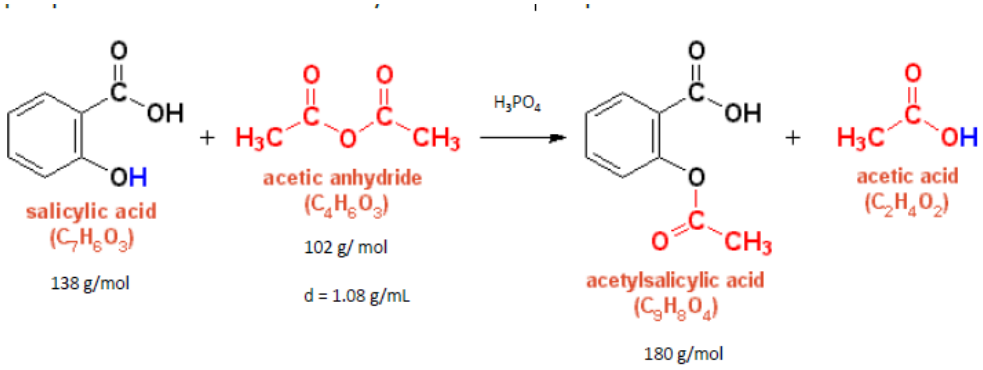
4. What is phase inversion? Nov Dec 2013

Phase inversion is the phenomenon whereby the phases of a liquid-liquid dispersion interchange such that the dispersed phase spontaneously inverts to become the continuous phase and vice versa under conditions determined by the system properties, volume ratio and energy input.

i.e. Phase inversion refers to a phenomenon that occurs when agitated oil in water emulsion, reverts to a water in oil and vice versa.

5. Write the reaction involved in synthesis of aspirin.

Aspirin (acetylsalicylic acid) is a synthetic organic derived from salicylic acid. Salicylic acid is a natural product found in the bark of the willow tree and was used by the ancient Greeks and Native Americans, among others, to counter fever and pain. However, salicylic acid is bitter and irritates the stomach.



6. What is synthetic reaction? Give an example. Nov Dec 2012

A synthesis reaction or direct combination reaction is a type of chemical reaction in which two or more simple substances combine to form a more complex product. The reactants may be elements or compounds. The product is always a compound.

The general form of a synthesis reaction is:

$A + B \rightarrow AB$

Synthesis of synthetic steroidal oestrogens (e.g., ethynyloestradiol and moestranol)

7. What is a SOP?

A Standard Operating Procedure (**SOP**) is a set of written instructions that document a routine or repetitive activity which is followed by employees in an organization. The development and use of **SOPs** are an integral part of a successful quality system. It provides information to perform a job properly, and consistently in order to achieve pre-determined specification and quality end-result.

8. What is the need of SOP?

SOPs detail the regularly recurring work processes that are to be conducted or followed within an organization. They document the way activities are to be performed to facilitate consistent conformance to technical and quality system requirements and to support data quality. They may describe, for example, fundamental programmatic actions and technical actions such as analytical processes, and processes for maintaining, calibrating, and using equipment. Sops are intended to be specific to the organization or facility whose activities are described and assist that organization to maintain their quality control and quality assurance processes and ensure compliance with governmental regulations.

9. Write about quality assurance.

It is the sum of all activities and responsibilities required to ensure that the medicine that reaches the patient is safe, effective, and acceptable to the patient.

- All those planned or systematic actions necessary to provide adequate confidence that a product will satisfy the requirements for quality
- QA is company based.

10. How Is Quality Assessed?

- INSPECTION of products on arrival
  - Visual inspection
  - Product specification review (including expiration dates)
- LABORATORY TESTING for compliance with pharmacopoeial standards
  - International Pharmacopoeia, European Pharmacopoeia, U. S. Pharmacopeia, British Pharmacopoeia, National Pharmacopoeia
- BIOAVAILABILITY DATA

11. Name some separation techniques employed in bulk drug manufacturing?

- Extraction.
- Decanting.
- Centrifugation.
- Crystallization
- Purification
- Drying

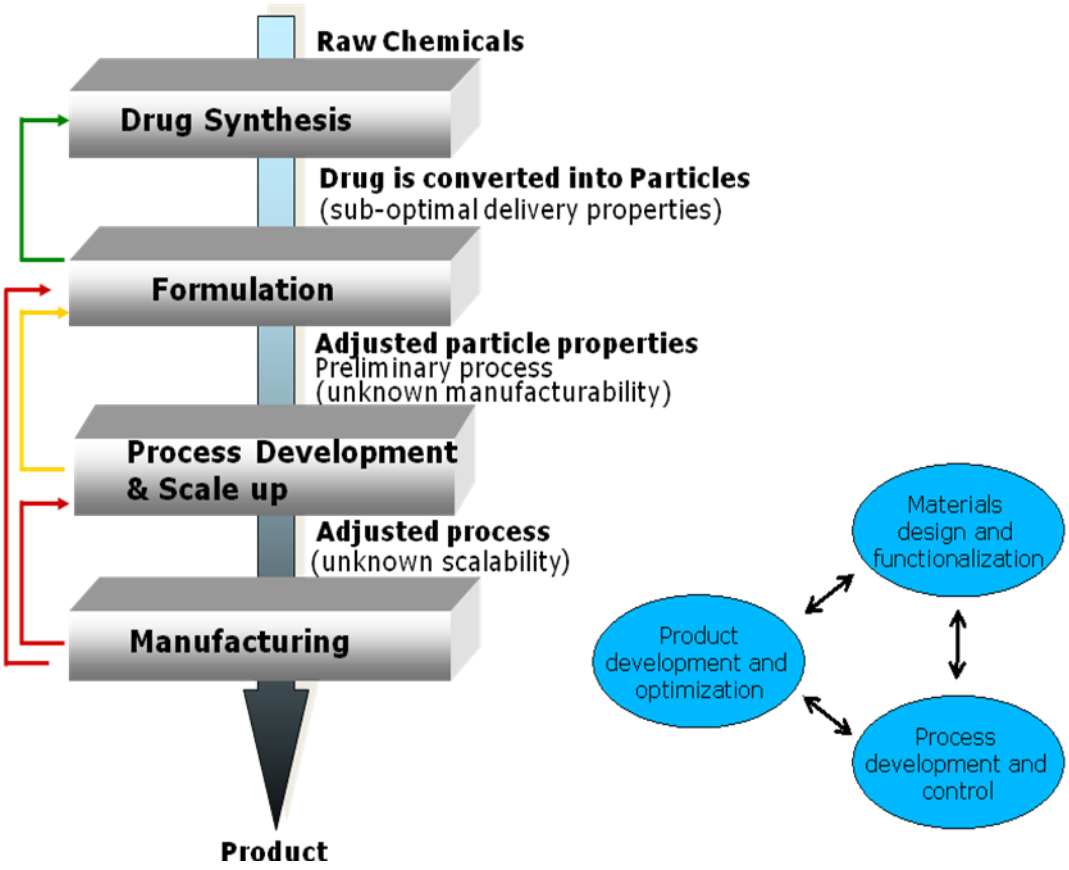
12. Write about pharmaceutical formulation.

Drugs ready for consumption by patients (generic drugs) sold as a brand or generic product as tablets, capsules, injectables, or syrups. Formulations can be subdivided into two categories: generic drugs and branded drugs.

13. Define Pharmaceutical Engineering.

Design of pharmaceutical and diagnostic products and the associated manufacturing processes based on a detailed understanding of the underlying effects and on deductive engineering principles, while recognizing the multi-level functionality and structure of the products.

14. Draw a flowchart describing the sequence of events in product development.



15. Name the chemical processing routes for synthesizing bulk drug?

Bulk drug is obtained via one of the following three chemical processing routes

1. Biosynthetic route (from biomass or fermentation broth)

2. Semi-biosynthetic route with chemical modification (natural & chemical)

3. Total chemical synthesis (from chemical commodities and intermediates)

Bulk drug is obtained via three possible chemical processing routes. Both chemical entities and macromolecules can be obtained using routes 2 and 3. Chemical entities are only obtained via route 3 and macromolecules only obtained via route 1.

16. Define GMP.

- "GMP" - A set of principles and procedures which, when followed by manufacturers for therapeutic goods, helps ensure that the products manufactured will have the required quality.
- GMP is that part of Quality assurance which ensures that the products are consistently manufactured and controlled to the Quality standards appropriate to their intended use

17. What are the main stages in bulk drug process development?

Consists of three main stages:

1. ***Preparative Task:*** bulk drug is prepared at the bench scale, unit operations and pilot plant scales to provide drug for Preclinical through Phase II/III studies.
2. ***Bulk Drug Definition Task***: Preformulation studies characterizing physico-chemical properties of the bulk compound for formulation development.
3. ***Body of Knowledge Task***: Acquisition and organization of data to meet requlatory requirements for technology transfer to manufacturing.

18. Explain Scale up tools.

- ***Process chemistry***: bench scale development of synthetic route.
- ***Prep (kilo) lab support***: process characterization for scale-up.
- ***Engineering support***: process development and scale-up.
- ***Analytical support***: in-process & bulk drug chemical analysis.
- ***Physical chemistry***: bulk drug physical attributes.
- ***Pilot plant***: equipment set-up, operation and maintenance.
- ***Process analytics support***: in-process monitoring.

19. Give some examples of equipment scale issues.

- ***Semi-batch fast reactions:*** reactants are not added fast enough to maintain high enough concentration during reaction.
  - can result in: lab-scale kinetics are not reproduced.
- ***Multiphase reactions:*** large stirred tank mixing cannot mimic smaller tank.
  - can result in: lab-scale kinetics are not reproduced.
- ***Large-scale agitators & impellers:*** result in increased linear tip velocities.
  - can result in: increased shear and high temperatures.
- ***Semi-batch crystallization:*** heterogeneity in solvent composition.
  - can result in: increased nucleation rates; undesired crystal form.
- ***Heat of reaction:*** heat transfer is compromised in larger reaction vessel.

- can result in: reaction and crystallization kinetics altered.

20. Define unit operations.

Unit operations involve the physical separation of the products obtained during various unit processes. Absorption and stripping, Distillation, Evaporation, Fluidisation, Crystallisation, Liquid- Liquid extraction.

21. List some manufacturing operations.

Large-scale manufacturing of the products includes a diverse set of unit operations, including chemical and biochemical synthesis, bulk separation, purification, crystallization, extraction, membrane separation, chromatographic separation, filtration, filter-bed drying, spray drying, dry and wet granulation, milling, coating, packaging, flocculation, cell disruption, absorption, flocculation, blending, compaction, tablet pressing, capsule filling, fluidized beds, sterilization, lyophilization, extrusion and many others.

22. Define Generic drug.

Copies of off-patent brand-name drugs that come in the same dosage, safety, strength, and quality and for the same intended use. These drugs are then sold under their chemical names as both over the counter and prescription forms. Also, referred to as unbranded formulations.

23. Recommendation of Hathi Committee – Explain.

In 1975, the Hathi Committee which was appointed by the Government of India to analyse the Indian drug industry, recommended a restricted list of essential drugs and that measures be implemented to ensure their production, that a gradual shift be made from brand names to generic names, that price control measures be effected with the aim of making life-saving drugs and essential drugs affordable, that public sector play a leading role in drug production and certain drugs be reserved to encourage the growth of Indian drug companies. The Committee also recommended elimination of irrational drugs. The Committee decried the role played by MNCs and recommended immediate dilution of foreign equity in drug companies up to 40% and progressively to 26%. It had, in fact recommended the nationalisation of foreign drug companies. (See for more details: Hathi Committee, Report of the Committee on the Drugs and Pharmaceutical Industry, Ministry of Petroleum and Chemicals, Government of India, New Delhi, April 1975).

24. Write about GATT.

General Agreement on Tariffs and Trade (GATT) was a multilateral agreement regulating international trade. According to its preamble, its purpose was the "substantial reduction of tariffs and other trade barriers and the elimination of preferences, on a reciprocal and mutually advantageous basis."

25. What is meant by DMF?

The regulatory process by which API manufacturers generally register their products for commercial sale in the U.S. and other similarly regulated countries is via the filing of a Drug Master File (DMF). DMFs are confidential documents containing information on the manufacturing facility and processes used in the manufacture, characterization, quality control, packaging and storage of an API. The DMF is reviewed for completeness by the FDA, or other similar regulatory agencies in other countries, in conjunction with applications filed by finished dosage formulation manufacturers, requesting approval to use the given API in the production of their drug products.

26. What are the main activities in Process validation.

Stage 1 – Process Design: The commercial manufacturing process is defined during this stage based on knowledge gained through development and scale-up activities.

Stage 2 – Process Qualification: During this stage, the process design is evaluated to determine if the process is capable of reproducible commercial manufacturing.

Stage 3 – Continued Process Verification: Ongoing assurance is gained during routine production that the process remains in a state of control.

27. List the important documents in GMP.

- Policies
- SOP
- Specifications
- MFR (Master Formula Record)
- BMR
- Manuals
- Master plans/ files
- Validation protocols
- Forms and Formats
- Records

28. Write about the principles of GMP.

- Design and construct the facilities and equipments properly
- Follow written procedures and Instructions
- Document work
- Validate work
- Monitor facilities and equipment
- Write step by step operating procedures and work on instructions
- Design ,develop and demonstrate job competence
- Protect against contamination

- Control components and product related processes
- Conduct planned and periodic audits

29. Define Quality control.

It is that part of GMP concerned with sampling, specification & testing, documentation & release procedures which ensure that the necessary & relevant tests are performed & the product is released for use only after ascertaining it's quality.

- Operational laboratory techniques and activities used to fulfill the requirement of Quality
- QC is lab based

30. What are the major risk in pharmaceutical production?

- Contamination of products (microbial, particulate or other)
- Incorrect labels on containers
- Insufficient active ingredient
- Excess active ingredient
- Poor quality raw materials
- Poor formulation practices

31. Comment on current scenario of an Indian pharmaceutical industry meant for bulk drug manufacture. (Nov/Dec, 2016)

- Indian pharmaceutical sector accounts for about 2.4 per cent of the global pharmaceutical industry in value terms and 10 per cent in volume terms
- India has become the third largest global generic API merchant market by 2016, with a 7.2 per cent market share
  The Indian pharmaceutical industry accounts for the second largest number of Abbreviated New Drug Applications (ANDAs), is the world's leader in Drug Master Files (DMFs) applications with the US.
  India accounts for 20 per cent of global exports in generics. In FY16, India exported pharmaceutical products worth USD16.89 billion, with the number expected to reach USD40 billion by 2020.
- The country's pharmaceutical industry is expected to expand at a CAGR of 12.89 per cent over 2015–20 to reach USD55 billion
- Indian healthcare sector, one of the fastest growing sectors, is expected to advance at a CAGR of 17 per cent to reach USD250 billion over 2008–20
  Pharmaceutical sector in India attracted 4.48 per cent of the total FDIs into India from April 2000 to December 2016
- Cumulative FDI inflows worth USD14.53 billion were made during April 2000 to December 2016

32. What is mean by API? Give few examples. (Nov/Dec, 2016)

- A substance used in a finished pharmaceutical product (FPP), intended to furnish pharmacological activity or to otherwise have direct effect in the diagnosis, cure, mitigation, treatment or prevention of disease, or to have direct effect in restoring, correcting or modifying physiological functions in human beings.
- Examples: acetaminophen in a pain relief tablet, Amoxicillin Trihydrate as Antiinfective, Memantine HCl as Anti-Alzheimer, etc.

PART B:

1. Write a note on the special requirements for bulk drug manufacture. (Dec 2013, Dec 2012, Dec 2009, Nov/Dec, 2016) [TB2: 4-21]
2. What are the various mechanisms that should be in place for ensuring quality assurance in drug manufacture? [www.who.int/medicines/technical_briefing/tbs/05-Drug-Quality_final-08.ppt?ua=1]
3. Discuss the various standard operating procedures in drug manufacture. [http://www.pharmacopeia.cn/v29240/usp29nf24s0_c1075.html]
4. Give a flowchart and explain the manufacturing process in the pharma industry. [http://www.ilocis.org/documents/chpt79e.htm]
5. Explain the various types, applications and advantages of tablet coating. (Dec 2014, Dec 2010, Dec 2009) [TB2: 244-245; 1099-1121]
6. Write about tablets under the following heads. (Dec 2014, Dec 2010, Dec 2009) : Dry granulation ii. wet granulation [TB2: 977-1008]

PART C:

1. Explain in detail about the various types of reactions and reactors used in bulk drug manufacture. (Nov/Dec, 2016) [TB2: 139-142]
2. (i) Write down the flow chart of any bulk drug manufacturing. [http://www.ilocis.org/documents/chpt79e.htm]

   (ii) Describe the steps involved in the manufacturing of tablets by wet granulation. [TB2: 977-1008]
3. What are the important good manufacturing practices to be followed in a pharmaceutical manufacturing unit? (Apr/May, 2011) [TB2: 3-20]

UNIT IV

PRINCIPLES OF DRUG MANUFACTURE

1. List any two topical applications. Nov Dec 2014

- ***Topical administration*** is the application of a drug directly to the surface of the skin.
- Topical Solution, Lotion, Cream, Ointment, Gel, Foam, Paste, Tincture, Powder, etc.
- Povidone iodine topical solution – surgical scrub and non irritating antiseptic solution
- Aluminium acetate topical solution – used as an astringent
- Includes administration of drugs to any mucous membrane
  - Eye, Nose, Vagina, Urethra, Ears, Colon, Lungs

2. What is GMP? Nov Dec 2014

A GMP is a system for ensuring that products are consistently produced and controlled according to quality standards.

Good manufacturing practices (GMP) are the practices required in order to confirm the guidelines recommended by agencies that control authorization and licensing for manufacture and sale of food, drug products, and active pharmaceutical products.

3. What is the use of cam tracks in tablet presses? Nov Dec 2007

- The use of Cam tracks in tablet presses for guiding the movement of the punches.
- Lower Cam track: The lower cm track guides the lower punch during the filling stage so that the die bore is over filled to allow accurate adjustment.
- Cam tracks: These lift and lower both upper and lower punches as.
- Ejection Cam: The ejection cam guides the lower punch upwards during tablet ejection.

4. What is the definition of tablet press/machine?

Tablets are prepared or made by compressing a formulation containing a drug or the drug with excipients on stamping machines called presses. So it is also called as compression machine or tablet presses. To form a tablet, the formulation containing a drug or the drug with excipients material must be metered into a cavity formed by two punches and a die, and then the punches must be pressed together with great force to fuse the material together.

5. What are the components of the tableting machine?

Tablet compression machine/tablet presses are designed with the following basic components:

Hopper: It is used to hold the materials (drug or the drug with excipients/ granules) to be compressed.

Dies: Dies defines the shape and the size of the tablet.

Punches: These are used for compressing of the materials (drug or the drug with excipients/ granules) within the dies.

Cam track: This is the component used for guiding the movement of the punches.

Feeding mechanism: A feeding mechanism for moving the materials (drug or the drug with excipients/ granules) from hopper into the dies.

6. What is cracking of emulsions? Nov Dec 2007

When an emulsion separates into its separate ingredients (when the oil and water are clearly separated and will not recombine) the emulsion is said to have "cracked" or "broken." Do not confuse a "cracked" emulsion with one that has creamed! Creaming is a natural occurrence with most emulsions and simple shaking will restore the uniformity of the preparation. However, no amount of shaking will restore the cracked emulsion to its original state.

The most common reason that an emulsion cracks is the addition of too much or too concentrated alcohol or electrolyte solution. Freezing will also cause an emulsion to crack.

7. What are the common defects in film coated tablets?

- Sticking and picking
- Roughness
- Orange peel
- Color variation
- Cracking
- Twinning
- Capping
- Lamination
- Blistering
- Catering

8. Mention any two differences between lotion and liniment.

- Lotions are liquid preperations meant for external application without friction ,while liniments are liquid or semi-liquid preparations usually applied to the skin with friction and rubbing of the skin.
- Lotions are slightly less viscous than liniments.
- Lotions are applied before bath whereas liniment is applied after taking a bath.
- Lotions are applied direct to the skin while a liniment should not be applied to the broken skin because it may cause excessive irritation.

9. Write about: Mandl's Paint. Nov Dec 2013

Mandl's Paint: COMPOUND IODINE THROAT PAINT I.P Synonym : Mandl's paint Rx
Potassium iodide 24g
Iodine 12g
Alcohol 40ml

Purified water 24ml
Peppermint oil 4ml
Glycerine…. q.s …. 1000ml
Theory : Iodine is slightly soluble in water, but it is soluble in presence of potassium Iodide and forms polyiodides. These polyiodides are highly soluble in water and hence produce monophasic liquid. Alcohol(90%) acts as cosolvent , to increase the solubility of iodine.It is also used to dissolve peppermint oil, which acts as flavouring agent.glycerine is viscous in nature hence Mandl's paint will remain in contact with mucous membrane of throat for longer time,it also acts as humectant and soothing agent.

Uses : Mandl ' s paint is used in the treatment of pharyngitis,laryngitis,tonsillitis and sore throat.

10. Write about Milk of Magnesia. Nov Dec 2013

Milk of Magnesia: Magnesium hydroxide is an inorganic compound with the chemical formula of hydrated $Mg(OH)_2$. It is often known as milk of magnesia, because of its milk-like appearance as a suspension.

Magnesium hydroxide also reduces stomach acid, and increases water in the intestines which may induce defecation. Magnesium hydroxide is used as a laxative to relieve occasional constipation (irregularity) and as an antacid to relieve indigestion, sour stomach, and heartburn.

11. What is the important of tablet coating? Nov Dec 2009

- Cover the unpleasant taste, odor and color.
- Physical and chemical protection in medicine from environment (light, moisture, and air).
- Control of drug release as in enteric coating or sustained release or more usually to coated multi particulates.
- To protect drug from the gastric environment of the stomach with an acid-resistant enteric coating.
- Improve the appearance of tablets.
- Assist and facilitate the identification of drug.
- Easing the process of blistering.

12. How is pyrogen test carried out for sterile drug dosages? Nov Dec 2009

- Pyrogens are products of metabolism in microorganisms Gm-ve bacteria produces most potent pyrogens. When these pyrogens are introduced into a body they produce a mark response of fever with body ache and vasoconstriction within an onset of 1 hour. Basically there are test performed to detect the presence of pyrogens in sterile parenteral products they are : Rabbit Test and LAL Test.
- RABBIT TEST: This test basically involves the injection Sample solution which is to be tested into a Rabbits Which are use as test animals through ear vein. The Temperature sensing probe (Clinical Thermometer, Thermosestor or similar probe) into a rectum cavity of Rabbit at the depth of 7.5 cm, the test solution must be warmed at 37 degrees prior to injection. Then Rectal temperature is recorded at 1,2,3 hr subsequent to injection. This test is performed in separate area designed solely for

this purpose under environmental conditions similar to animal house should be free from disturbances that likely to excite them.

13. Differentiate flocculated suspension from deflocculated suspension.

Deflocculated	**Flocculated**
Particles exist in suspension as separate entities.	Particles form loose aggregates
Rate of sedimentation is slow, since each particle settles separately and particle size is minimal.	Rate of sedimentation is high, since particles settle as a floc, which is a collection of particles.
A sediment is formed slowly	A sediment is formed rapidly
The sediment eventually becomes very closely packed, due to weight of upper layers of sedimenting material. Repulsive forces between particles are overcome and a hard cake is formed which is difficult, if not impossible, to redisperse.	The sediment is loosely packed and possesses a scaffold-like structure (large volume of final sediment). Particles do not bond tightly to each other and a hard, dense cake does not form. The sediment is easy to redisperse, so as to reform the original suspension.
The suspension has a pleasing appearance, since the suspended material remains suspended for a relatively long time. The supernatant also remains cloudy, even when settling is apparent.	The suspension is somewhat unslightly, due to rapid sedimentation and the presence of an obvious, clear supernatant region. This can be minimized if the volume of sediment is made large. Ideally, volume of sediment should encompass the volume of the suspension.

14. Differentiate between w/o and o/w emulsions. Nov Dec 2010

o/w emulsions	**w/o emulsions**
• Water is the dispersion medium and oil is the dispersed phase. • non greasy and easily removable from the skin. • used externally to provide cooling effect e.g. vanishing cream. • preferred for internal use as bitter taste of oils can be masked.	• Oil is the dispersion medium and water is the dispersed phase. • greasy and not water washable. • used externally to prevent evaporation of moisture from the surface of skin e.g. Cold cream. • preferred for external use like creams.

15. What are the advantages of suppositories as dosage forms? Nov Dec 2010

It is a small solid medicated mass, usually cone-shaped ,that is inserted either into the rectum (rectal suppository), vagina (vaginal suppository or pessaries) where it melts at body temperature .

ADVANTAGES:_ Can exert local effect on rectal mucosa._ Used to promote evacuation of bowel._ Avoid any gastrointestinal irritation._ Can be used in unconscious patients (e.g. during fitting)._ Can be used for systemic absorption of drugs and avoid first-pass metabolism.− Babies or old people who cannot swallow oral medication.− Post operative people who cannot be administered oral medication.− People suffering from severe nausea or vomiting.

16. Briefly write about endotoxin test. Nov Dec 2011

The Bacterial Endotoxins Test (BET) is a test to detect or quantify endotoxins from Gram-negative bacteria using amoebocyte lysate from the horseshoe crab (Limulus poly-phemus or Tachypleus tridentatus).

There are three techniques for this test:

- the gel-clot technique, which is based on gel formation; The gel-clot technique is used for detecting or quantifying endotoxins based on clotting of the lysate reagent in the presence of endotoxin.
- the turbidimetric technique, based on the development of turbidity after cleavage of an endogenous substrate; and
- the chromogenic technique, based on the development of color after cleavage of a synthetic peptide-chromogen complex (by the reaction of endotoxins with lysate).

17. Briefly write about wet granulation. Nov Dec 2011

Wet granulation involves the production of a granule by the addition of liquid binders to the powder mixture.

The process of adding a liquid solution to powders involves the massing of a mix of dry primary powder particles using a granulating fluid. The fluid contains a solvent that must be volatile, so that it can be removed by drying, and be non-toxic. Typical liquids include water, ethanol and isopropanol, either alone or in combination. The liquid solution can be either aqueous-based (safer) or solvent-based. Water mixed into the powders can form bonds between powder particles that are strong enough to lock them together. However, once the water dries, the powders may fall apart. Therefore, water may not be strong enough to create and hold a bond. In such instances, a liquid solution that includes a binder is required. Once the solvent/water has been dried and the powders have formed a more densely held mass, then the granulation is milled.

18. Briefly write about capsule preparation. Nov Dec 2011

Capsules are solid dosage forms in which one or more medicinal and/or inert substances are enclosed within a small shell or container generally prepared from a suitable form of gelatin. Depending upon their formulation, the gelatin capsule shells may be hard or soft.

Steps involved in making empty gelatin capsules…

Dipping : Pairs of the stainless steel pins are dipped into the dipping solution to simultaneously form the caps and bodies. The dipping solution is maintained at a temperature of about 500C in a heated, jacketed dipping pan.

Spinning : The pins are rotated to distribute the gelatin over the pins uniformly and to avoid the formation of a bead at the capsule ends.

Drying : The gelatin is dried by a blast of cool air to form a hard shells. The pins are moved through a series of air drying kilns to remove water

Stripping : A series of bronze jaws strip the cap and body portions of the capsules from the pins.

Trimming and joining: The stripped cap and body portions are trimmed to the required length by stationary knives. After trimming to the right length, the cap and body portion are joined and ejected from the machine.

Polishing: Pan Polishing : Acela-cota pan is used to dust and polish; Cloth Dusting : Capsule are rubbed with cloth; Brushing : Capsule are feed under soft rotating brush.

19. Briefly write about stability test. Nov Dec 2011

The purpose of stability testing is to provide evidence on how the quality of an active substance or pharmaceutical product varies with time under the influence of a variety of environmental factors such as temperature, humidity, and light.

In addition, product-related factors influence the stability, e.g. the chemical and physical properties of the active substance and the pharmaceutical excipients, the dosage form and its composition, the manufacturing process, the nature of the container-closure system, and the properties of the packaging materials.

Also, the stability of excipients that may contain or form reactive degradation products, have to be considered.

20. What are the advantages of capsules over tablets?

Capsules are widely used in supplements because they are easy-to-swallow and break down quickly in the stomach. Also Large tablets can be hard for some people to swallow (they can be crushed just before use). Tablets do not offer the flexibility of dosing that liquids and powders do.

21. Differentiate ointments from creams.

A cream is an emulsion of oil and water. It is thicker than lotion, but thinner than ointment.	An ointment is a “homogeneous, viscous, semi-solid preparation”, essentially it is a greasy, thick oil.
Creams are prepared in a approximately equal proportions, i.e. 50 % oil and 50 % water.	an ointment is 80 % oil and 20 % water. Hence, it is oilier than a cream.
creams are absorbed faster into the skin than ointments.	Ointments tend to stay longer on the surface of the skin and take longer to get absorbed.
Creams are absorbed faster into the skin due to their high water content. As the water evaporated, it tends to cause the skin to dry up faster. Hence, creams are better suited for greasy and oily skin.	Due to the high oil factor, ointments tend to be greasier than creams. They may tend to leave the skin greasy, and may even leave grease spots on cloth.

22. What is the importance of enteric coating tablets? Name atleast two enteric coating materials used in tablet coating.

- This technique is used to protect the tablet core from disintegration in the acid environment of the stomach for one or more of the following reasons:
- Prevention of acid attack on active constituents unstable at low pH.
- To protect the stomach from the irritant effect of certain drugs.
- To facilitate absorption of a drug that is preferentially absorbed distal to the stomach.
- Polymer are insoluble in aqueous media at low pH, but as the pH rises they experience a sharp, well defined increase in solubility at a specific pH.

23. How do table presses work?

A tablet is formed by the combined pressing action of two punches and a die.

Single station /single punch/eccentric presses:

FILLING:

Step-1: Upper punch is withdrawn from the die by the upper cam, bottom punch is low in the die so powder falls in through the hole and fill the die.

Stage-2: Bottom punch move ups to adjust the powder weight, it rasies and expelles the powder.

COMPRESSION:

Stage-3: Upper punch is driven into the die by upper cam. Bottom punch is rasied by lower cam. Both punch heads pass between the heavy rollers to compress the tablet.

EJECTION:

Stage-4: Upper punch is withdrawn by the upper cam. Lower punch is pushed up and expel the tablets. Tablet is romved from the die surface by the surface plate.

Stage-5: Return to the 1^{st} stage.

24. Explain about Dry granulation.

Dry Granulation: This process is used to form granules without using a liquid solution, because the product to be granulated may be sensitive to moisture and heat or does not compress well. Forming granules without moisture involves compacting and size reduction of the mix to produce a granular, free flowing blend of uniform size. Thus, the primary powder particles are aggregated under high pressure using swaying or high shear mixer-granulators.

Dry granulation can be done in two ways: either a large tablet (slug) is produced in a heavy duty tableting press or the powder is squeezed between two rollers to produce a sheet of materials (roller compactor/chilsonator).

25. Write about Enema.

An enema (Rectal dosage forms) is the procedure of introducing liquids into the rectum and colon via the anus.

Types of enema:

1- Evacuant enema: used as a bowel stimulant to treat constipation. E.g. soft soap enema & $Mgso_4$ enema

-The volume of evacuant enemas may reach up to 2 liters.
- They should be warmed to body temperature before administration.
2- Retention enema:
- Their volume does not exceed 100 ml.
- No warming needed.

- May exert:
A- Local effect: e.g. a barium enema is used as a contrast substance in the radiological imaging of the bowel.
B- Systemic effect: e.g. the administration of substances into the bloodstream. This may be done in situations where it is impossible to deliver a medication by mouth, such as antiemetics. e.g. nutrient enema which contains carbohydrates, vitamins & minerals.

26. Write about Preservatives.

- Preservatives are chemical agents which serve to retard, hinder or mask microbial damage. They are of two categories (i) Natural products, both organic and inorganic (ii) synthetic compounds.
- The natural preservatives are organic acids such as lactic, malic and citric, and their salts; vinegars; sodium chloride; sugars, spices and essential oils from spices.
- Sodium chloride caused high osmotic pressure , and hence plasmolysis of cell it dehydrates vegetable products by drawing out and tying up moisture. It is ionized to yield chloride ion which is harmful organisms.
- Sugars, i.e. glucose and sucrose act by tying up moisture, High concentrations are necessary for preservative action
- Artificial preservatives used in food and drug are sodium and calcium propionates, caprylic acid, sorbic acid and sorbates; benzoid acid and benzoates; derivatives of benzoic acid such as the parabens; sulphur dioxide and sulphites, sodium nitrite.

27. What are the types of packing materials used?
The types of packaging materials used for pharmaceutical packaging are:
- Glass
- Plastics
- Rubbers
- Paper/card boards
- Metals

28. Define Packaging.

- Pharmaceutical packaging can be defined as the economical means of providing presentation, protection, identification , information, convenience ,compliance , integrity and stability of the product .
- Packaging greatly helps in identification of products. Packaging protects the contents of a product from spoilage, breakage, leakage, etc. Packaging should be convenience to open, handle and use for the consumers. Packaging is also used for promotional and attracting the attention of the people while purchasing.

29. Brief about Liquid dosage forms.

Liquid dosage forms, given orally, deliver medication to the body the fastest because they move so quickly through the system. They are also the most common form of children's medications.

The liquid dosage forms are

- Oral Emulsion,
- Oral Suspension,
- syrups,
- elixirs,
- Linctuses and drops.

30. What is an Elixir?

- An elixir is a **hydro-alcoholic solution** of at least one active ingredient. Elixirs consist of **alcohol** and **water** and are sweet in taste and have a nice flavor.
- The lowest alcoholic quantity that will dissolve completely the active ingredient(s) and give a clear solution is generally chosen. High concentrations of alcohol give burning taste to the final product.
- Elixirs have **low viscosity** than syrups and they can flow more freely as there will be very less use of agents that increase viscosity like sucrose.
- Sedative and hypnotic elixirs: sedatives induce drowsiness, and hypnotics induce sleep: pediatric chloral hydrate elixirs
- Antihistaminic elixirs: used against allergy: chloramphenіramine maleate elixirs (USP), diphenhydramine HCl elixirs.

31. Give examples for topical application preparation. (Nov/Dec, 2016)

Some drugs can be applied directly to where they are needed. These are called TOPICAL preparations and can be used to treat eye, ear or skin problems.

Topical preparations are available in different forms:-

- CREAMS – the drug is dissolved in water and mixed with oil or fat. Creams spread easily and penetrate the outer layers of the skin.
- OINTMENTS – the drugs are present in a base of wax or fat. They do not penetrate the skin.
- POWDERS – fine powders to apply to the skin e.g. flea powders.
- MEDICATED SHAMPOOS – drugs mixed with detergents which penetrate the coat. Shampoos are left in contact with the skin for the recommended amount of time and then should be rinsed off thoroughly.
- SPRAYS – a way of applying liquids in fine droplet form e.g. flea sprays.

32. Sort out the mechanical properties of the plastic packing materials. (Nov/Dec, 2016)

Mechanical properties of the plastic packing materials:

- tensile strength (Unoriented PP becomes brittle at low temperatures)
- stiffness (Oriented Polypropylene (OPP) film is clear, stiff and glossy)
- coefficient of friction
- use temperatures
- elongation (LDPE -Very high elongation (desirable for stretch wrap))
- formability

PART B:

1. Explain in detail the following analytical tests. (Dec 2011, May 2011) [TB2: 1165-1190]

i. Sterility test
ii. Disintegration test

2.

i. How do tablet presses work? (May 2011, Dec 2012, Dec 2009) [TB2: 1133-1163]
ii. Write a note on quality control for tablet manufacture. [TB2: 3-26]

3. Describe the packing techniques in drug manufacture. (Dec 2013, Dec 2012) [TB2: 159-200]
4. Explain in detail about preparation of hard gelatin capsules. [TB2: 245-251]
5. Write about tablets compression. [TB2: 1133-1163]
6. Explain how Preservation of drugs done in pharmaceutical industries? [TB2: 1165-1190]

PART C:

1. Write short notes on:. (Nov/Dec, 2016)
   i. Importance of granulation and coating (4) [TB2: 977-1008; 244-245]
   ii. Tablets manufacturing using direct compression method. (4) [TB2: 1133-1163]
   iii. Manufacturing of a soft gelatine capsule (8) [TB2: 245-251]
2. Write short notes on (Nov/Dec, 2016) [TB2: 313-343]
   i. Classification of liquid orals using suitable samples.
   ii. Vegetable drugs
   iii. Ideal properties and requirements for a semisolid preparation
   iv. Comment on basic principles of GMP. [TB2: 3-26]
3. (i) What is the significance of tablet coating? Describe the steps of steps coating of tablets. (Nov/Dec, 2009) [TB2: 244-245; 1099-1121]

   (ii) Give the formulation of film coating solution and discuss. (Nov/Dec, 2009) [TB2: 244-245]

UNIT V
BIOPHARMACEUTICALS

1. What are macrolides group of antibiotics? Give two examples. Nov Dec 2012

Macrolides are a class of antibiotics found in streptomycetes. They are natural lactones with a large ring, consisting of 14 to 20 atoms. Macrolides bind to the 50S subunit of the bacterial ribosome and inhibit ribosomal translocation, leading to inhibition of bacterial protein synthesis. Their action is primarily bacteriostatic but may be bactericidal at high concentrations, or depending on the type of microorganism.

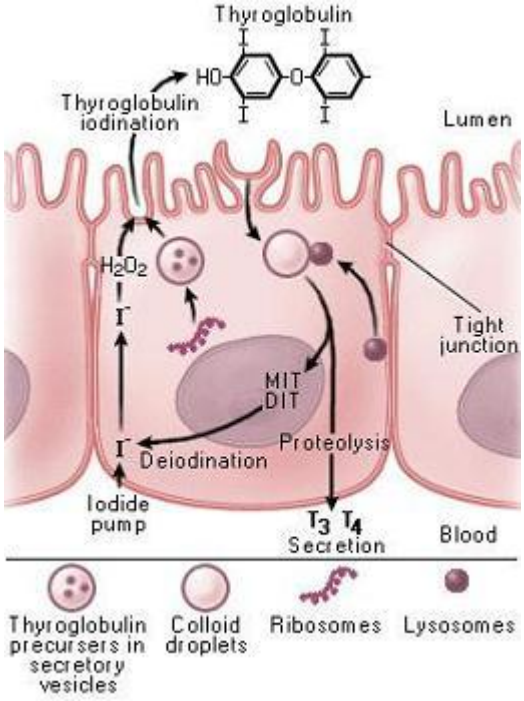
Macrolides mainly affect gram-positive cocci and intracellular pathogens such as mycoplasma, chlamydia, legionella.

Macrolides are a class of antibiotic that includes erythromycin, roxithromycin, azithromycin, Biaxin, Ery-Tab and clarithromycin.

2. Mention the steps involved in thyroid hormones synthesis. Nov Dec 2007

The first step in the synthesis of thyroid hormones is the organification of iodine. Iodide is taken up, converted to iodine, and then condensed onto tyrosine residues which reside along the polypeptide backbone of a protein molecule called thyroglobulin. This reaction results in either a mono-iodinated tyrosine (MIT) or di-iodinated tyrosine (DIT) being incorporated into thyroglobulin. This newly formed iodothyroglobulin forms one of the most important constituents of the colloid material, present in the follicle of the thyroid unit.

The other synthetic reaction, that is closely linked to organification, is a coupling reaction, where iodotyrosine molecules are coupled together. If two di-iodotyrosine molecules couple together, the result is the formation of thyroxin (T4). If a di-iodotyrosine and a mono-iodotyrosine are coupled together, the result is the formation of tri-iodothyronine (T3).



3. Are antibiotics a suitable treatment for the common cold? Justify. Nov Dec 2013

No. Antibiotics play no role in treating the common cold. Antibiotics are effective only against illnesses caused by bacteria, and colds are caused by viruses. Not only do antibiotics

not help, but they can rarely also cause severe allergic reactions that can sometimes be fatal. Furthermore, using antibiotics when they are not necessary has led to the growth of several strains of common bacteria that have become resistant to certain antibiotics. For these and other reasons, it is important to limit the use of antibiotics to situations in which they are medically indicated.

Occasionally, a bacterial infection such as sinusitis or a middle ear infection can develop following the common cold, however, the decision to treat with antibiotics should be determined by a physician or health-care professional after a medical evaluation.

4. Give the meaning of the followings: Vasectomy & Expectorant. Nov Dec 2013

Vasectomy:

A vasectomy is considered a permanent method of birth control. A vasectomy prevents the release of sperm when a man ejaculates.

During a vasectomy, the vas deferens from each testicle is clamped, cut, or otherwise sealed. This prevents sperm from mixing with the semen that is ejaculated from the penis so as to prevent sperm from entering into the seminal stream (ejaculate) and thereby prevent fertilization.

Expectorant:

Expectorants are drugs that loosen and clear mucus and phlegm from the respiratory tract (lungs, bronchi, and trachea). An example of an expectorant is guaifenesin, which promotes drainage of mucus from the lungs by thinning the mucus, and also lubricates the irritated respiratory tract.

5. What are the risks of using hormones? Nov Dec 2013

Women can experience side effects during hormone therapy. These symptoms include:

- headaches, nausea, breast pain, Weight gain
- Hormone therapy (HT) increases the risk of vein clots in the legs (deep vein thrombosis) and blood clots in the lungs (pulmonary embolus) by about 2 or 3 fold.
- women who have their uterus and use estrogen alone are at risk for endometrial (Uterine) cancer.
- increases the risk of breast cancer, although the increase in risk is very small.
- Even though hormone therapy (HT) lowers the bad LDL cholesterol and raises the good HDL cholesterol, hormone therapy (HT) increases the risk of heart attacks in women who already have heart disease, as well as in women who do not have known heart disease.
- Abnormal vaginal bleeding
- slightly increased the risk of stroke

6. What do you mean by natural birth control methods? Nov Dec 2013

Birth control is the use of practices, medications, or devices to prevent pregnancy.

Natural methods of birth control, or natural family planning, are a type of birth control that relies on observations about the woman's body and menstrual cycle.

Natural methods of birth control include fertility awareness methods.

Calendar rhythm method - to avoid pregnancy relies upon calculating a woman's fertile period on the calendar

Basal body temperature method - based upon the fact that a woman's temperature drops 12 to 24 hours before an egg is released from her ovary and then increases again once the egg has been released.

Mucus inspection method - depends on the presence or absence of a particular type of cervical mucus that a woman produces in response to estrogen.

Symptothermal method - ombines certain aspects of the calendar, the basal body temperature, and the mucus inspection methods.

Ovulation indicator testing kits

Withdrawal method

Lactational infertility

Douching and urination

Abstinence

7. What are therapeutic agents? Write any two recombinant therapeutic agent?

Therapeutic agent is a substance capable of producing a curative effect in a disease state.
Examples: Aspirin as a therapeutic agent in cardiovascular disease, anticarcinogenic agents, antibiotics, antimitotic agents, anti-inflammatory agents
Ex. Alteplase and Reteplase (Thrombolytic agents), Insulin lispro and Insulin glargine, Interferon alpha-2b, etc.

8. Define laxatives with examples. Nov Dec 2009

Laxatives (purgatives, aperients) are (chiefly of a drug or medicine) tending to stimulate or facilitate evacuation of the bowels. They are the substances that loosen stools and increase bowel movements. They are used to treat and prevent constipation.

Examples: Psyllium (Metamucil), Glycerin suppositories, docusate (Colace), magnesium hydroxide solution (called milk of magnesia), Bisacodyl (Dulcolax)

9. Write about lubricant laxatives.

Lubricant laxatives, including mineral oil and white petroleum, are hydrocarbon mixtures derived from petroleum. Mineral oil is frequently used in large animals and white petrolwum products are used to treat trichobezoars in cats. These large hydrocarbons are minimally absorbed and act by coating feces with a film that entraps moisture and lubricates passage. Hydrocarbon laxatives reduce absorption of fat soluble vitamins and possibly other nutrients, thus chronic use can produce deficiencies. The small amount of absorbed hydrocarbons can provide a nidus for granuloma formation in the intestinal mucosa, mesenteric lymph nodes or liver. Adverse effects, however, are rarely reported with lubricant laxatives.

10. Write about stimulant laxatives.

Stimulant laxatives, also known as contact laxatives, encourage bowel movements by acting on the intestinal wall. They increase the muscle contractions that move along the stool mass. Stimulant laxatives are a popular type of laxative for self-treatment. However, they also are more likely to cause side effects. One of the stimulant laxatives, dehydrocholic acid, may also be used for treating certain conditions of the biliary tract.

11. Explain emollients.

Stool softeners (emollients)—Stool softeners encourage bowel movements by helping liquids mix into the stool and prevent dry, hard stool masses. This type of laxative has been said not to cause a bowel movement but instead allows the patient to have a bowel movement without straining.

12. Classify analgesic drugs with examples.

Opioid (Narcotic) Analgesics	Non-opioid Analgesics (analgesics- antipyretics)
• Are the most powerful analgesics that can relieve any type of pain except itching. • Act mainly at the level of the cortex. • Can produce addiction. • Example: Morphine and codeine.	• Are mild analgesics and effective in mild types of pain as headache, toothache … • Act on the level of the thalamus and hypothalamus. • No addiction. • Used to lower the elevated body temperature. • Example: NSAIDs e.g. salicylates, and paracetamol

13. Write the applications of Unna's paste.

- Unna Boot: named after German dermatologist Paul Gerson Unna. Inmedicine, an Unna boot is a special gauze (usually 4 inches wide and 10 yards long) bandage, which can be used for the treatment of venous stasis ulcers and other venous insufficiencies of the leg.
- It can also be used as a supportive bandage for sprains and strains of the foot, ankle and lower leg. The gauze is impregnated with a thick, creamy mixture of zinc oxide and calamine to promote healing. It may also contain acacia, glycerin, castor oil and white petrolatum.
- The zinc oxide paste in the Unna Boot helps ease skin irritation and keeps the area moist. The zinc promotes healing within wound sites, making it useful for burns and ulcers.
- It can be used to treat uninfected, non-necrotic leg and foot ulcers caused by venous insufficiency and stasis dermatitis.
- **Contraindications:** Allergy to any ingredient, Arterial ulcer, Weeping eczema, Cellulites

14. Mention any two methods of fertility control. Nov Dec 2014

- Hormonal Methods:
  - Birth COntrol Pill - estrogen and progestin - Keeping eggs from leaving the ovaries and Making cervical mucus thicker this keeps sperm from getting to the eggs.
  - Transdermal Patch
  - Contraceptive Ring
  - Injection Method
  - Intrauterine Device/system

- Emergency Contraception - Ulipristal acetate, Levonorgestrel pill
- Barrier Methods: Condom, Sponge,
  - Spermicides - chemicals that stop sperm from moving
- Abstinence - not having vaginal intercourse

15. List the major endocrine glands.

- Pituitary Gland,
- Hypothalmus,
- Thymus,
- Pineal Gland,
- Testes,
- Ovaries,
- Thyroid,
- Adrenal Glands,
- Parathyroid, Pancreas.

16. What are bulk laxatives? Nov Dec 2009

Bulk-forming laxatives absorb liquid in the intestines. This creates a bulky, more liquidy stool that's softer and easier to pass. The bowel is then stimulated normally by the presence of the bulky mass. Common bulk-forming laxatives include psyllium (Metamucil), polycarbophil (FiberCon), and methylcellulose (Citrucel).

17. List out the antibiotics used in cancer abnormalities. Nov Dec 2009

Many treatments for cancer destroy disease-fighting white blood cells, thereby reducing the body's ability to fight infection. For example, bladder, pulmonary, and urinary tract infections may occur with chemotherapy .

Because of the dangers that infections present for cancer patients, antibiotic treatment often is initiated before the exact nature of the infection has been determined.

The common antibiotics that are used during cancer treatment include:

- Atovaquone (Mapren): antiprotozoal drug used to prevent and treat a very serious type of pneumonia
- Ciprofloxacin (Cipro): fluoroquinolone antibiotic used to treat certain gram-negative and gram-positive bacteria and some mycobacteria.
- Sulfamethoxazole-Trimethoprim (SMZ-TMP) (generic name product, Bactrim, Cofatrim Forte, Cotrim, Septra, Sulfatrim): to prevent and treat PCP and bacterial infections, such as bronchitis and middle ear and urinary tract infections.
- Trimethoprim (generic name product, Proloprim, Trimpex): primarily used to prevent or treat urinary tract infections.
- Clindamycin phosphate (Cleocin): used to treat gram-positive and gram-negative bacterial infections

18. Classify antibiotics based on their antibacterial activity.

A. Inhibition of cell wall synthesis leads to the death of the bacteria lysis (bactericidal effect)
→ penicillin, cycloserine, vancomycin, bacitracin, cefottaxime, ceftriaxone.

B. Disruption of cell membrane function → polymyxin (polymyxin B, polymyxin E), polyenes, nystatin

C. Inhibition of protein synthesis:

- This antibiotics inhibit one of the reactions in the process of transcription

1. Inhibition of translation process of microbes

a. Inhibit ribosome on the 30 S subunit → streptomycin, tetracylines, netilmicin, kanamycin

b. Inhibit ribosom on the 50 S subunit → chloramphenicol, clyndamycin, lincomycin

2. Inhibits the transcription process of microbes → Rifampin, actinomycin

D. Inhibits spesific metabolic reaction

- Inhibits the enzymatic reactions → sulfonamides, trimethoprim

19. What are oral contraceptives? Give example.

Oral contraceptives (birth-control pills) are used to prevent pregnancy. Estrogen and progestin are two female sex hormones. Combinations of estrogen and progestin work by preventing ovulation (the release of eggs from the ovaries). They also change the lining of the uterus (womb) to prevent pregnancy from developing and change the mucus at the cervix (opening of the uterus) to prevent sperm (male reproductive cells) from entering.

Combined pills - Norgestrel (Ethinyl estradiol) - MALA-D

Phased pills - Levanorgestrel (TRIQUILAR), Norethindrone (ORTHONOVUM)

Postcoital pill - Levonorgestrel (OVRAL, DUOLUTION-L)

Mini pills - Norethindrone (MICRONOR), Norgestrel (OVRETTE)

20. What are osmotic laxatives? Give examples.

Osmotic laxatives work by increasing the amount of fluid in the large bowel by drawing fluid into it (osmosis). Less fluid is then absorbed into the bloodstream from the large bowel. The bowels become more filled (distended) because of the extra fluid. This stimulates the muscles of the walls of the bowels to contract. These muscle contractions (called peristalsis) squeeze the faeces along.

The danger is that fluid is pulled from the rest of the body and can cause severe dehydration and depletion of electrolytes.

Lactulose: Duphalac®, Kristalose®, and Actilax® (Lactulose)

Sorbitol: Sorbilax®

Polyethylene Glycol Compounds: MiraLAX®

Magnesium Hydroxide (Milk of Magnesia): Phillip's® Milk of Magnesia, Dulcolax®, Milk of Magnesia, and Freelax®

21. Give an example of a lubricant, a preservative used in solutions, an enteric coating material, surfactant.

Lubricant - a lubricant as 1% Magnesium stearate is utilized to prevent adhesion and facilitate the flow of the powder in capsule filling machine.

Preservatives - vinegars, Sodium chloride, glucose and sucrose (high conc), sorbic acid, benzoid acid, lactic, malic and citric etc.

An enteric coating material - Cellulose Acetate Phthalate (CAP), Acrylate polymers, Polyvinyl Acetate Phthalate (PVAP)

Surfactants - polysorbate 80 (Tween 80), Cetyl alcohol, SLS, Myvacet, Pluronic.

22. Explain – NSAIDs. Nov Dec 2011

Nonsteroidal anti-inflammatory drugs (NSAIDs) are a drug class that groups together drugs that provide analgesic (pain-killing) and antipyretic (fever-reducing) effects, and, in higher doses, anti-inflammatory effects.

- Important medicines include ibuprofen (Motrin), naproxen (Aleve) and Aspirin.
- Can reduce fever and suppress inflammation.
- Work by blocking cyclooxygenase (COX), an enzyme in various tissues that produce the chemical mediators which are the cause for inflammation, related pain, and fever.
- Aspirin besides acting as a pain killer also has anti-platelet properties, which helps in the treatment for heart attacks and strokes.

23. Briefly write about tissue plasminogen activator. Nov Dec 2011

(tPA) An enzyme that helps dissolve clots. tPA is made by the cells lining blood vessels and has also been made in the laboratory. It is systemic thrombolytic (clot-busting) agent and is used in the treatment of heart attack and stroke. Activase (alteplase) is a tissue plasminogen activator produced by recombinant DNA technology. Recombinant tPA is abbreviated r-tPA.

24. Why are suspensions not given through intravenous route?

A suspension may be used orally, but it cannot be used intravenously, subcutaneously or parenterally. In other words, suspensions can't be used for injections, period. Suspension means that a solid is suspended in a liquid. Grinding up a tablet and mixing it into a sugar syrup would be an example of a suspension. The suspended ingredient would clog up capillaries and arterioles if given as an injection, therefore it's impossible.

25. Write a short note on Bisimilars? Nov Dec 2014

A biosimilar product is a biological product that is approved based on a showing that it is highly similar to an FDA-approved biological product, known as a reference product, and has no clinically meaningful differences in terms of safety and effectiveness from the reference product. Only minor differences in clinically inactive components are allowable in biosimilar products.

Ex. Epogen® - Epoetin alfa - Retacrit® by Hospira

26. Explain themechanism of action of Paracetamol.

Paracetamol (Acetaminophen) N-Acetyl-P-Aminophenol:

Mechanism:

- inhibits prostaglandin synthesis via *CNS* inhibition of COX (not peripheral)- doesn't promote ulcers, bleeding or renal failure;

- peripherally blocks generation of pain impulses, inhibits hypothalamic heat-regulation center
- maximal effect if the drug is introduced orally – after 2 hours, lasts approximately for 4 hours
- in case of durable administration of big doses – damaging of liver and kidneys, production of met-hemoglobin

27. Write about opioids.

- The opioid analgesics relieve pain by binding to opioid receptors in the central nervous system.
- are also known as **NARCOTICS**.
- act as agonists to produce the effect of analgesia.
- give relief for moderate to severe pain.
- used when pain is too severe to be controlled by NSAID analgesics.
- All narcotic analgesics are prescription medications.

28. What are the types of analgesics?

- Nonsteroidal Anti-Inflammatory Drugs - ibuprofen (Motrin), naproxen (Aleve) and Aspirin
- Corticosteroids
- Opioids
- Neurological Analgesia - antidepressant amitriptyline (Elavil) and the anticonvulsant gabapentin (Neurontin).
- Anesthetic Nerve Blockade - lidocaine

29. what are vitamins? Give its types. Nov Dec 2014

- Organic molecules needed in small quantities for normal metabolism and other biochemical functions, such as growth or repair of tissue
- Attach to enzymes or coenzymes and help them activate anabolic (tissue-building) processes
- Water-Soluble Vitamins - B-complex group and vitamin C
- Fat-Soluble Vitamins - Vitamins A, D, E, K

30. Write the types, sources and deficiency diseases of vitamins.

	Vitamin	Sources	Functions (essential for)	Deficiency diseases
1	Vitamin A	Oil, fish, liver egg, milk, butter and carrots	Eye and lungs	Night blindness
2	Vitamin D	Animal fat, milk ghee, butter	Bones and teeth formation	Rickets
3	Vitamin E	Vegetable, milk, egg yolk and vegetable oils	Sex glands	Hemolysis & sterility
4	Vitamin K	Liver, spinach cauliflower green tomatoes	Blood clotting	Haemorrhage
5	Vitamin B_1	Cereals, wheat, carrot, milk	Nervous system	Beri-beri
6	Vitamin B_2	Cereals, milk, egg, liver	Eyes, skin, blood	Slow growth, sore eyes
7	Vitamin B_4	Meat, fish, cereals, peanuts	Gum and tongue	Inflammation of the tongue and lateral margins of tongue and gums become swollen and red
8	Vitamin C	Lemon, grapes, tomatoes, oranges, apples and vegetables healing	Gums and wound	Scurvy

31. What are the various ways by which vitamin deficiency can occur? (Nov/Dec., 2016)

Vitamin deficiency is usually caused by some drugs (eg, pyridoxine-inactivating drug-isoniazid), inadequate nutrition (primary deficiency), protein-energy undernutrition, malabsorption (secondary deficiency), may be metabolic as in a defect converting tryptophan to niacin, lifestyle choices: smoking & alcoholism, or excessive loss

32. Give examples for biological s and non-steroidal contraceptives. (Nov/Dec., 2016)

Biological products, or biologics, are medical products. Biological products could be made of sugars, proteins, or nucleic acids or complex combinations of these substances, or may be living entities such as cells and tissues

- Botox: has both dermatologic and neurologic uses
- Herceptin (trastuzumab): for a certain type of breast cancer
- Vaccines, for example: the Shingles vaccine and the flu vaccines
- Humira (adalimumab), Remicade (infliximab), and Enbrel (etanercept): for rheumatoid arthritis and psoriasis
- Avonex (interferon beta-1a): Relapsing forms of MS, to slow accumulation of physical disability and decrease frequency of clinical exacerbations
- Lantus (insulin glargine): Once daily treatment for diabetes

Non-steroidal contraceptives:

- Ormeloxifene (centchroman) - selective estrogen receptor modulators - non-hormonal, non-steroidal oral contraceptive
- SAHELI the Non-Steroidal Oral Contraceptive

PART B:

1. Define and classify laxatives with examples. Write a note on the irritant and lubricant laxatives. (Dec 2013, Dec 2011, May 2011) [TB1: 534-537]

2. Write on the mechanism of action, antibacterial activity, adverse reaction and therapeutic uses of the following antibiotics. (May 2011, Dec 2012, Dec 2010) [TB1: 549-621]
   i. Tetracycline
   ii. Streptomycin
   iii. Penicillin
3. Classify analgesic drugs with examples and discuss the pharmacological actions of any two. (Dec 2013, May 2011) [TB1: 202-277; 810-840]
4. List the major endocrine glands. (ii) Elaborate on their secretions and functions. [TB1: 487-500]
5. Write short notes on : (i) Biosimilars, (ii) Biological, (iii) Vitamins, (iv) Analgesics. [TB1: 487-500; 534-537; 202-277]
6. Describe types, uses and side effects of oral contraceptives. [TB1: 476-480]

PART C:

1. Write a note on (i) laxatives [TB1: 534-537] (ii) Analgesics. [TB1: 202-277] (Nov/Dec., 2016)
2. Write a note on (i) Antibiotics [TB1: 549-621] (ii) Hormones. [TB1: 487-500] (Nov/Dec., 2016).
3. Explain about hormones and biological. [TB1: 487-500]

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 50171

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fifth Semester
Bio Technology
BT6006 – BIOPHARMACEUTICAL TECHNOLOGY
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Define drug.
2. Write short notes on biopharmaceuticals.
3. Define Pharmacokinetics.
4. What is radioactivity and give its role in drug evolution ?
5. What is Pharmaceutical formulation ?
6. Give the role of granulation in formulation.
7. What is GMP ?
8. What are vegetable drugs ?
9. Write short notes on hormonal drugs.
10. Define antibiotics with examples.

PART – B **(15×3=65 Marks)**

11. a) Explain briefly about therapeutic agents and their applications.

(OR)

b) Explain the process involved in drug development.

12. a) Write brief note on mechanism of drug action.

(OR)

b) Write a brief note on pharmacokinetics.

50171

13. a) What are the types of reaction process adapted in pharmaceutical manufacturing plants ?

(OR)

b) What are requirements in bulk drug manufacturing ?

14. a) What are the analytical methods and test used in drug manufacturing ?

(OR)

b) Write a detail note on tablet manufacturing process.

15. a) What are the vitamins used as therapeutics ?

(OR)

b) What are contraceptives ? Mention the various types of contraceptives used.

PART – C **(1×15=15 Marks)**

16. a) Schematically explain a drug manufacturing process and discuss the analytical methods used in drug manufacturing.

(OR)

b) Explain the importance and applications of biopharmaceutical technology in the field of Biotechnology.

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Reg. No. :

Question Paper Code : 80146

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Bio Technology

BT 6006 — BIOPHARMACEUTICAL TECHNOLOGY

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define pharmacoeconomics.
2. Comment on SWOT analysis of an Indian pharmaceutical industry.
3. Define Radiopharmaceuticals.
4. Define Bioequivalence.
5. Comment on current scenario of an Indian pharmaceutical industry meant for bulk drug manufacture.
6. What is meant by API? Give few examples.
7. Give examples for topical application preparation.
8. Sort-out the mechanical properties of the plastic packaging materials.
9. What are the various ways by which vitamin deficiency can occur?
10. Give examples for biologicals and non-steroidal contraceptives.

PART B — (5 × 16 = 80 marks)

11. (a) Explain in detail about the various therapeutic agents with suitable examples. (16)

Or

(b) Write short notes on : (8 + 8)

(i) Development of a new drug.

(ii) Regulatory aspects of a pharmaceutical industry.

12. (a) Explain in detail about the physicochemical principles involved during drug metabolism. (16)

Or

(b) Write short notes on : (4 × 4)

(i) Pharmacokinetic models.

(ii) Renal and hepatic clearance of drugs.

(iii) Factors that affect distribution of a drug within the body.

(iv) Steps to minimize the risk of drug inter action.

13. (a) Explain in detail about the various types of reactions and reactors used in bulk drug manufacture. (16)

Or

(b) Explain in detail about the special requirements for the manufacture of bulk drugs. (16)

14. (a) Write short notes on :

(i) Importance of granulation and coating. (4)

(ii) Tablets manufacture using direct compression method. (4)

(iii) Manufacture of a soft gelatin capsule. (8)

Or

(b) Write short notes on : (4 × 4)

(i) Classification of liquid orals using suitable examples.

(ii) Vegetable drugs.

(iii) Ideal properties and requirements for a semisolid preparation.

(iv) Comment on basic principles of GMP.

15. (a) Write short notes on : (8 + 8)

(i) Laxatives.

(ii) Analgesics.

Or

(b) Write short notes on : (8 + 8)

(i) Antibiotics.

(ii) Hormones.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 27074

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fifth Semester

Biotechnology

BT 6006 – BIOPHARMACEUTICAL TECHNOLOGY

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a generic drug?
2. What is a therapeutic agent?
3. Define pharmacokinetics.
4. What is a ligand?
5. What is milling?
6. What is Granulation in pharmaceutical manufacturing?
7. What is GMP?
8. What is a capsule?
9. What is an analgesic?
10. What are laxatives?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the process involved in drug development.

Or

(b) Explain briefly about therapeutic agents and their applications?

12. (a) Describe pharmacokinetics by citing examples.

Or

(b) Discuss the mechanism of drug action by citing examples.

13. (a) What are the requirements in bulk drug manufacture?

Or

(b) What are the types of reaction process needed in the pharmaceutical manufacturing plants.

14. (a) Discuss tablet manufacturing process and its applications.

Or

(b) What are the analytical methods and test used in drug manufacture?

15. (a) Describe in detail vitamins that are used as therapeutics and its use in pharmaceutics.

Or

(b) What are contraceptives? Describe the various types of contraceptives used.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 91149

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Seventh Semester

Biotechnology

BT 2040/BT 713/10155 BTE 51 — BIOPHARMACEUTICAL TECHNOLOGY

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the types of therapeutic agents?

2. Name one agency and its role in regulating the drug industry.

3. Define mutasynthesis and how it is used for the design of novel drugs.

4. What is the mechanism of action of aspirin?

5. What is 'systems approach' for dose response?

6. Define process validation.

7. List any two topical applications.

8. Mention any two methods of fertility control.

9. What is GMP?

10. Differentiate between pharmacodynamics and pharmacokinetics.

PART B — (5 × 16 = 80 marks)

11. (a) Using graphical representation show the relationship between:

(i) Plasma to tissue concentration. (4)

(ii) Drug concentration and drug effect at the receptor site. (4)

(iii) Tolerance to drug effect with repeated dosing. (4)

(iv) Relationship of drug concentration at the receptor site to percent maximum effect. (4)

Or

(b) Discuss the mechanism of action of drugs.

12. (a) Elaborate on the different types of therapeutic agents and their applications.

Or

(b) Discuss the various standard operating procedures in drug manufacture.

13. (a) What are the various mechanisms that should be in place for ensuring quality assurance in drug manufacture?

Or

(b) Write short notes on :

(i) Tablet compression. (4)

(ii) Granulation and drying. (4)

(iii) Tablet coating. (4)

(iv) Powder blending. (4)

14. (a) Give a flowchart and explain the manufacturing process in the pharma industry.

Or

(b) Write short notes on :

(i) Biosimilars (4)

(ii) Biological (4)

(iii) Vitamins (4)

(iv) Analgesics. (4)

15. (a) (i) List the major endocrine glands. (4)

(ii) Elaborate on their secretions and functions. (12)

Or

(b) Discuss the applications of radioactive isotopes in biopharmaceutical technology.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 31147

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Seventh Semester

Biotechnology

BT 2040/BT 713/10155 BTE 51 — BIOPHARMACEUTICAL TECHNOLOGY

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define bioequivalence and bioavailability.
2. What is first pass effect?
3. Mention any two differences between lotion and liniment.
4. Write the application of the followings: Mandl's Paint & Milk of magnesia.
5. What is Placebo effect?
6. Are antibiotics a suitable treatment for the common cold? Justify.
7. What is phase inversion?
8. Give the meaning of the followings:- Vasectomy & Expectorant
9. What are the risks of using hormones?
10. What do you mean by natural birth control method?

PART B — (5 × 16 = 80 marks)

11. (a) Discuss the efficacy and safety regulation in pharmaceutical industry.(16)

Or

(b) What are therapeutic agents? Describe the production of any one recombinant therapeutic agent. (16)

12. (a) Discuss in detail about various factors affecting ADME process. (16)

Or

(b) Discuss drug kinetics in detail. (16)

13. (a) Write briefly about

(i) Soft gelatin capsules (8)

(ii) Tablet coating. (8)

Or

(b) Comment about basic requirements for manufacture of bulk drugs. (16)

14. (a) (i) Write a note on plant based anti-cancer drugs. (8)

(ii) Describe the formula, preparation and applications of Unna's paste. (8)

Or

(b) Give detailed information about modern packing techniques for the pharmaceutical products. (16)

15. (a) Define and classify laxatives with examples. Write a note on the irritant and lubricant laxatives. (16)

Or

(b) Classify analgesic drugs with examples and discuss the pharmacological actions of any two. (16)

Reg. No. :

Question Paper Code : 13156

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2012.

Seventh Semester

Biotechnology

BT 1010 — BIOPHARMACEUTICAL TECHNOLOGY

(Regulation 2004/2007)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the various sources of drugs?
2. What is ICH?
3. What are the various routes by which a drug can be administered?
4. How radioactivity is used in determining pharmacokinetics of a drug?
5. What is synthetic reaction? Give an example.
6. What are the advantages of capsules over tablets?
7. Differentiate ointments from creams.
8. What is the importance of enteric coating of tablets? Name atleast two enter coating materials used in tablet coating.
9. What are macrolide group of antibiotics? Give two examples.
10. Give examples of :
    (a) a bulk laxative.
    (b) preservative for a parenteral.
    (c) suspending agent.
    (d) an enteric coating material.

PART B — (5 × 16 = 80 marks)

(a) Write briefly about – pharmacopoeia, cGMP, use of HPLC in drug analysis. (5 + 5 + 6)

Or

(b) Write briefly about – Quality assurance, The Drug and Cosmetic Act 1940, spectrophotometric analysis of drugs. (5 + 5 + 6)

(a) (i) Calculate Vd if the dose of drug administered is 500 mg and the plasma concentration of the drug is 100 mcg. (3)

(ii) What is the half life of a drug given that its Kel is 0.15/hr. (3)

(iii) Write briefly about Drug excretion. Bioequivalence. (5 + 5)

Or

(b) (i) Define the following terms : Clearance, Volume of distribution, Polymorphism. (2 + 2 + 2)

(ii) Describe phase 1 and phase 2 biotransformation. (5 + 5)

(a) (i) Write a note on the special requirements for bulk drug manufacture. (8)

(ii) Describe the steps involved in the manufacturing of tablets by wet granulation. (8)

Or

(b) (i) What are the different components of capsule-filling machine? Explain the performance of capsule- filling machine. (12)

(ii) What are the common defects of film coated tablets? (4)

(a) (i) How do table presses work? (4)

(ii) Discuss the formulation of any two topical applications. (12)

Or

(b) (i) Describe the packaging techniques in drug manufacture. (8)

(ii) What is the impact of Total Quality Management in pharmaceutical industry? (8)

15. (a) Write on the mechanism of action, antibacterial activity, adverse reactions and therapeutic uses of the following antibiotics.

(i) Streptomycin (8)

(ii) Tetracyclines. (8)

Or

(b) Discuss Insulin under the following heads.

(i) Physiological actions (6)

(ii) Pharmacological actions (6)

(iii) Therapeutic uses. (4)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 66175

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2011.

Seventh Semester

Biotechnology

BT 1010 — BIO PHARMACEUTICAL TECHNOLOGY

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the significance of serendipity in drug discovery?

2. What is the need for regulating pharmaceutical manufacturing?

3. Define bioavailability.

4. What is meant by 'First-pass' metabolism?

5. "Highly lipophilic drugs will have low apparent volume of distribution"- Validate and justify this statement?

6. Why are suspensions not given through intravenous route?

7. What is meant by depot action?

8. What are liposomes?

9. What are proton-pump inhibitors and where they are useful?

10. Explain any ONE receptor-mediated drug action. With a suitable example.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Briefly explain the drug development process? (8)

(ii) What are the important good manufacturing practices to be followed in an injection manufacturing unit? (4)

(iii) What are the main implications of Patent law in Indian Pharmaceutical industry? (4)

Or

(b) (i) Give a brief outline of the historical development of pharmaceutical industry. (8)

(ii) What are the important good manufacturing practices to be followed in a pharmaceutical manufacturing unit? (8)

12. (a) (i) Explain the various factors which influences the absorption and distribution of drugs in the body. (8)

(ii) Explain with suitable examples, how genetic variations may affect drug action. (8)

Or

(b) (i) Explain the various factors which influences the metabolism and elimination of drugs. (8)

(ii) Discuss mechanisms of drug action. (8)

13. (a) Describe the various special processes used in bulk drug manufacturing.

Or

(b) Explain the various methods used for preservation of drugs.

14. (a) (i) Explain the manufacturing process for compressed tablets. With a neat labeled sketch. (10)

(ii) Explain the various applications and advantages of tablet coating. (6)

Or

(b) (i) Explain in detail, the following analytical tests

(1) Sterility test of injection

(2) Disintegration test for tablet. (8)

(ii) Explain the manufacturing process for any ONE topical preparation. (4)

(iii) What are the special considerations to be taken for manufacture of vegetable drugs? (4)

(a) (i) Give the biological role and deficiency diseases of any FOUR vitamins. (12)

(ii) What is the mechanism of action of penicillin and tetracycline? (4)

Or

(b) (i) What are analgesics and explain the mechanism of action of any TWO analgesics? (8)

(ii) What is the mechanism of action of oral contraceptive pills? (4)

(iii) What are laxatives and what are the different mechanisms by which they act? (4)

Reg. No. :

Question Paper Code : 55198

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2011.

Seventh Semester

Biotechnology

BT 2040 — BIOPHARMACEUTICAL TECHNOLOGY

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

Briefly write on the following :

1. Drug-drug interactions.
2. Volume of distribution.
3. Thermodynamics.
4. Osmotic pressure.
5. Endotoxin test.
6. Wet granulation.
7. Capsule preparation.
8. Stability test.
9. Tissue plasminogen activator.
10. Pharmacophore.

PART B — (5 × 16 = 80 marks)

11. (a) Explain the role of recombinant proteins as pharmaceutical drugs.

Or

(b) Describe regulatory aspects of drug manufacturing.

12. (a) Differentiate between phase-I and phase-II drug metabolism. Give all their features.

Or

(b) Give a detailed account of pharmacokinetics of peptides and proteins.

13. (a) What are sterility tests? Discuss in detail.

Or

(b) Give a detailed account of the types of reactors used in pharmaceutical industries.

14. (a) Explain in detail the preparation of suspension and tablets in pharmaceutical industry.

Or

(b) Describe formulation of biotech products.

15. (a) Write a detailed note on DNA vaccine construction.

Or

(b) Discuss in detail about the laxatives.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 31095

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2010.

Seventh Semester

Biotechnology

BT 1010 — BIOPHARMACEUTICAL TECHNOLOGY

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the various sources of drugs?
2. What is ICH?
3. List out the drugs used in hyperthyroidism.
4. What is absolute and relative bioavailability?
5. Differentiate flocculated suspension from deflocculated suspension.
6. Differentiate between w/o and o/w emulsions.
7. What are the advantages of suppositories as dosage forms?
8. What are osmotic laxatives? Give examples.
9. What is the effect of gastric emptying rate on bioavailability?
10. Give an example of
    (a) A lubricant
    (b) A preservative used in solutions
    (c) An enteric coating material
    (d) Surfactant.

PART B — (5 × 16 = 80 marks)

11. (a) Write brief on :

(i) Indian drugs and cosmetics act.

(ii) Pharmacopoeia.

Or

(b) Write briefly on :

(i) cGMP

(ii) Clinical Trials.

12. (a) (i) Calculate Vd if the dose of drug administered is 500mg and the plasma concentration of the drug is 100mcg. (3)

(ii) What is the half life of a drug given that its Kel is 0.15/hr. (3)

(iii) Write briefly about – Drug excretion, Bioequivalence. (5 + 5)

Or

(b) (i) Define the following terms : Clearance, volume of distribution, polymorphism. (2 + 2 + 2)

(ii) Describe phase 1 and phase 2 biotransformation. (5 + 5)

13. (a) (i) What is the mechanism of action of - erythromycin, ciprofloxacin? (4 + 4)

(ii) What are the side effects of tetracycline, chloramphenicol? (4 + 4)

Or

(b) Write about penicillins based on the following :

(i) Classify with examples. (4)

(ii) Mechanism of action. (4)

(iii) Spectrum of action. (4)

(iv) Side effects. (4)

14. (a) Write about tablets under the following heads.

(i) Wet granulation. (4)

(ii) Tablet compression. (6)

(iii) Quality control. (6)

Or

(b) Write about sustained release preparations under the following heads

(i) Conventional/controlled release. (4)

(ii) Advantages of controlled release. (6)

(iii) Any one method of achieving controlled release. (6)

15. (a) Write briefly about :

(i) Tablet Coating. (5)

(ii) NSAIDs.. (6)

(iii) Ointments. (5)

Or

(b) Write briefly about :

(i) Preservatives used in parenterals.

(ii) Soft gelatin capsules.

(iii) Compartment models.

15. (a) Discuss paracetamol under the following heads

(i) Mechanism of action. (4)

(ii) Therapeutic effects. (4)

(iii) Adverse effects. (4)

(iv) Preparations and dosage. (4)

Or

(b) (i) Classify antibiotics based on their antibacterial activity. (10)

(ii) What are oral contraceptives? Write their mechanism of action with examples. (6)

Reg. No. : | | | | | | | | | | | |

Question Paper Code : Q 2822

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Seventh Semester

Bio—Technology

BT 1010 — BIOPHARMACEUTICAL TECHNOLOGY

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a spurious drug?

2. What does pharmaco-economics deal with?

3. Define pharmacokinetics.

4. How is radioactivity used in determining pharmacokinetics of a drug?

5. Write the reaction involved in synthesis of Aspirin.

6. What is a bulk drug? Give at least two examples.

7. What is the importance of tablet coating?

8. How is pyrogen test carried out for sterile drug dosages?

9. What are laxatives? Give examples for bulk laxatives.

10. List out the antibiotics used in cancer chemoth

PART B — (5 × 16 = 80 marks)

11. (a) Describe the steps in developing a new drug. (16)

Or

(b) (i) Outline the requirements of a pharmaceutical industry and discuss. (8)

(ii) Explain the regulatory aspects of a pharma industry. (8)

12. (a) (i) Discuss various mechanisms of drug action. (10)

(ii) What is first pass effect of metabolism? Explain. (6)

Or

(b) What are the factors that affect drug absorption? Explain. (16)

13. (a) (i) Explain the special requirements for bulk drug manufacturing. (10)

(ii) Write down the flow chart of any bulk drug manufacturing. (6)

Or

(b) (i) Differentiate and explain the dry and wet granulation methods of tablet manufacturing. (10)

(ii) Describe the compression cycle of a tablet press. (6)

14. (a) (i) What is the significance of tablet coating? Describe the steps of sugar coating of tablets (10)

(ii) Give the formulation of film coating solution and discuss. (6)

Or

(b) (i) Write down the formulation of hard capsules and explain. (8)

(ii) Explain the analytical methods used in capsule preparation. (8)

15. (a) Discuss paracetamol under the following heads

(i) Mechanism of action. (4)

(ii) Therapeutic effects. (4)

(iii) Adverse effects. (4)

(iv) Preparations and dosage. (4)

Or

(b) (i) Classify antibiotics based on their antibacterial activity. (10)

(ii) What are oral contraceptives? Write their mechanism of action with examples. (6)

Reg. No. : | | | | | | | | | | | |

R 3108

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Seventh Semester

Bio Technology

BT 1010 — BIOPHARMACEUTICAL TECHNOLOGY

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define a drug.
2. What are the stages of clinical trials in developing a drug?
3. What are the various routes by which a drug can be administered?
4. How radioactivity is used in determining pharmacokinetics of a drug?
5. Write the reaction involved in synthesis of Aspirin.
6. What is bulk drug? Give an example.
7. What is the use of cam tracks in tablet presses?
8. What is cracking of emulsions?
9. What are macrolide group of antibiotics? Give two examples.
10. Mention the steps involved in thyroid hormone synthesis.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the role of FDA in drug development programme. (8)

(ii) List out the important therapeutic categories with examples. (8)

Or

(b) Describe the following economic evaluation methods to measure the value of any new health programme.

(i) Cost- Benefit analysis (8)

(ii) Cost- Effective analysis. (8)

12. (a) (i) Explain the factors that affect the rate of absorption of drugs. (12)

(ii) Differentiate between prodrug and active drug. (4)

Or

(b) What is the objective of pharmacokinetic models? Discuss the compartmental models. (16)

13. (a) (i) Write a note on the special requirements for bulk drug manufacture. (8)

(ii) Describe the steps involved in the manufacturing of tablets by wet granulation. (8)

Or

(b) (i) What are the different components of capsule-filling machine? Explain the performance of capsule- filling machine. (12)

(ii) What are the common defects of film coated tablets? (4)

14. (a) Write an account on the plastic materials used in the manufacturing of containers for the packaging of pharmaceutical products. (16)

Or

(b) What are the various types of ointment bases used in the formulation of ointments? Explain their properties. (16)

15. (a) Explain in detail about physiological role, pharmacological actions and therapeutic uses of insulin. (16)

Or

(b) Write the mechanism of action, antibacterial activity, adverse effects and therapeutic uses of streptomycin. (16)
