

ASSESSMENT OF SCIENCE AND TECHNOLOGY ACHIEVEMENT PROJECT (ASAP)

Science and Technology Exemplars

Grade 7: Matter and Materials – Pure Substances and Mixtures

Exemplar Task (7MMPT01/Feb 2002)

Dissolving Solubility



© York University, Feb 2002

Preface

This task is one of a series developed by the Assessment of Science and Technology Achievement Project (ASAP), which is being used for the ASAP Science and Technology Exemplars Project.

This task is organized in three parts:

- A. Task Overview
- B. Student task sheet – designed to be photocopied for the students
- C. Teacher Information – providing essential information relating specifically to this task

For further information, contact the ASAP office at 416-736-5006 or email:

asap@edu.yorku.ca

Task Overview



Description of the Task:

This is a culminating activity designed to assess a cluster of expectations for this grade and strand. Students should have been taught the concepts and skills required to perform this task prior to attempting it.

Students will be given Vitamin C tablets and asked to investigate factors that affect how quickly they dissolve.



Materials and Equipment Required:

dissolvable vitamin C tablets/or other soluble tablet
water supply
kettle for heating water
stir sticks

beakers
graduated cylinders
stopwatch
thermometers



Suggested Timeline:

4 x 65 minutes



Suggested Grouping:

Pair/share; groups of 4



Safety Considerations:

Care not to consume tablets
Care with boiling water
Wear goggles when handling glassware

**ASSESSMENT OF SCIENCE AND TECHNOLOGY
ACHIEVEMENT PROJECT
(ASAP)**

Science and Technology Exemplars Project

Grade 7: Matter and Materials – Pure Substances and Mixtures

Exemplar Task (7MMPT01/Feb 2002)

Dissolving Solubility

Student Task Sheet

© York University, Feb 2002

Dissolving Solubility

You are working for a pharmaceutical company. You have been asked to test the solubility of a new Vitamin C tablet before it goes on the market. You will also have to provide instructions on how it could be used as an additive/supplement in commercially prepared foods.

Your task is to investigate the solubility of this tablet and present your results to the marketing group of the pharmaceutical company.

Your presentation must include:

- how you carried out your investigation and made your test fair
- the results of your investigation
- your conclusions about the solubility of the tablets and the factors that affect solubility
- an evaluation of your investigation
- suggest food products where Vitamin C could be added to make the food more nutritious.

In addition you will need to explain the scientific theory relating to solubility. Include the following in your presentation:

- information about the concentration of your solutions
- identification of the solute and the solvent in your experiment
- appropriate scientific terminology
- how you followed safe procedures
- how water can be used as a solvent and a chemical reactant

ASSESSMENT OF SCIENCE AND TECHNOLOGY ACHIEVEMENT PROJECT (ASAP)

Science and Technology Exemplars Project

Grade 7: Matter and Materials – Pure Substances and Mixtures

Exemplar Task (7MMPT01/Feb 2002)

Dissolving Solubility

Teacher Information Sheets

© York University, Feb 2002

This task addresses the following cluster of expectations. Expectations assessed by the rubric are highlighted in bold.



Understanding Basic Concepts

- describe the concentration of a solution in qualitative terms (e.g., dilute, concentrated) and in quantitative terms (e.g., grams of solute per 100 ml)
- identify factors that affect solubility and the rate at which substances dissolve (e.g., temperature, type of solute or solvent, particle size, stirring)
- describe, through observation, the difference between saturated and unsaturated solutions
- identify solvents and solutes in various kinds of solutions.



Developing Skills of Inquiry, Design and Communication

- formulate questions about and identify needs and problems related to the characteristics of mixtures and solutions, and explore possible answers and ways of meeting these needs (e.g., design a fair test to determine the amount of solute required to form a saturated solution with a fixed amount of solvent whose temperature is varied)
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test, identifying criteria for assessing solutions
- use appropriate vocabulary, including correct science and technology terminology, to communicate ideas, procedures, and results (e.g., define the terms *mixture*, *mechanical mixture*, *solution*, *solute*, *solvent*, *mass concentration*, *dissolve*, *soluble*, *insoluble*, *saturated*, *supersaturated*, *unsaturated*, *dilute*)
- compile qualitative and quantitative data gathered through investigation in order to record and present results, using diagrams, flow charts, frequency tables, bar graphs, line graphs, and stem-and-leaf plots produced by hand or with a computer (e.g., use a database to record and display results showing the amount of solute used in given amounts of solvent)
- communicate the procedures and result of investigation for specific purposes and to specific audiences, using media works, written notes and descriptions, charts, graphs, drawings, and oral presentations (e.g., use drawings to illustrate the process of manufacturing a product from the collecting of raw materials to the end use of the product or its disposal)
- follow safe work procedures (e.g., wash hands after handling chemicals; seal containers of unused chemicals promptly after use; recognize and take note of WHMIS warning symbols) and use of appropriate tools, materials, and equipment.



Relating Science and Technology to the World Outside the School

- demonstrate the use of water as a solvent and as a chemical reactant
- identify a variety of manufactured products made from mixtures or solutions and explain their functions (e.g., medicines, cleaning solutions, salad dressings)



Prior Knowledge Required:

Before attempting this task students should have been taught the following:

- solution concentration in qualitative and quantitative terms
- factors that affect solubility
- saturated and unsaturated solutions
- the use of water as a solvent



Students should be familiar with the following science and technology terminology:

- Mixture, solution, solvent, solute, concentration, saturated unsaturated dissolve



Prior Skills Required:

Before attempting this task students should have experience of the following:

- planning, carrying out and reporting on investigations
- working in groups effectively



Suggested Introductory Activities:

The following activities are suggested to introduce this task to the students:

- brainstorm suggestions for investigation
- recap basic concepts

Cross-strand Links:

Every strand in the Science and Technology document has common set of expectations clustered under the title ***Developing Skills of Inquiry, Design and Communication***. This task is therefore appropriate to assess and evaluate these skills for every Grade 7 strand.

Cross-curricular Links:

Links can be made to *The Ontario Curriculum Grade 1-8 Mathematics* Data Management and Probability: Grade 7. The expectations that can be addressed are:

- collect and organise data on tally charts
- identify and describe trends in graphs, using informal language to identify growth, clustering and simple attributes
- use conventional symbols, titles and labels when displaying data
- make inferences and convincing arguments that are based on data analysis

Considerations for Split/Grade Classes:

Appropriate strategies are as follows:

- Teach one grade while the other grade completes the task which does not require active teacher guidance
- Create separate learning centers for student investigation specific to each grade topic and strand. The methods of science and technology (inquiry and communication) would provide the whole class focus
- Introduce self-directed student activities connected to specific expectations
- Reorganize students into grade groupings for the purposes of teaching a given topic
- Teach specific grade expectations when part of the class is working with another teacher
- Make thematic connections by clustering the overall expectations around a unifying organizer such as “Form and Function”.

RUBRIC FOR GRADE 7: Dissolving Solubility

Knowledge/Skills	Level 1 The student:	Level 2 The student:	Level 3 The student:	Level 4 The student:
Understanding of Basic Concepts <ul style="list-style-type: none"> concentration of solutions factors that affect solubility identifies characteristics of solutes and solvents 	<ul style="list-style-type: none"> demonstrates little understanding of concentration and solubility identifies few of the characteristics of solutes and solvents 	<ul style="list-style-type: none"> demonstrates a partial understanding of concentration and solubility identifies some of the characteristics of solutes and solvents 	<ul style="list-style-type: none"> demonstrates understanding of concentration and solubility with few errors identifies most of the characteristics of solutes and solvents 	<ul style="list-style-type: none"> demonstrates understanding of concentration and solubility without errors identifies almost all of the characteristics of solutes and solvents
Inquiry Skills <ul style="list-style-type: none"> demonstrates the required skills and strategies of inquiry (e.g. plans fair investigation, records observations and conclusions) practises safe procedures 	<ul style="list-style-type: none"> develops and follows an confusing plan in order to conduct a fair test rarely applies safety procedures 	<ul style="list-style-type: none"> develops and follows a somewhat adequate plan in order to conduct a fair test sometimes applies safety procedures 	<ul style="list-style-type: none"> develops and follows an appropriate plan in order to conduct a fair test consistently applies safety procedures 	<ul style="list-style-type: none"> develops and follows a clear and efficient plan in order to conduct a fair test always applies safety procedures
Communication of Required Knowledge <ul style="list-style-type: none"> communicates results and conclusions use of appropriate science and technology terminology 	<ul style="list-style-type: none"> communicates with little precision and clarity infrequently uses science and technology terminology in context 	<ul style="list-style-type: none"> communicates with some precision and clarity uses some science and technology terminology in context 	<ul style="list-style-type: none"> communicates with precision and clarity throughout most of the task generally uses science and technology terminology in context 	<ul style="list-style-type: none"> communicates with precision and clarity throughout all of the task consistently uses science and technology terminology in context
Relating Science and Technology to each other and the World Outside the School <ul style="list-style-type: none"> Identify a variety of products that are made from mixtures 	<ul style="list-style-type: none"> provides few food products where they could use Vitamin C solubility findings 	<ul style="list-style-type: none"> provides some food products where they could apply their Vitamin C solubility findings 	<ul style="list-style-type: none"> provides several food products where they could apply their Vitamin C solubility findings 	<ul style="list-style-type: none"> provides many food products where they could apply their Vitamin C solubility findings