

# **AtSc 252 Applied Weather Modification Study Guide: Spring 2022 - Exam 2**

## **Section I**

### **Weather Modification Projects and Aircraft Research Experience**

- North Dakota Cloud Modification Project Location, Flight Hours, and Partners
- Aircraft Seeding Equipment and Activities
- Types of Aircraft Flight Activities
- Research Aircraft Projects, Activities and Objectives

### **Weather Modification History and Critical Thinking**

- Weather Modification Pioneers
- First Test: Results and Experiments
- Operational Programs Locations
- Analyze to Formulate Conclusions/Opinions

### **Legal, Environmental and Sociological**

- Licenses/Permits, Laws, and Liability
- Water Rights
- Cloud Seeding Environmental Impacts
- Effect of Silver Iodide (AgI)
- Public Awareness, Concerns and Fears

### **Economics and Inadvertent Modification**

- Costs and Benefits
- North Dakota Economic Impacts
- Scale of Possible Effects
- Possible Mechanisms for Inadvertent Effects
- Urban and Rural Impacts

### **Evaluation of Weather Modification Projects**

- Black Box and Physical
- Operational Evaluations Issue
- Distribution, Hypothesis Testing and P-values
- Statistical Evaluation Methods
- Evaluation of North Dakota Cloud Modification Projects

### **Aerosols, Water and Nucleation**

- Aerosol, Cloud Condensation Nuclei (CCN) and Ice Nucle (IN) Concentrations and Sizes
- Atmospheric Aerosols Vertical, Horizontal and Temporal Distribution
- Sources, Sinks and Composition
- Energy and Phases of Water
- Saturation and Changes
- Equilibrium of Water
- Mechanisms of Ice Crystal Nucleation
- Ice Nucleation Activity as a Function of Temperature

## Section II

### **Droplet Growth and Ice Nuclei Activation**

- Solute and Curvature Effects
- Köhler (Koehler) Curve
- Growing Droplets and Cloud Formation
- Effectiveness of Ice Nuclei
- Activation of Ice Nuclei

### **Ice Crystal Growth**

- Equilibrium Vapor Pressure
- Mixed Phase Clouds

### **Basic Clouds**

- Convective Clouds
- Ice Clouds

### **Cloud Dynamics**

- Cold Rain Process
- Warm Rain Process

### **Conceptual Models**

- Updraft Speed

### **Precipitation Models**

- Microphysical Seeding
- Dynamic Seeding
- Over-seeding
- Orographic Precipitation Enhancement

### **Hail Suppression Conceptual Models**

- Hail Growth
- Precipitation Augmentation
- Types of Hail Suppression Conceptual Models
- National Hail Research Experiments

### **North Dakota Cloud Modification Project (NDCMP) Conceptual Model**

- Natural Hail Process
- Cloud Seeding Hypothesis
- Feeder and Mature Cells
- Multi-cell Storms