Syllabus for Direct Recruitment of post of Drug control Officer, Haryana

1. **Capsules:** Hard and soft gelatin capsules, Advantages, applications, formulation and evaluation.
2. **Tablets:** Types of tablets, granulation techniques, formulation of tablets, quality control tests, coating of tablets.
3. **Parenterals:** Formulation and quality control of parenterals.
4. **Liquid orals**: Formulation and manufacturing considerations of syrups, elixirs, gargles and mouthwashes.
5. **Biphasic liquids:** Emulsions: Advantages, Classification, Appearance and identification, Emulsifying agents, Physical instability- Markers, Evaluation of physical stability of emulsions; Suspensions: Advantages, Classification of suspensions, Physical stability, theory of sedimentation, surfactants.
6. **Semisolid dosage forms:** Preparation of ointments, pastes, creams and gels Excipients used in semisolid dosage forms Evaluation of semi solid dosage forms.
7. **Ophthalmic preparations:** Formulation of eye drops, eye ointments and eye lotions evaluation of ophthalmic preparations.
8. **Cosmetics:** Formulation and preparation of following cosmetic preparations: lipsticks, shampoos, cold cream, vanishing cream and sunscreens.
9. **Pharmaceutical aerosols:** Propellants, containers, valves, formulation of aerosols, evaluation of aerosols.
10. **Packaging technology:** Materials used for packaging of pharmaceutical products, Stability aspects of packaging materials.
11. **Forensic Pharmacy:** The Drugs and Cosmetics Act, 1940 and Rules, 1945; The Pharmacy Act, 1948; The Medicinal and Toilet Preparations Act, 1955; The Narcotic Drugs and Psychotropic Substances Act-1985.
12. **Biopharmaceutics:** Absorption, Distribution, Metabolism and Excretion of drugs; Bioavailability: absolute and relative bioavailability, measurement of bioavailability, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.
13. **Quality control and quality assurance aspects of pharmaceutical industries:** GMP, Total quality management (TQM), Good Laboratory Practices, Document maintenance in pharmaceutical industries.

14. **Indian regulatory requirements:** Central Drugs Standard Control Organization (CDSCC) and State Licensing Authority.
15. **Pharmaceutical Microbiology:** Different methods of sterilization, classification and mode of action of disinfectants, Sources of contamination in an aseptic area.
16. **Physical Pharmacy:** Rheology - Newtonian systems, non-Newtonian systems, Thixotropy, determination of viscosity; Micromeretics- Particle size, methods for determining particle size, Flow properties; Drug stability- Factors influencing the degradation of pharmaceutical products. Accelerated stability testing.
17. **Pharmaceutical Engineering:** Filtration, factors influencing filtration, different types of filters, Centrifugation: Principle and applications of centrifugation, different types of centrifuge machines. Materials of pharmaceutical plant construction, Corrosion and its prevention.
18. **Stereo isomerism:** Optical isomerism Optical activity, enantiomerism, diastereoisomerism, meso compounds, Elements of symmetry, chiral and chiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers, Reactions of chiral molecules, Raceme modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute.
19. **Heterocyclic compounds:** Nomenclature and classification, Synthesis, reactions and medicinal uses of following compounds/derivatives, Pyrrole, Furan, and Thiophene, Relative arromaticity and reactivity of Pyrrole, Furan and Thiophene.
20. **Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit tests for Chloride, Sulphate, lron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate.
21. **Radiopharmaceuticals:** Radio activity, Measurement of radioactivity, half life, radio isotopes and study and radio isotopes - Sodium iodide l-131, Storage conditions, precaitions & pharmaceutical application of radioactive substances.
22. **Carbohydrates metabolism:** Glycolsis - Pathway, energetic and significance, Citric acid cycle- Pathway, energetic and significance, HMP shunt and. its significance; Glucose-6-Phosphate dehydrogenate (G6PD) deficiency', Glycogen metabolism Pathways and glycogen storage diseases (GSD) GluconeogenesisPathvoay and its significance, Hormonal "regulation of blood glucose level and Diabetes mellitus, Biological oxidation: Electron transport chain (EI'C) and its mechanism.Oxidative

phosphorylation & its mechanism and substrate level phosprorylation, Inhibitors ETC and oxidative phosphorylation/Uncouples.

23. **Lipid metabolism:** B-Oxidation of saturated fatty acid (Palmitic acid), Formation and utilization of ketone bodies; ketoacidosis, De novo synthesis of fatty acids (Palmitic acid), Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D, Disorders of lipid metabolism; Hypercholesterolemia, atherosclerosis, fatty liver and obesity.
24. **Amino acid metabolism:** General reactions of amino acid metabolism Transamination, deamination & decarboxylation, urea cycle and its disorders Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia), Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenalin, adrenaline catabolism of heme; hyperbilirubinemia and jaundice.
25. **Qualitative analysis:** Carbohydrates, Proteins, reducing sugars (DNSA method) and proteins (Biuret method), blood creatinine, blood sugar, serum total cholesterol, abnormal constituents of urine.
26. **Determination of oil values;** Acid value, Saponification value, lodine value etc.
27. **Assay of drugs:** Chloroquine, Metronidazole, Dapsone, Chlorpheniramine maleate, Benzyl penicillin.
28. **UV Visible spectrcrscopy:** Electronic transitions, chromoohores, auxochromes, spectial shifts, solvent effect on absorption spectra, Beer and Larnbert's law, Derivation and deviations, instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors - Photo tube, Photomultiplier tube, photo voltaic cell, Silicon Photoflood. Applications - Spectrophotometric titrations, Single compliment and multi component analysis
29. **lR spectroscopy:** introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations., instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications.
30. **High performance tiquid chromatography (HPLC):** introduction, theory, instrumentation, advantages and applications.
31. **Drug estimation:** Estimation, of –dextrose by colorirmetry; Estimation of sulfanilamide by colorimetric; Simultaneous estimation of ibuprofen and paracetemol by UV spectroscopy; Assay of paracetamol by UV- Spectrophotometry

32. **Pharmacodynamics;** Mechanism of drug action, Receptors, classification and drug-receptor interactions, combined effects of drugs, factors modifying drug actions, drug addiction, drug abuse, tolerance and dependence.
33. **Clinical Pharmacokinetics:** Principles of basic and clinical pharrnracokinetiis Pharn-racogenetics. Drscovery and development of new drugs-Preclinical and clinical studies.
34. **Classification, physicochemical properties, pharmacology, mode of action, structure activity relationships, therapeutic uses, side effects & drug resistance (wherever applicable) should be covered in respective classes of drugs;** Autonomic Nervous System- Synrpathominretics/lytics, Parasympathomimetics/ lytics, , Neuromuscular transmission, Neuromuscular blockers; Central Nervous System: - Anti-Parkinsonian Anti-Epileptics, Sedatives/ hypnotics, Nootropics. Narcotic analgesics, Cardiovascular:- Antihypertensives, Anti-anginal agents Anti-arrhythmic drugs. Drugs used in congestive heart failure. Antihyperlipidemic drugs. Drugs used in the therapy of shock, Diuretics; Antimicrobial:- Penicillins & beta-lactamase inhibitors, Cephalosporin's, Amino glycosides, Antibacterial sulpha drugs; Quinolone Antibacterial; Antimycobacterial drugs, Antiviral Drugs; Antifungal agents; Anthelmintic agents; Chemotherapy of) tuberculosis, leprosy, AIDS, worm infections, urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy Endocrine:- insulin, oral Hypoglycemics, corticosteroids, Thyroid/Ant thyroids, Estrogens & progesterone; General anesthetics, Local anesthetic agents; Antiseptics, disinfectants, & astringents.
35. **Blood:** Composition and functions of brood, RBC, WBC, platelets, Homeostasis, blood groups, mechanism of clotting. Introduction to disorders of the blood. Haematinics, anticoagulants and haemostatic agents. Fibrinolytics and antiptatalet drugs. Blood and plasma volume expanders.
36. **Principles of toxicology:** Definition of poison. General principles of treatment of Poisoning. Treatment of poisoning due to Heavy metals (lead, mercury and arsenic), insecticides, barbiturates, oganophosphosphorus opioids and other addict forming drugs study of acute, sub acute and chronic toxicity as per OECD guidelines; their significance Definition and basic knowledge of carcinogenicity, teratogenicity and mutagenicity.
37. **Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis,Gout.

38. **Pathphysiology of common diseases:** Parkinsonism. Schizophrenia, Depression, stroke (ischemic and hemorrhage), Hypertension. Angina. Myocardial infarction, CCF. Atherosclerosis. Diabetes mellitus. Peptic ulcer and inflammatory bowel disease. Cirrhosis and alcoholic liver diseases. Acute and chronic renal failure. Asthma and chronic obstructive airway diseases.
39. **Laboratory tests for liver function tests and kidney function tests.**
40. **Disturbances of growth of cells:** General biology of tumors, differences between benign and malignant tumors. Classification of tumors, Historical diagnosis of Malignancy. Etiology and pathogenesis of cancer, invasions, metastasis, patterns of spread, of cancer. Environmental carcinogenesis.
41. **Adverse Drug Reaction (ADR):** Types of ADR, Mechanism of ADR. Drug interaction, Monitoring and reporting of ADR and its significance. Drug information services.
42. **Pharmacovigilance:** Therapeutic drug monitoring, essential drugs and rational drug usage.
43. **Age-related drug therapy:** concept of posology, drug therapy for neonates, pediatrics and geriatrics. Drugs used in pregnancy and lactation.
44. **Drug therapy:** Gastrointestinal, hepatic, renal, cardiovascular and respiratory disorders.
45. **Quality control of Drugs of Natural Origin:** Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.
46. **Introduction to secondary metabolites:** Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins.
47. **Proteins and Enzymes:** Gelatin, casein, proteolytic enzymes (Papain, serratiopeptidase, urokinase, streptokinase, pepsin).
48. **Nutraceuticals:** General aspects, Health benefits and role of Nutraceuticals in aliments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.
49. **Herbal**-Drug and Herb-Food Interactions: General introduction to interaction and
50. **Herbal drugs and their possible side effects and interactions:** Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

51. **Herbal Cosmetics:** Sources and description of raw materials of herbal origin used via colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.
52. **Herbal excipients:** Significance, colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.
53. **Herbal formulations:** Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes.
54. **Evaluation of Drugs:** WHO & ICH guidelines for the assessment of herbal drugs, Stability testing of herbal drugs.
55. **Patenting and Regulatory requirements of natural products: Patents & IPR.**
56. **Regulatory Issues:** Regulations in India, Regulation of manufacture of ASU drugs Schedule Z of Drugs & Cosmetics Act for ASU drugs.
57. **Good Manufacturing Practice of Indian systems of medicine:** Components of GMP (Schedule-T) and its objectives.
58. **Crude drugs:** Biological source, chief chemical constituents, chemical tests and importance of crude drugs belonging to: **Volatile oils:** Black pepper, menthe, cardamom, cinnamon, coriander, caraway, dill, clove, eucalyptus, sandal wood; **Alkaloids:** Rauwolfia, Datura, Coffee, Opium, Ephedra, Cinchona, Noxvomica, Kurchi, Epedra : **Tannins:** Pale catechu, black catechu, Terminalia chebula, Terminalia arjuna; **Glycosides:** Seena, Aloe, Liquorice, Digitalis, Dioscorea, Ginseng, Traditional Drugs: Brahmi, Tulsi, Bael, Ashwagadha.
59. **Biogenetic pathways:** Formation of primary and secondary metabolites, Study of Shikimic acid pathway, Mevalonate acetate pathway, Melonate pathway.