



高等院校药学类专业**双语实验教材**

YAOJIXUE
SHUANGYU SHIYAN

药剂学

双语实验

主编 崔亚男 李万忠



中国健康传媒集团
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内 容 提 要

本教材是“高等院校药学类专业双语实验教材”之一。本套教材由济宁医学院联合潍坊医学院共同编写。为适应医药行业国际化对药学类人才的需求,结合目前大学生英语水平普遍较高的特点,本教材用英语编写。本教材共16个药剂学教学实验,包括课前预习、实验部分、实验结论和讨论部分四个部分。

本教材适合高等院校药学类专业使用。

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教材使用说明

本教材适用于药剂学实验单独设课的教学使用。

1. 课前预习 主要是指实验正文中 Part 1 Preview 中的四部分内容。

课堂上随堂检查，同时兼顾课堂上的提问情况，当堂给予分数。

2. 实验过程 包括 Part 2 Experimental 中的处方分析、实验具体操作过程流程图的总结叙述；以及 Part 3 中“结果和结论”的描述。也需当堂给予成绩。

3. 实验报告 要求学生在实验课结束后的第二天即上交实验报告。

实验报告的要求包括实验目的，实验原理，实验过程（处方分析、实验步骤），实验结果与结论，思考题。鼓励学生用英文进行书写。

4. 关于课程的考核 实验课考核内容包括四部分：①课前预习，占 10 分；②实验操作过程及实验结果结论的描述，占 30 分；③实验报告，占 10 分；④期末考核，占 50 分。其中期末考核由两部分内容组成：笔试成绩占 30 分；实验操作成绩占 20 分。即如下所示。

课前预习 (10分)

实验过程 (30分)

实验报告 (10分)

期末考核 (50分)

笔试成绩 (30分)

实验操作 (20分)

前 言

药剂学是一门应用性较强的学科,其实验教学亦是药学专业的必开课。伴随着世界一体化的进程,以及“中国需要了解世界,世界需要了解中国”的需求,自20世纪90年代以来,双语教学在我国如火如荼展开。

近年来,在济宁医学院“以研促教”的思想指导下,同时为响应“国家大学生创新训练计划”,培养训练学生自主研发创新能力,鼓励学生积极动脑动手,我们积极转变教学理念,探讨切实有效的教学方法,将药剂学实验单独设课,利用双语进行教学,打破传统实验教学的思维模式,特编写本教材。与传统实验教材相比,本教材具有以下特色。

1. 增设了课前预习模块 ①实验中所涉及相关专业术语的英文名称,理论课中已经进行阐释,需要学生在上实验课之前复习巩固,这样可以提高学生在双语实验课中的听课效率和质量。②根据实验内容预设1~2个问题,让学生根据理论课所学知识,组织语言尝试用英文进行解答。③让学生尝试写出实验过程中应该注意的关键操作点,然后在听课过程中进行验证补充。本模块的设计有利于教师对学生掌握理论知识的情况进行初步考察,初步评价学生理论知识的掌握情况;同时可初步培养训练学生科研思维的形成。

2. 实验部分 根据药剂学实验的特点,补充了处方分析版块;同时在每一项实验项目下均留出空白处,让学生在听完课后自行画出实验步骤流程图,并标记注意事项。

3. 实验结论和讨论部分 根据实验情况当堂完成实验结果的记录与描述;教师可根据学生的动手操作情况进行当堂评分,可为今后筛选实验技能大赛选手作参考。

感谢各位编者以严谨负责的态度参与本教材的编写工作。本教材各章节任务分工如下:崔亚男(Experiment 1、2、6、10),李万忠(Experiment 15),王慧云(Experiment 3),孙珊珊(Experiment 7),宋博(Experiment 4),张春燕(Experiment 11、13),郑增娟(Experiment 5),顾英琳(Experiment 8),张惠平(Experiment 9),刘兆明(Experiment 12),王保国(Experiment 14),张波(Experiment 16)。

本教材的编写得到了参编院校领导和老师的大力支持,在此表示诚挚的感谢。由于编者水平和编写时间所限,书中不足之处在所难免,敬请广大师生提出宝贵意见,以便再版时修订提高。

编 者

2018年11月

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Experiment 1 Liquid Dosage Forms I

—solutions

Simple syrups

Part 1 Preview

1. Key Words. Read the words below and then translate them into Chinese.

solutions-

syrups -

simple syrups-

dissolve -

extractants -

concentrated -

sucrose -

filtration -

viscosity-

sterilize -

2. What is a syrup? And what is simple syrup?

3. Please write down how to make simple syrup?

4. After previewing this experiment, please write down some points that we should pay attention to just from your own part of view.

Part 2 Experimental

Purposes

1. To master the preparation method of solutions.
2. To be familiar with the function of excipients in solutions.

Introduction

Syrups are widely applied in food and pharmaceutical industry and their consumption is increasing nowadays. Syrups are usually termed as solutions of sucrose and drugs, in which some additives may be included, such as flavoring agents, protectants, and etc. In general, drugs may be extractants from crude traditional Chinese materials, or some others that could dissolve in the concentrated solutions of sucrose.

The preparation of syrups is nothing of special. To be simple, drugs and sucrose could be dissolved in water simultaneously, or drugs could be added into simple syrups which had been prepared in advance. Simple syrups could be prepared just by the dissolution of sucrose in water, in which the concentration of sucrose is destined, that is 85% (g/ml) or 64.7% (g/g). And just because of the concentrated content of sucrose in simple syrups, antiseptic substances could be abridged.

Apparatus & Materials

Sucrose (AR), distilled water, electronic scale, measuring cylinder, stirring rod, electric furnace, beaker, glass funnel, filter paper, cotton.

Contents

[Prescription]		[Analysis]
Sucrose	17 g	()
Distilled water	add to 20 ml	()

[Procedures]

17 g of sucrose was accurately obtained using electronic scale, and then was dissolved in 9 ml of distilled water with continuous stirring on electric furnace to be heated. After boiling for a few minutes, the sucrose solution was immediately filtered through a piece of filter paper and cottons which was previously placed and stuffed in a glass funnel. The remaining distilled water was filtered and added to the solution of sucrose. The final simple syrups could be obtained by stirring and mixing completely.

Please write down the preparation flow-process diagram below:

[Key points]

I. The heating step during the preparation of simple syrups is to sterilize the solution, as well as to precipitate some of the macromolecules like proteins. The filtration should be undertaken immediately after boiling. Otherwise, with the cooling of the solution, the filtration will be hardly processed for the high viscosity.

II. In order to prevent the transformation of sucrose into caramel which may change the appearance of the solution into brown or even darker, the boiling time should be monitored strictly.

III. The filtration speed may be variational depending on the temperature of the surrounding. The filtration could be speeded up by using cotton cushions or multi-layer gauzes.

Part 3 Results and Conclusions

Please describe what you have got in this experiment, and try to explain the problem or phenomenon that you have encountered during the preparation. And please feel free to give us your suggestions on this experiment.

[Results]**[Conclusions]****[Suggestions]**



Part 4 Questions

- I. Please calculate the concentration of the simple syrups that you had just prepared.
- II. What should be noticed in the preparation of simple syrup? What effective steps can be adopted?

Colloidal solutions

Part 1 Preview

1. Key Words. Read the words below and then translate them into Chinese.

colloidal solution -	mucilage-
homogeneous -	heterogeneous -
affinity -	hydrophobic colloid-
hydrophilic colloid-	macromolecular -
swell-	thermodynamic stable system-
sodium carboxymethylcellulose -	
coagulation method-	dispersing method-

2. What are colloidal solutions?

3. Please write down how to prepare colloidal solutions.

4. After previewing this experiment, please write down some points that we should pay attention to just from your own part of view.

Part 2 Experimental

Purposes

1. To master the definition and some of the typical properties of colloidal solutions.
2. To master the types and the typical preparation method of colloidal solutions.

Introduction

A colloidal solution is defined as a homogeneous (such as mucilages) or heterogeneous (such as sols) liquid system, in which the particles are about 1 nm~100 nm. The solvents are almost water except for some nonaqueous solvents. Depending on the affinity of the materials with the solvents, colloidal solutions could be classified into two types, hydrophobic colloid also termed as sols and hydrophilic colloid also named as macromolecular solutions. Macromolecular solutions is thermodynamic stable and the sols is thermodynamic unstable.

The of the two kinds of colloidal solutions is also different. Swelling process is necessary for the preparation of macromolecular solutions, and grinding, stirring or heating is needed when necessary. Coagulation method (both chemical and physical) and dispersing method are usually used in the preparation of sols.

Apparatus & Materials

Sodium carboxymethylcellulose, glycerol, alcohol solution of ethylparaben (50 mg/ml), distilled water, beaker, stirring rod, electronic scale, measuring cylinder.

Contents

[Prescription]

Sodium carboxymethylcellulose
Glycerol
Alcohol solution of ethylparaben
Distilled water

0.25 g
3 ml
0.1 ml
add to 10 ml

[Analysis]

()
()
()
()

[Procedures]

0.25 mg of sodium carboxymethylcellulose was firstly dispersed in 6 ml of distilled water and then the mixture was heated until the sodium carboxymethylcellulose was dissolved completely to form a clear and transparent solution. 3 ml of glycerol and 0.1 ml of ethylparaben solution were then added in sequence. The final mucilage was obtained by adding the remaining distilled water.

Please write down the preparation flow-process diagram below:

[Key points]

I. The dispersion step is suggested to be undertaken in cold water, and then the mixture is heated gently to promote the dissolution.

II. Quaternary ammonium salts and preservatives containing mercury are not suitable in this prescription for precipitation may occur when sodium carboxymethylcellulose encountered with the chemicals mentioned above.

Part 3 Results and Conclusions

Please describe what you have got in this experiment, and try to explain the problem or phenomenon that you have encountered during the preparation. And please feel free to give us your suggestions on this experiment.

[Results]

[Conclusions]

[Suggestions]

Part 4 Questions

I. What is the function of ethylparaben in this formulation? Are there any other adjuvants that could replace it? If yes, give us some examples.

II. During the dispersion process, cold water is needed. Try to explain the reason.

Suspensions

Part 1 Preview

1. Key Words. Read the words below and then translate them into Chinese.

suspensions -

suspending agents -

polydispersity index -

stabilizer -

wetting agent -

dry suspensions-

coagulation method-

flocculating agent or deflocculating agent -

sedimentation rate-

2. What is a suspension? Is it thermodynamic stable?

3. suspensions may be prepared by many methods. Please write down some methods.

4. After previewing this experiment, please write down some points that we should pay attention to just from your own part of view.

Part 2 Experimental

Purposes

- 1. To master the definition and classical fabrication method of suspensions.
- 2. To master the quality control of suspensions, especially the calculation of sedimentation coefficient.

Introduction

Suspensions are heterogeneous liquid preparations of insoluble solid particles, the size of which range from 0.5 μm to 10 μm or even larger. The dispersion medium is usually water, and vegetable oils could also be used. Suspensions are thermodynamic instable systems for the high polydispersity index and surface free energy. The main problems on physical stability are particle precipitation, flocculation, crystal growth and so on. To overcome these obstacles during the preparation of suspensions, some other additives like suspending agent, wetting agent, flocculating agent and deflocculating agent are needed. To be special, dry suspensions emerged as an alternative choice.

Suspensions could be obtained by many ways. To be simple, dispersing method, such as grinding and elutriation, and both physical (crystallization) and chemical (reaction) coagulation methods are usually used.

Apparatus & Materials

Mortar and pestle, beaker, graduated cylinder, electronic scale, sulfadiazine, sodium hydroxide, citric acid, sodium citrate, sodium benzoate, sodium saccharin, flavor, distilled water.

Contents

Sulfadiazine mixtures		
[Prescription]		[Analysis]
Sulfadiazine	5 g	()
sodium hydroxide	0.8 g	()
citric acid	1.5 g	()
sodium citrate	3.25 g	()
sodium benzoate	0.1 g	()
1% sodium saccharin	Q.S	()
Flavor	Q.S	()
distilled water	add to 50 ml	()

[Procedures]

The sulfadiazine mixtures were prepared by micro-crystallization method. 0.8 g of sodium hydroxide was dissolved in 15 ml of freshly prepared cool distilled water. Then 5 g of sulfadiazine was added and dissolved by continuous stirring. The solution (A) was cooled down at room temperature. 1.5 g of citric acid was dissolved in 5 ml of water to form solution B. 3.25 g of sodium citrate, 0.1 g of sodium benzoate, a reasonable amount of sodium saccharin (1%) and flavor were mixed and stirred in about 15 ml of water to form solution C.

Solution A and solution B were added into solution C alternately at a ratio of 3:1 (V/V). Keep on stirring the mixture for a few minutes to form microcrystal of sulfadiazine. Finally, the remaining 15 ml of water was added and sulfadiazine suspension was obtained.

Please write down the preparation flow-process diagram below:

[Key points]

Sulfadiazine is white or off-white crystalline powder, odorless, and will get darkened when exposed to light. It is insoluble in water but will dissolve in sodium hydroxide solution or ammonia. The sodium salt of sulfadiazine will separate out for the absorption of carbon dioxide, as well as color changing will occur for the oxidation by light and metal ion. So in this experiment, the sodium salt of sulfadiazine is not suitable for the preparation of suspensions.

Part 3 Results and Conclusions

Please describe what you have got in this experiment, and try to explain the problem or phenomenon that you have encountered during the preparation. And please feel free to give us your suggestions on this experiment.

[Results]**[Conclusions]**



[Suggestions]

Part 4 Questions

- I. What are the functions of various constituents in formulation in this experiment?
- II. Try to design an experiment to determine the sedimentation rate.

Experiment 2 Liquid Dosage Forms II

—Emulsions

Part 1 Preview

1. Key Words. Read the words below and then translate them into Chinese.

emulsions-

emulsification-

emulsifier-

emulsifying agents-

internal phase-

external/continuous phase-

oil-in-water emulsions-

primary(Initial) emulsions-

hydrophil-lipophil balance (HLB) value-

dry gum method (Continental method)-

wet gum method (English method)-

wedgwood/porcelain mortar and pestle-

creamy white-

Crackling sound-

2. What is an emulsion? And what is it made of?

3. Emulsions may be prepared by many methods. Please write down some methods used in the small-scale improvisational preparation.

4. After previewing this experiment, please write down some points that we should pay attention to just from your own part of view.