

**Examination Syllabus for Qualification of
Weather Forecasters
(Trial)**

**China Meteorological Administration
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CHAPTER 1 NATURE OF THE EXAMINATION

Qualification Test of Weather Forecasters is mandatory to those who engage in weather Forecasting in Meteorological Services. The staff who shall attend the examination and obtain the Qualification Certificate of Weather Forecaster include those that engage in weather forecasting: (1) but without a Qualification Certificate of Weather Forecaster; (2) with a Bachelor or above degree in atmospheric science; and (3) with a Bachelor or above degree in mathematics, physics and others and an experience in participating in Training on Meteorology Fundamentals. The examination is organized by the China Meteorological Administration and a Qualification

Certificate will be granted to him/her who passes it.

CHAPTER 2 REQUIREMENTS OF THE EXAMINATION

With the principle of "focusing on basic theoretical knowledge and basic skill related to weather forecasting, while emphasizing the application of theoretical knowledge and practical data operation", the test identifies the guideline of setting practical skill oriented questions to comprehensively check the weather forecasting qualification of the candidates with a combination of the basic knowledge, practical operation and forecasting skill.

I. Basic Knowledge and Capacity Requirements

1. Basic Theoretical Knowledge Required

The basic theoretical knowledge refers to the concept, nature, law, formulas, as well as ideas and methods given in the teaching content identified in the "Syllabus on Atmospheric Sciences (undergraduate)" of the Ministry of Education.

The requirements for basic knowledge can be divided into three levels: understanding, mastering and integrated use.

(1) Understanding: Gain preliminary and perceptual awareness of knowledge required and its background; learn the basic concept

knowledge and relevant content; identify it in the relevant issues.

(2) Mastering: It is required to gain a more profound understanding of the knowledge to explain, illustrate or infer and to solve related problems using the knowledge.

(3) Integrated use: It is required to master the inner link of the knowledge and to analyze and solve complex or comprehensive problems using knowledge learnt.

2. Capacity Requirements

The candidates are able to: (1) comprehensively use the basic theoretical knowledge, ideas and methods of Atmospheric Sciences; (2) summarize, sort and classify the information provided to form an initial weather forecasting idea; (3) use the correct terminology and expressions to make an explanation according to the forecast operational norms; (4) be skilled in use of weather forecasting service platform to complete a weather chart analysis and a generation of conventional weather forecasting.

II. Examination Requirements

The examination focuses on basic knowledge, forecasting ideas basic data operational skill and practical forecasting ability. Taking into account the fundamentality, integrity and contemporaneity of test

questions, the examination pays attention to their hierarchy by reasonably regulating their degree of integration. The examination also aims to achieve a comprehensive test of the overall quality from multiple angles and levels.

Chapter 3 Exam on Weather Forecasting Theory

I. Meteorology (Introduction to atmospheric sciences)

1. Exam Content

Earth's atmospheric composition; atmospheric stratification and structure; atmospheric statics; radiation processes; atmospheric thermodynamics; atmospheric boundary layer.

2. Exam requirements

(1) Be familiarized with the following knowledge: the basic components of the atmosphere; the importance of water vapor in the atmosphere; the role of aerosol particles in the atmospheric process.

(2) Be familiarized with the following knowledge: Stratification of the atmosphere; the basic characteristics of the troposphere; the concepts of main meteorological elements including temperature, pressure, humidity, wind, clouds, precipitation, and the level of visibility; the representation of atmospheric temperature and

humidity.

(3) Be familiarized with the following knowledge: the concept of gravity and centrifugal force; the concept of gravitational potential and geopotential meter; the significance of atmospheric statics equation; the concept of homogeneous atmosphere; the differences in barometric height formulas in homogeneous, Isothermal and polytropic atmosphere; the concept of isobaric surface and isohypsic surface; the concept of pressure gradient; the change in pressure system with height.

(4) Be familiarized with the following knowledge: the concept of atmospheric radiation, solar constant, atmospheric counter radiation, and surface effective radiation; the basic principle and law of radiation; solar radiation absorption and reflection by the earth-atmosphere system and radiation exchange process between the air and the ground.

(5) Be familiarized with the following knowledge: the concept of dry-adiabatic process, adiabatic process of moist air, potential temperature and potential pseudo-equivalent temperature, and thermal inversion layer; dry adiabatic and wet adiabatic lapse rate; the expression of the first law of thermodynamics in the atmosphere;

the definition of static stability of atmosphere; individual change and local change in air temperature; the factors affecting local change in air temperature; the structure of T-logP diagram.

(6) Be familiarized with the following knowledge: the basic concept of atmospheric boundary layer; the basic structure of boundary layer; the concept of turbulent fluxes and thermal equilibrium; the concept of land and sea breezes, valley wind and urban heat islands.

3. Bibliography

《大气物理学》盛裴轩、毛节泰等，北京大学出版社，2003。

《气象学》陈佑淑、蒋瑞宾，气象出版社，1988。

《边界层气象学导论》R.B.斯塔尔编，徐静琦、杨殿荣译，青岛海洋大学出版社，1991。

II. Atmospheric Sounding

1. Exam Content

Conventional ground meteorological observation; Conventional upper-air meteorological observation; modern integrated meteorological observation system.

2. Exam requirements

(1) Be familiarize with the following knowledge: the observation principle and methods for cloud, meteorological visibility, weather phenomena, air pressure, air temperature and humidity, wind direction and wind speed, and precipitation; the characteristics of various clouds and weather phenomena; the limitations in the accuracy of ground detection data, data error and representative data.

(2) Be familiarized with the following knowledge: the observation method of upper wind; radiosonde detection method of upper temperature, humidity and pressure; the limitations in the accuracy of upper-air detection data, data error and representative data.

(3) Be familiarized with the following knowledge: the composition of modern integrated meteorological observation systems; airborne atmospheric sounding systems; space-based atmospheric sounding systems; ground-based remote sensing atmospheric detection system.

3. Bibliography

《现代气象观测》张蔼琛，北京大学出版社，2006。

III. Dynamic meteorology

1. Exam Content

Basic equations of atmospheric motion; scale analysis of atmospheric motion and simplified basic equations; balanced motion in free atmosphere; circulation and vorticity; atmospheric energy; basic fluctuations of the atmosphere.

2. Exam requirements

(1) Be familiarized with the following knowledge: various basic forces on air micelle and their physical significance; the atmospheric equation set in rotating coordinate system, that is motion equation (Newton's second law), the continuity equation (conservation of mass), equation of state (gaseous state equation), thermodynamic equation (first law of thermodynamics), as well as their the physical meaning; coordinate conversion formula; atmospheric motion equation sets in local Cartesian coordinate system and P coordinates.

(2) Be familiarized with the following knowledge: the concept of spatial and temporal scales in weather systems; classification of atmospheric motion scales; the scale analysis of atmospheric motion; simplified atmospheric motion equation set; the basic features of large-scale atmospheric motions; the main characteristics of a dimensionless parameter.

(3) Be familiarized with the following knowledge: the application

of geostrophic wind, thermal wind, and gradient wind; the relationship between geostrophic deviation and vertical movement.

(4) Be familiarized with the following knowledge: the definition of circulation and its change; the definitions of the absolute vorticity, relative vorticity, geostrophic wind vorticity, geostrophic vorticity, curvature vorticity, and shear vorticity; vorticity equation; the application of vorticity equation; the potential vorticity and its changes; the divergence equation and its simplified form.

(5) Be familiarized with the following knowledge: the main form of energy in the atmosphere and its significance; energy conservation of atmosphere in the conservative system; the concept of available potential energy; the qualitative results of average energy equation and the qualitative conclusions of average atmospheric energy cycle.

(6) Be familiarized with the following knowledge: the basic concept of wave number; the concept of wave group and group velocity; the linear method of equation set; the significance of atmospheric longwave (horizontal non-divergence Rossby waves).

3. Bibliography

《天气学原理方法和方法》朱乾根、林锦瑞、寿绍文等，气象出版社，2007。

《动力气象学引论》霍尔顿著，中国人民解放军空军气象学院训练部译，科学出版社，1986。

IV. Synoptic Meteorology

1. Exam Content

Atmospheric circulation; air mass and front; the westerlies large-scale disturbance and large-scale weather process; precipitation process; small- and meso-scale convective system and convective weather; weather systems in tropical and subtropical regions.

2. Exam requirements

(1) Be familiarized with the following knowledge: the concept of atmospheric circulation; the concept of thermodynamic circulation; the formation principle and scientific assumption of three-cell circulation; the status of the polar circulation; the global average zonal wind component and meridional wind component distribution in winter and summer; the concept of the core of atmospheric activity; the average conditions of atmospheric circulations in troposphere and stratosphere; the concept and forming principle of upper-level jet stream; topographic and thermal features in East Asia; the characteristics of circulation in East Asia.

(2) Be familiarized with the following knowledge: the concept of air mass, air mass variability and its classification; the concept of frontal edge, frontal zone and frontal line; thermal classification of frontal edge; the characteristics of pressure, temperature and wind fields near the frontal edge; the concept of occluded front; the weather phenomena possibly resulting from all kinds of fronts, especially frontal precipitation characteristics; the concept of frontogenesis; the significance of Frontogenesis formula; major frontogenesis belts in China.

(3) Be familiarized with the following knowledge: the quasi-geostrophic theory; the applications of the potential tendency equation and ω Equation; the concept of extratropical cyclone and extratropical anti-cyclone; the classification of extratropical cyclone and extratropical anti-cyclone; the life cycle of formation and development of extratropical cyclone; frontal cyclone weather; the concept of blocking high and cut-off low; the formation processes of blocking high and cut-off low; the weather resulting from blocking high and cut-off low.

(4) Be familiarized with the following knowledge: the formation of cloud; the characteristics of warm cloud precipitation and cold

cloud precipitation; the basic principle of precipitation formation and basic condition for rainstorm formation; the significance of water vapor equation and precipitation rate; the role of weather systems of various scales in precipitation; the concept of low-level jet and its impact on rainstorm; the impact of topography and friction on precipitation; the concept and features of Yangtze river and Huai river shear lines and southwest vortex; the main types of rainstorm and their characteristics of each in China.

(5) Be familiarized with the following knowledge: the concept of cold wave; the intensity ratings of cold wave and the characteristics of the weather; the outbreak path, outbreak process and condition of cold wave; the cold wave weather systems and processes; the position and role of key areas for cold wave outbreak.

(6) Be familiarized with the following knowledge: the concept of small scale and mesoscale; the characteristics and classification of mesoscale convective system; conditions resulting in atmospheric instability and convective weather; the cause of local changes in stability; the favorable conditions for occurrence and development of severe thunderstorms.

(7) Be familiarized with the following knowledge: Horizontal

distribution characteristics of meteorological elements in the tropics; the characteristics of atmospheric circulation at upper and lower tropical troposphere in winter and summer; the concept of tropical cyclones and typhoon; the activity pattern of tropical cyclone over the Western Pacific; the classification of tropical cyclones; the weather resulting from tropical cyclones; large-scale circulation system affecting the moving path of tropical cyclones; the concept, classification and formation principle of intertropical convergence zone and its seasonal variations; the concept and cause of the western Pacific subtropical high and its impact on weather in China; the concept, classification and formation principle of South Asia high and its impact on weather in China.

3. Bibliography

《天气学原理方法和方法》（第四版）朱乾根、林锦瑞、寿绍文等，气象出版社，2007。

V. Satellite Meteorological Applications

1. Exam Content

Meteorological satellite detection principle; identification of meteorological satellite images; clouds and weather systems on

meteorological satellite images.

2. Exam requirements

(1) Be familiarized with the following knowledge: characteristics and complementariness of near-polar sun-synchronous orbiting meteorological satellites (basic characteristics) and geostationary orbiting meteorological satellites (basic); the meanings of remote sensing, active and passive remote sensing remote sensing; the electromagnetic spectrum and its division; the basic law of radiation; solar and the earth-atmosphere system radiation spectrum; absorption bands and the atmospheric window; the limitations in satellite data accuracy, data errors and representative data.

(2) Be familiarized with the following knowledge: the feature of infrared channel detection; the feature of infrared channel cloud image; the feature of visible channel detection; the feature of visible channel cloud image; the feature of water vapor channel detection; the feature of water vapor channel cloud image; the feature of infrared-split window channels detection; the feature of infrared-split window channels cloud image; the feature of near-infrared channel; the characteristics of the near-infrared channel cloud image.

(3) Be familiarized with the following knowledge: six criteria for

identification of cloud on meteorological satellite image to correctly distinguish between cloud and ground; methods for identification of water, fog, snow, desert, sand and vegetation; identification of cloud patterns and cloud systems for the high, medium and low cloud types.

(4) Be familiarized with the following knowledge: large-scale cloud systems, such as: cyclone cloud system, Meiyu front shear line cloud system, upper-air jet stream cloud system, and cold vortex cloud system, and their physical relationship with weather systems on a weather map; mesoscale weather system's cloud systems, such as: mesoscale storm cloud cluster (MCC and MCS), strong convective cloud cluster (cloud squall line, strong thunderstorms and hail clouds), mountain lee wave cloud system, the cloud type characteristics and evolution in various weather systems and their correspondence with the radar echo.

3. Bibliography

《卫星气象学》陈渭民，气象出版社，2003。

VI. Principles and Applications of Doppler Weather Radar

1. Exam Content

Principle of the new generation weather radar in China; weather

radar image recognition; radar echo characteristics of convective storm; new generation weather radar products.

2. Exam requirements

(1) Be familiarized with the following knowledge: three components and functions of the new generation weather radar; scattering, attenuation, refraction of electromagnetic wave; radar meteorological equation; range folding; the principles of radar detection; the limitations in radar data accuracy, data errors and representative data.

(2) Be familiarized with the following knowledge: the Doppler effect; the main technical methods for measurement of reflectivity factors, mean radial velocity and velocity spectral width by Doppler weather radar; the concept of range folding and speed ambiguity; the working modality of the new generation weather radar; the data quality control principles and methods.

(3) Be familiarized with the following knowledge: the main features of the reflectivity image for stratiform precipitation, precipitation cumulus, cumulus and stratiformis mixing precipitation; the identification of boundary layer convergence line; the main feature of radial velocity maps in which wind changes with height; the

feature of radial velocity image of frontal edge; radial velocity characteristics of γ -scale systems.

(4) Be familiarized with the following knowledge: the conceptual model of convective cells; the classification of convective storm; the main factors affecting the generation of thunderstorm and diagnostic methods; the concept and physical meaning of relative helicity of storm; characteristics of the radar echo for pulse storm; the definition of cyclone; the definition of supercell storm and characteristics of the radar echo; the radar echo characteristics for squall lines.

(5) Be familiarized with the following knowledge: the commonly used products such as the basic reflectivity, mean radial velocity, composite reflectivity, vertical accumulated liquid water content, echo top heights, one-hour precipitation estimates, Mesocyclone, hail index, and tornado vortex characteristics; the principle of precipitation estimation.

3. Bibliography

《多普勒天气雷达原理与业务应用》俞小鼎，姚秀萍，熊廷南等，气象出版社，2005。

VII. Climatology

1. Exam Content

Distribution and classification of climate zones; the impact of ocean on the climate; climate in China; monsoon.

2. Exam requirements

(1) Be familiarized with the following knowledge: the geographic distribution of temperature and its influencing factors; four global precipitation belts and their geographical distribution; influencing factors of precipitation distribution; the concept of climate classification and the world climate classification (name one representative climate classification); precipitation characteristics of four global precipitation belts; Law of zonality in climate; basic climate types for various climate classifications.

(2) Be familiarized with the following knowledge: the differences in the land and sea surface thermal nature; the concept of the Walker circulation, the Southern Oscillation, EL Nino and La Nina; the effect of the Walker circulation, the Southern Oscillation, EL Nino and La Nina on climate, especially on climate in China; oceanic and continental climatic features and distribution; regulation by ocean of climate.

(3) Be familiarized with the following knowledge: the basic characteristics of climate in China; the concepts and definitions of the

monsoon; the components of the East Asian monsoon system; the climatological dates of the establishment, maintenance and withdrawal of the East Asian monsoon and its corresponding climate characteristics; the impact of the East Asian monsoon on climate in China; the circulation background of the East Asian monsoon; the establishment, maintenance and withdrawal of the East Asian monsoon; recent studies of the East Asian monsoon; climate zoning and climate characteristics in China.

3. Bibliography

《气象学与气候学基础》李爱贞等，气象出版社，2004。

《天气学原理方法和方法》朱乾根、林锦瑞、寿绍文等，气象出版社。

VIII. Meteorological Disasters

1. Exam Content

Types of meteorological disasters, critical factor in meteorological disasters and the critical weather condition resulting in disaster.

2. Exam requirements

Be familiarized with the following knowledge: the definitions of severe weather and meteorological disasters; meteorological disasters

grading principles; weather condition resulting in disaster; the common method used in determining the weather condition resulting in disaster.

3. Bibliography

《气象灾害风险评估与区划方法》章国材，气象出版社，2010。

Chapter 4 Exam on Weather Forecasting Skill

I. Analysis of Weather Chart

1. Exam Content

Basic analysis of weather chart; auxiliary weather chart analysis; analysis of frontal edge; analysis and application of pressure-temperature diagram (T-LogP).

2. Exam requirements

(1) Be familiarized with the following knowledge: the purpose of the different projection base maps; the meteorological meaning of upper-air weather chart plotting symbols; the principle, content and methods for analyzing ground and upper-air weather charts;

identification of troughs and ridges of longwave and shortwave; identification of blocking high and cut-off low; vorticity advection and temperature advection; changes in troughs and ridges; secondary circulation, especially the upward motion; asymmetrical troughs and ridges and their changes; vertical structure of the pressure system.

(2) Be familiarized with the following knowledge: generation and analysis of sectional view; identification of the position of the front area, the position and size of upper-air jet stream, and the position of the tropopause; analysis of upper-air wind chart; analysis of vertical wind shear between two layers and thermal wind direction; analysis of cold and warm advection; atmospheric static stability /or instability structure strengthening / weakening over time at either direction of two thickness layers; flow chart analysis; identification of cyclone, anticyclone, deformation field and convergence line; the analysis of isentropic.

(3) Be familiarized with the following knowledge: Analysis methods and principles of the frontal edge, in particular the analysis of the specific fronts in China; the effects of terrain on the frontal edge.

(4) Be familiarized with the following knowledge: Characteristic

quantities on T-LOGP graph; the concept of atmospheric instability; the criterion of atmospheric instability and its application; the concept of common convection parameters including CAPE\CIN\Si\K\Li\Sweat and their applications.

3. Bibliography

II. Weather Forecasting Operational Platform - Application of MICAPS and Short-term Nowcasting Forecasting Operational System (SWAN)

1. Exam Content

MICAPS structure; the main window of MICAPS3 system; data retrieval and graphics access; graphics display settings; basemap operation and layer editing; graphics saving; graphical analysis based on MICAPS; the other functions of MICAPS3; access to SWAN products; the operation of forecasting tools and generation of text products in SWAN system.

2. Exam requirements

(1) Be familiarized with the following knowledge: the data used in weather forecasting (conventional observation data, physical diagnosis data, satellite cloud image data, operational numerical

forecast product data, facsimile image, precipitation forecast data from abroad, radar data, etc.) and data directory, such as surface, high, ecmwf, satellite cloud image directory, fax, typhoon, grapes and so on.

(2) Be familiarized with the following knowledge: the start of MICAPS3; the components of main window for MICAPS3 and their functions.

(3) Be familiarized with the following knowledge: MICAPS3 file name search, integrated map search, menu search, parameter search, flip search, and animation; information search of the Internet and FTP server.

(4) Be familiarized with the following knowledge: the display and setting of the following items: MICAPS3 surface observations, upper-air observation plotting, TLOGP map, the temporal and spatial sectional view of sounding data, satellite data, radar data and NWP data; the display and setting of other data and basic geographic information.

(5) Be familiarized with the following knowledge: the operation of MICAPS3 basemap; interactive editing; how to save the edited results.

(6) Be familiarized with the following knowledge: the back office generation of MICAP3 basemap, its saving, its generation by batch, and editing of batch files.

(7) Be familiarized with the following knowledge: the configured MICAPS3 data monitoring; calculation of cumulative rainfall; the production of animation.

(8) Be familiarized with SWAN system's input data and product sets as well as directory structure.

(9) Be familiarized with how to access to SWAN menus and products.

(10) Be familiarized with the operation of SWAN severe weather real-time monitoring and alarm functions.

(11) Be familiarized with the operation of sectional view 3-D SWAN mosaic and vertical height replacement.

(12) Be familiarized with the access and use of real-time analysis products such as the mosaic of TREC wind and radar combined reflectivity in SWAN system, echo top height mosaic, and one-hour radar QPE mosaic.

(13) Be familiarized with the following knowledge: forecasting timeliness, graphic expressions and use of forecasting products such

as echo forecasting, QPF, storm tracking, and TITAN.

(14) Be familiarized with the production of SWAN text products and modification of text templates.

3. Bibliography

《MICAPS 3.0系统培训教材》吴洪，中国气象局培训中心。

《SWAN用户手册》，SWAN项目开发组。

III. Application of Operational NWP Products

1. Exam Content

Basic situation of numerical model; NWP products commonly used in operational forecasting; NWP products interpretation and application techniques.

2. Exam requirements

(1) Be familiarized with the characteristics of major operational models in China and the development trend of international major models.

(2) Be familiarized with the numerical model output products commonly used in operational NWP models from ECMWF, GRAPES, T213 / T639, MM5, WRF, Japan and Germany and their applications.

(3) Be familiarized with NWP products interpretation and

application techniques.

IV. Basic Skill of Weather Forecasting

1. Exam Content

0-24 hour forecasting for precipitation areas; 0-24 hour forecasting for elements.

2. Exam requirements

(1) General requirements: clearly and methodically analyze the weather situation; scientifically and rationally analyze, diagnose and forecast the developing and evolving weather system; be able to comprehensively use a variety of information and forecasting tools; produce reasonable short-range weather forecasting.

(2) Be familiarized with the following knowledge: the basic forecasting elements for the evolution of upper-air trough-ridge (including low vortex, shear line, blocking high and shear low); the basic forecasting elements for the evolution of ground high, low and frontal edge; the basic forecasting elements for tropical cyclone movement; the basic ideas and methods of the medium-range weather forecasting.

(3) Be familiarized with the basic elements for precipitation

forecasting (including rainstorm, snowstorm).

(4) Be familiarized with the basic elements for wind forecasting (including sandstorm).

(5) Be familiarized with the basic elements for temperature forecasting (including cold wave, high and low temperatures, frost).

(6) Be familiarized with the basic elements for fog forecasting.

(7) Be familiarized with the basic elements for typhoon path and wind speed forecasting.

(8) Be familiarized with the short-term forecast of strong convective weather potential.

V. Exam on Weather Forecasting Operational Norms

1. Exam Content

Proposed Methods for Issue and Dissemination of Meteorological Disaster Warning Signal (CMA Decree No. 16); Proposed Regulations on Weather Forecasting Scale Terms (QYH [2005] No. 53); Operational Regulations on National Nowcasting (QBF [2010] No. 19); Proposed Regulations on Fine Weather Forecasting (CMA [2006] No. 147).

2. Exam requirements

(1) Be familiarized with the following knowledge: classification of

meteorological disasters; the name, icons, standard of, response to, and issue of warning signals.

(2) Understand terms for weather forecasting scale.

(3) Be familiarized with the following knowledge: the definition of timeliness for short-range forecasting and nowcasting; the monitoring and warning of strong convective weather including short duration of heavy precipitation, hail, thunderstorms, tornadoes and lightning, a priority for short-range forecasting and nowcasting; division of operations and areas of responsibility; on-duty system; generation and release of forecasts and warning.

(4) Be familiarized with the following knowledge: the principle of refined forecasting; the insights of refined forecasting; the generation of refined forecasts including conventional weather elements, severe weather and meteorological disasters; validation methods.

Chapter 6 The Proportion of Test Content

The exam of basic knowledge of weather forecasting accounts for 55%, and the exam of basic skill of weather forecasting accounts for 40%, with weather forecasting operational norms for 5%.

In the exam of basic knowledge of weather forecasting, the meteorology (introduction to atmospheric science) accounts for 10%,

atmospheric sounding for 2%, synoptic meteorology for 18%, dynamic meteorology for 10%, satellite meteorology application for 5%, Doppler weather radar principle and application for 5%, climatology for 3%, and meteorological disasters for 2%.

In the exam of basic skill of weather forecasting, weather chart analysis accounts for 15%, basic skill of weather forecasting for 18% and operational platform of weather forecasting for 7%.

Chapter 7 Examination Modality and Structure

In the exams of basic knowledge of weather forecasting and of weather forecasting specification, it takes a form of closed book with a full score of 100, and an examination time of 120 minutes.

The exam of basic skill of weather forecasting takes the form of operation on computer. The full score is 100 points and the examination time is 120 minutes.

An exam paper typically includes such types of items as multiple choice, blank fill-in, short answer, and practical operation. The multiple choice type includes single-choice-out of-four and multiple-choice; blank fill-in only requires a direct result; short answer requires an answer to or analysis of problems in written form based on the questions or charts listed; practical operation includes an

analysis of weather chart, the generation of short-range weather forecasting and so on, which should be explained and justified in writing.

The test paper is composed of easy, medium difficult and difficult questions, taking medium difficult questions as a major part to be appropriate in terms of global difficulty.

Chapter 8 Statistics of Exam Scores

The consolidated score of a candidate equals to those for basic theoretical knowledge plus weather forecast operational norms multiplied by $\times 0.6$ and then plus basic skill of weather forecasting multiplied by 0.4.

Among them, the score for the test of basic skill of weather forecasting shall not be less than 25.