SOLAPUR UNIVERSITY, SOLAPUR.

SYLLABUS

FOR

Five Year Integrated M. Tech. Course in Cosmetic Technology

(Semester I and II)

Choice Based Credit System (CBCS)

WITH EFFECT FROM ACADEMIC YEAR 2018-19

SOLAPUR UNIVERSITY, SOLAPUR

SCHOOL OF TECHNOLOGY

Syllabi of Five Year Integrated M. Tech. Course in Cosmetic Technology (Choice Based Credit System)

1) **Title of the course:** Integrated M. Tech. (Cosmetic Technology).
2) **Duration of course**: Five years.
3) **Pattern:** Semester and Credit system.
4) **Eligibility:** For Five Year Integrated M. Tech. Course in Cosmetic Technology following candidates are eligible.
   - H.S.C. with Biology as one of the subjects.

5) Strength of the Students: 30

Five Year Integrated M. Tech. Course in Cosmetic Technology consists of 250 credits.

Five Year Integrated M. Tech. Course in Cosmetic Technology Course

Semester	No. of Papers/ Practicals / Seminar	Marks	Credits
Semester I			
• Theory Papers	05	500	20
• Practical Paper	02	100	04
• Seminar/Tutorial/Home Assignment /Field Tour/ Industrial Visit	01	25	01
Semester II			
• Theory Papers	05	500	20
• Practical Paper	02	100	04
• Seminar/ Tutorial/Home Assignment /Field Tour/ Industrial Visit	01	25	01
Total marks and credits for Course		**1250**	**50**

First Year syllabus **(according to the Semester Pattern Examination) to be effective from the Academic Year 2018-19**

Semester	Code	Title of the Paper	Semester Examination			L	T	P	Credits
			Theory	IA	Total				
Sem-I		**Hard Core**							
	HCT1.1	Cosmetic Chemistry - I	70	30	100	4	--	--	4
	HCT1.2	Anatomy & Physiology - I	70	30	100	4	--	--	4
	HCT1.3	Fundamental Chemistry -I	70	30	100	4	--	--	4
	HCT1.4	Natural Cosmetic Agents-I	70	30	100	4	--	--	4
		Soft Core (Any one)							
	SCT1.1	Elementary Mathematics	70	30	100	4	--	--	4
	SCT1.2	Elementary Statistics	70	30	100	4	--	--	4
		Seminar/Tutorial/ Industrial Visit/ Field Tour	---	25	25	--	1	--	1
	HCP1.1	**Practical-I**	35	15	50	--	--	06	2
	HCP1.1	**Practical-II**	35	15	50	--	--	06	2
	Total for Semester-I		**420**	**205**	**625**	**--**	**--**	**--**	**25**
Sem-II		**Hard Core**							
	HCT2.1	Cosmetic Chemistry - II	70	30	100	4	--	--	4
	HCT2.2	Anatomy & Physiology - II	70	30	100	4	--	--	4
	HCT2.3	Fundamental Chemistry -II	70	30	100	4	--	--	4
	HCT2.4	Natural Cosmetic Agents - II	70	30	100	4	--	--	4
		Soft Core (Any one)							
	SCT2.1	English Communication Skills	70	30	100	4	--	--	4
	SCT2.2	Analytical Chemistry	70	30	100	4	--	--	4
		Seminar/Tutorial/ Industrial Visit/ Field Tour	---	25	25	--	1	--	1
	HCP2.1	**Practical-III**	35	15	50	--	--	06	2
	HCP2.2	**Practical-IV**	35	15	50	--	--	06	2
	Total for Semester-II		**420**	**205**	**625**	**--**	**--**	**--**	**25**

L=Lecture T=Tutorials P=Practical IA=Internal Assessment
HCT=Hard Core Theory SCT=Soft Core Theory
HCP=Hard Core Practical

Evaluation Scheme:

Each theory paper will have 100 marks out of which 70 marks will be for Term End examination and 30 marks for Internal Assessment. Each practical paper will have 50 marks out of which 35 marks will be for Term End examination and 15 marks for Internal Assessment. The candidate has to appear for internal evaluation of 30 marks and external evaluation (University Examination) of 70 marks for each **theory** paper. The candidate also has to appear for internal evaluation of 15 marks and external evaluation (University Examination) of 35 marks for each **practical** paper.

Internal Evaluation:

- In case of theory papers internal examinations will be conducted by school.
- In case of practical paper 05 marks shall be for day-to-day journal and internal examination of 10 marks will be conducted by the school.

External Evaluation (End of Term University Examination):

I) Nature of Theory question paper:

Q.1 Multiple Choice Questions 14
Q.2 A) Answer the following (Any Four) 08
1. 02
2. 02
3. 02
4. 02
5. 02

B) Write Notes on (Any Two) 06
1. 03
2. 03
3. 03

Q.3 A) Answer the following (Any two) 08
1. 04
2. 04
3. 04

B) Answer the following (Any One) 06
1. 06
2. 06

Q.4 A) Answer the following (Any Two) 10
1. 05
2. 05
3. 05

B) Answer the following (Any One) 04
1. 04
2. 04

Q.5 Answer the following (Any two) 14
1. 07
2. 07
3. 07

II) Nature of Practical Question paper: Practical examination will be of 3 hours duration carrying 35 marks. There shall be 5 questions each of 10 marks, of which student has to attempt any 3 questions. VIVA will be for 05 marks.

Paper No. I
Paper Code: HCT1.1

COSMETIC CHEMISTRY – I

Unit-1: Sources of impurities and their control in Cosmetic raw materials. Limit tests, limit test of chlorides, sulfates, lead, arsenic and heavy metals. **(15 L)**

Unit-2: Acid base theory, concept of pH, Buffer solutions, Acid Base titrations, Standard solutions, Acid base Indicators, Theory of Acid base titration curves. **(15 L)**

Unit-3: Non-aq. titration of weak acid and weak bases – indicators uses and application. (**15 L)**

Unit-4: Theoretical basis of qualitative inorganic analysis. **(15 L)**

Reference Books:

1. Text book of Practical Pharmaceutical Chemistry by Beckette and Stentake.
2. Quantitative Inorganic analysis be I. Vogal.
3. Cosmetic Chemistry -1 by Dr. Sheela Kulkarni

Paper No. II
Paper Code: HCT1.2

ANATOMY & PHYSIOLOGY – I

Unit-1: Cell Structure & Elementary tissues of body-

i) Epithelial Tissues ii) Connective Tissues

iii) Nervous Tissues iv) Muscular Tissues. **(15 L)**

Unit-2: i) Detail knowledge of structure and function of Skin

ii) Skin appendages –

1 Sweat gland & Sebaceous gland

2 Hair

3 Nails

iii) Eye

iv) Tooth **(15 L)**

Unit-3: a) Keratinisation

b) Colour and Pigmentation

c) Baby skin and adult skin. **(15 L)**

Unit-4: Endocrine glands and Hormones. Temperature conservation – Temperature regulation and heat balance of body. **(15 L)**

Reference Books:

1. Best and Taylor – The Living Body.
2. Kimber and Gray – Human Physiology and Anatomy
3. Fransis – Introduction to Human Anaomy.
4. Pharmacology and Pharmacotherapeutics By R.S. Satoskar and S. Bhandarkar
5. Ross & Wilson – Anotomy and physiology in health and illness – Ross & Wilson
6. Anatomy and physiology for Nurse – Windwood R.S.

Paper No. III

Paper Code: HCT1.3

FUNDAMENTAL CHEMISTRY -I

Unit-1: Hydrocarbons (Saturated) Alkanes, Terahedral natural of carbon, SP3 hybridisation, isomerism, liquid paraffin, hard paraffin, preparation and reaction of cyclolkanes. Hydrocarbon (Unsaturated) Alkenes SP2 Hybridisation, Markonikoff Rules, Cis-trans Isomerism, Dienes: preparation properties chemical reaction classification of dienes Alkynes SP – hybridization, preparation, properties, reactions of acetylene. **(15 L)**

Unit-2: Estimation and Quantitative Analysis : Estimation of elements and their principals, Determination of equivalent weight of acids and bases. Determination of empirical and molecular formula of acids and bases.

Ethers- Definition, preparation, properties and reaction of ethers, diethyl ether, an aesthetic ether, thioether and vinyl ethers. Aldehyde & Ketones- Definition and nomenclature, preparation, properties and chemical reaction of aldehyde and ketones. Carboxylic Acid – classification, structure, preparation and chemical reaction of monocharboxylic acid. Optical isomerism. **(15 L)**

Unit-3: Physical Properties and properties of liquids molecules.

i) Surface tension ii) Viscosity iii) Intermolecular forces and it's impact on states of matter, physical properties and chemical constitution, parachor, dipole moment. **(15 L)**

Unit-4: Osmotic pressure, osmosis, semi – permeable membrane, osmotic pressure measurement, laws of osmotic pressure Molecular wt. Calculations. **(15 L)**

Reference Books:

1. Text Book of Organic Chemistry by Morrison and Boyd.
2. L.M. Atherdon, Bentley and Driver's Text Books of Pharmaceutical Chemistry. Oxford University Press, London.
3. Text book of Organic Chemistry by Bahl & Bahl.
4. A.N. Martin – Physical Pharmacy
5. Glasstone – Elements of Physical Chemistry
6. A. J. Med – Physical Chemistry
7. Vogel- Quantitative Inorganic Analysis.
8. Bahl and Tuli : Essentials of Physical Chemistry

Paper No. IV
Paper Code: HCT1.4

NATURAL COSMETIC AGENTS – I

Unit-1: History, development and role of natural product in cosmetic & medicine. Different systems of classification of drugs of natural origin their merits & demerits **(15 L)**

Unit-2: Herbs description and morphology of organized and unorganized herbs. Organized herbs root, stem, leaf and fruit and seed. Unorganized herbs – mucilage, latex and extracts. **(15 L)**

Unit-3: Carbohydrate- Definition, classification and general identification tests.

study of following carbohydrates used in cosmetics with respect to their source, chemical constituents and uses-i) Starches – Wheat, maize, rice, potato ii) Gums- Acacia, gaur-gum. pectin, agar, and cellulose **(15 L)**

Unit-4: Lipids-

a) Definition, classification and general identification tests.

b) i) oils – castor, linseed, olive, sesame, coconut, arachise oil

ii) fat and waxes – kokum butter, lanoline, beeswax, spermaceti, carnauba wax, candellila wax, shea butter.space. **(15 L)**

Reference Books:

1. Text book of Pharmacognosy – Trease and Evan's
2. Pharmacognosy – By Claus and Tayler.
3. Text Book of Pharmacognosy – T. E. Wallis.
4. Materia Medica – By Nadkarni.
5. Wealth of India – CSIR
6. Indian medical plants: by Kirtikar & Basu
7. Pharmacognosy – by Dr. Kokate
8. Naturals and Cosmetics – by Dr. Satish Sakharwade

Paper No. V
Paper Code: SCT1.1

ELEMENTARY MATHEMATICS

Unit-1: Algerbra: - Profit and loss, percentage calculation, Logarithms, Trigonometry: - Degrees and Radians trigonometric ratios. Identities for sum and difference of angles, multiple angles. **(15 L)**

Unit-2: Statistics: - Frequency Distribution, Histogram, Representation of data in a curve, Measures of Central tendency : Mean, Median, mode, Measures of dispersion: Standard deviation, Correlation, Coefficient of correlation only. **(15 L)**

Unit-3: Derivatives: Concept of derivative, derivative of some simple algebraic and trigonometric functions. Chain rule. **(15 L)**

Unit-4: Application of Derivatives: Maxima, Minima b) Rates and motion c) Velocity acceleration. **(15L)**

Reference Books

1. 1 Higher Engineering Mathematics by B. S. Grewal (Unit I, II,V).
2. Higher Algebra by Hall and Knight (Unit I)
3. Plane Trigonometry Part I by S.L. Loney (Unit II)

Paper No. V
Paper Code: SCT1.1
ELEMENTARY STATISTICS

Unit-1: Introduction to data and types of data. Primary and Secondary data. Scales of measurement as ordinal, nominal, interval and ratio. **(15 L)**

Unit-2: Descriptive Statistics: Measures of central tendency, arithmetic mean, geometric mean, harmonic mean, median and mode for grouped and ungrouped data. Numerical Problems. **(15 L)**

Unit-3: Measures of dispersion: Range, quartile deviation, variance, standard deviation for grouped and ungrouped data. Numerical Problems. **(15 L)**

Unit-4: Correlation : Scatter diagram, Karl Pearson's coefficient of correlation. Formula for ungrouped data. Numerical Problems. **(15L)**

Reference Books

1. Fundamentals of Mathematical Statistics by S.C. Gupta and V. K. Kapoor

Practical Paper-I
Paper Code: HCP1.1
PRACTICAL –I

Cosmetic Chemistry

1. Preparation of Standard solutions: 1 normal, 1 molar, % w/v solution, % v/v solution 2. Standardization of volumetric apparatus.
3. Volumetric estimation involving Acidimetry, Alkalimetry oxidation & reductions.
4. Experiments based on limit tests of chlorides, Arsenic, ions sulphate & Heavy metals.
5. Practical significance of MSDS.

Fundamentals of Chemistry:

1. Organic Preparations based on:
   - i) Alkaline Hydrolysis
   - ii) Acidic Hydrolysis
   - iii) Acetylation
   - iv) Oxidation
2. Study of surface tension of liquids using a stalagmometer.
3. Study of Viscosity of liquids using Ostwald's Viscometer.
4. Study of variation of viscosity of liquid mixtures using an Ostwald's viscometer and its use to determine the concentration of such mixtures.
5. Study the total hardness of water
6. Study the temporary hardness of water.
7. Study the heat of solution of a salt in water.
8. Study the heat of neutralization of a strong acid by a strong base as well as weak acid and strong base using a calorimeter.

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Practical Paper-II

Paper Code: HCP1.2

PRACTICAL –II

Anatomy & Physiology

1. Study with the help of Charts and models of-
   a) Skin
   b) Hair
   c) Eye
   d) Tooth
2. Microscopic examination of Epithelial, Cardiac, Smooth Muscles, Skeletal muscles and other tissues.

Natural Cosmetic Agents

1. Carbohydrates:
   i. Study of organoleptic properties, identification and microscopic studies of:
      a. Rice Starch b. Maize starch
      c. Potato starch d. Wheat starch
   ii. a. Agar b. Gum Acacia.
      c. Tragacanth. d. Gaur Gum
      e. Pectin f. Cellulose
2. Study of chemical identification of fixed oils and waxes.
3. Detection of Adulteration in Olive oil, Coconut oil, Almond oil, and other vegetable oil.

Paper No. VI
Paper Code: HCT2.1

COSMETIC CHEMISTRY – II

Unit-1: Nernst eq. Calculation of std. Potential, oxi-red titrations, study of common oxidizing agents and reducing agents, oxi-red curves, ceric ammonium sulfate, titanous chloride, 2-6 dichlor phenol indo phenol titration, their theory and applications. **(15 L)**

Unit-2: Iodometry and iodimetry, Gravimetric analysis. Quantitative separation, solubility product. Fractional precipitation, CO - & post precipitation Practical aspects of gravimetry and applications. **(15 L)**

Unit-3: Precipitation titration, Precipitation and complex forming reactions. Argentometric Titration, Gay-Iusac, Volhard's Mohr's and Fujan's Method. Mercuric nitrate titration. Complexometric titration, concepts of complexation and chelation, co-ordination number stability constant, titation curves, metal ion indicator, Masking and demasking agents, types of complexometic titration and applications **(15 L)**

Unit-4: Determination & significance of acid value, saponification value, iodine value, ester value. **(15 L)**

Reference Books:

1. Text book of Practical Pharmaceutical Chemistry by Beckette and Stentake.
2. Quantitative Inorganic analysis by I. Vogal.
3. Cosmetic Chemistry -1 by Dr. Sheela Kulkarni

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Paper No. VII
Paper Code: HCT2.2

ANATOMY & PHYSIOLOGY – II

Unit-1: I) Cardiovascular system Anatomy of Heart, flow of blood through heart, blood pressure, structure of artery, vein and capillaries.

II) Blood –

i) Composition & Function ii) Blood groups

iii) Coagulation of blood **(15 L)**

Unit-2: Respiratory system – Anatomy of organs, mechanism of respiration. **(15 L)**

Unit-3: (i) Digestive system – Anatomy of digestive organs, Digestion of carbohydrate, protein and fat.

(ii) Excretory system – organs of excretion, structure of kidney, Mechanism of urine formation. **(15 L)**

Unit-4: Nervous system – CNS, Brain, anatomy in short, spinal cord, ganglion cranial nerves, reflex action and reflex arch. **(15 L)**

Reference Books:

1. Best and Taylor – The Living Body.
2. Kimber and Gray – Human Physiology and Anatomy
3. Fransis – Introduction to Human Anatomy.
4. Pharmacology and Pharmacotherapeutics By R.S. Satoskar and S. Bhandarkar
5. Ross & Wilson – Anotomy and physiology in health and illness – Ross & Wilson
6. Anatomy and physiology for Nurse – Windwood R.S.

Paper No. VIII
Paper Code: HCT2.3

FUNDAMENTALS OF CHEMISTRY

Unit-1: Halohydrocarbon: Preparation and reaction of alkyl halide and Grignard reagents and chloroform. Alcohols – Definition, classification, preparation, properties and chemical reaction of alcohols, fermentation, manufacture of ethyl alcohol, proof spirit, denatured alcohol, glycol and glycerol. **(15 L)**

Unit-2: Benzene and other aromatic compounds:

i) Benzene Resonance and structure – o-p & meta directing effect.

ii) Aromatic nitro compound (Nitrobenzenes): preparation & properties,

iii) Aromatic amines (Aniline) – Prearation & Properties.

iv) Aromatic carboxylic acids (Benzoic and Cinnamic acid, Salicylic acid.)

Fats & Oil : Definition, uses, properties. Analysis of fats and oils. Application of fats and oils in cosmetics. **(15 L)**

Unit-3: Law of mass action, Le-Chatelier's principle, homogeneous gaseous equilibria and homogeneous equilibra in liquid system.

Chemical kinetics: Introduction, molecularity, order and rate of reaction. Kinetics of first and second order reaction, their characteristics and some methods of determination. **(15 L)**

Unit-4: Phase rule : Phase rule, the terms involved in it and applications to one component system, water and sulphur system. Introduction to two component systems.

Solutions,: Raoult's law, and it's application, molecular weight determination by measuring vapour pressure, Boiling Pt. & freezing point. **(15 L)**

Reference Books:

1. Text Book of Organic Chemistry by Morrison and Boyd.
2. L.M. Atherdon, Bentley and Driver's Text Books of Pharmaceutical Chemistry. Oxford University Press, London.
3. Text book of Organic Chemistry by Bahl & Bahl
4. A.N. Martin – Physical Pharmacy
5. Glasstone – Elements of Physical Chemistry
6. A. J. Med – Physical Chemistry

Paper No. IX
Paper Code: HCT2.4

NATURAL COSMETIC AGENTS – II

Unit-1: Adulteration - types of adulteration, Method of adulteration and methods of detection of adulteration in Natural ingredients. **(15 L)**

Unit-2: Resin and balsum -

a) Definition, classification and general identification tests.

b) Study of following - Balsum of Tolu, Balsum of Peru, Benzoin, Storax, Colophony, Asafoetida. **(15 L)**

Unit-3:Tannins – Definition, Classification and Identification test.

Study of the following – Black Catechu, Tannic Acid, Amla, Behra, Hirda, Arjun, Pale catechu, Ashok. **(15 L)**

Unit-4: Study of mineral ingredients. Kaolin, Bentonite, Talc., Fuller's earth, Mica, Calamine. Herbs description and morphology of organized and unorganized herbs. **(15 L)**

Reference Books:

1. Text book of Pharmacognosy – Trease and Evan's
2. Pharmacognosy – By Claus and Tayler.
3. Text Book of Pharmacognosy – T. E. Wallis.
4. Materia Medica – By Nadkarni.
5. Wealth of India – CSIR
6. Indian medical plants: by Kirtikar & Basu
7. Pharmacognosy – by Dr. Kokate
8. Naturals and Cosmetics – by Dr. Satish Sakharwade

Paper No. X
Paper Code: SCT2.1

ENGLISH COMMUNICATION SKILLS

Unit-1: Writing skills:- Letter Writing, Informal letter, Formal letter, Bio-data/Resume, job Application, Report Writing: Dialogue writing, Advertisement . **(15 L)**

Unit-2: Personality Development: Effective Public speaking, Goal setting, time management, stress management. (**15 L)**

Unit-3: Speech Writing : View and Counterview, Expansion of Ideas, completion and Developing a story. Listening skills: Loud Reading, Speaking, Conversations, Telephonic conversation. **(15 L)**

Unit-4: Interview techniques, group discussion, situational role play. **(15 L)**

Paper No. X
Paper Code: SCT2.2

ANALYTICAL CHEMISTRY

Unit-1: pH metry: pH and hydrogen ion concentration, pH calculation for weak acids and weak bases. Buffer solutions and types, mechanism of buffer action of acidic and basic buffers. Theories of acid base indicators. **(15 L)**

Unit-2: General discussion of theory of colorimetry : Lambert law, Beer's law (Derivation not expected), Terms used in Colorimetry, Application of Beer's law, Deviation from Beer's law. Classification of methods of 'colour' measurement or comparison, Photoelectric photometer method- single cell photo-electric colorimeter. (**15 L)**

Unit-3: E.M.F. of Galvanic cell, Std. Oxidation Potential of an electrode, glass, calomel, redox electrodes, Principles of potentiometric titration. **(15 L)**

Unit-4: Electrolysis, Faraday's laws, Cathode current efficiency. Basic principles of electroplating, cleaning of articles. Electroplating of Nickel and Chromium. Anodising. **(15 L)**

Reference Books:

1. Text book of Quantitative Inorganic Analysis - By A. I. Vogel (ELBS and Longman 3rd Edition).
2. Instrumental methods of Chemical analysis by Willard, Merit and Dean.
3. Instrumental methods of Chemical analysis by Chatwal and Anand (Himalaya Publication).
4. Text Book of Physical Chemistry by S. Glasstone, Macmillan India Ltd.
5. Elements of Physical Chemistry by D. Lewis and S. Glasstone (Macmillan).
6. Principles of Physical Chemistry by Maron and Lando (Amerind).
7. An Introduction to Electrochemistry by S. Glasstone.

Practical Paper-III
Paper Code: HCP2.1
PRACTICAL-III

Cosmetic Chemistry (P2)

1. Preparation and standardization of Cerric Ammonium Sulphate Potassium Iodate, Assays Based on use of above agents.
2. Preparation and standardization of Perchloric Acid and Sodium Methoxide. Assay based on above.
3. Preparation and standardization of Sodium EDTA. Assay based on EDTA.
4. Preparation and Standardization of Silver Nitrate and Amonium Thiocynate. Assay Based on above.
5. Gravimetric analysis: experiments based on gravimetric analysis

Fundamentals of Chemistry

1. Systematic Organic analysis of unknown organic substance (i.e. preliminary tests, detection of elements, groups, determination of physical constants and specific tests and confirmation by derivatives preparation)
   a) Acetic acid
   b) Benzoic acid
   c) Salicylic acid
   d) Urea
   e) Thiourea
   f) Aniline
   g) Glucose
2. Study the phenol – water two phase system and determine the critical temperature of the system.
3. Determine the molecular weight of a nonvolatile compound by the Rast's Camphor method.
4. Study of partition of iodine between Carbon Tetrachloride and water and determine the partition coefficients of iodine between the two solvents.
5. Study the first order kinetics of the hydrolysis of Methyl Acetate in an acid medium.
6. Study the second order kinetics of the reaction of $K_2S_2O_8$ with KI.
7. Study of Buffer solutions and hence determine the pH of buffer solution using a comparator.

Practical Paper-IV

Paper Code: HCP2.2

PRACTICAL-IV

Anatomy & Physiology

1. Determination of clotting time.
2. Determination of bleeding time
3. Determination of hemoglobin content.
4. Determination of R.B.C. count, D.L.C., T.L.C.
5. Study with the help of charts and models of
    a) Cardiovascular system
    b) Excretory system
    c) Digestive system
    d) Nervous system
6. Recording of body temperature, Pulse and Heart rate and Blood Pressure.

Natural Cosmetic Agents

1. Organoleptic study and identification of
    a. Tolu Balsum b. Peru Balsum
    c. Benzion d. Storax
    e. Colophony f. Asfoetida
2. Morphological study and identification of following tannin containing agents:
    a. Black Catechu. b. Amls
    c. Behra d. Hirada
    e. Ashoka Bark f. Arjua Bark.
3. Organoleptic study of Kaolin, Bentonite, Talc., Fuller's earth, Mica, Calamine.

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