

## **Test Project 比赛内容**

### **Agricultural biotechnology 农业生物技术 TECHNICAL DESCRIPTION 技术描述**

The test project includes the following sections:比赛内容包含下面部分:

1. Introduction 介绍
2. Forms of participation in the competition 参与比赛的形式
3. Task for the competition 比赛任务
4. Task modules and required time 任务模块和所需时间
5. Evaluation criteria 评分标准
6. Required Applications 应用场合

Number of hours to complete the task: 15 h 完成比赛所需时间: 15 小时

## **1. INTRODUCTION 介绍**

### **1.1. Professional skill name and description 技能名称和描述**

1.1.1 Professional skill name: Agricultural biotechnologies 技能名称: 农业生物技术

#### 1.1.2. Professional skill description 技能描述

Agricultural biotechnologists receive, research and use enzymes, viruses, microorganisms, plant cell cultures, their biosynthesis and biotransformation products, production technologies of microbiological synthesis, biocatalysis, genetic engineering and nanotechnologies; they provide operation and quality management of biotechnological manufacturing, in compliance with national and international regulations, the management and quality control of raw materials, intermediate products, and finished product.

农业生物技术是对酶, 病毒, 微生物, 植物细胞培养, 生物合成和生物转化产物, 微生物合成的生产技术, 生物催化酶, 基因工程和纳米技术的接收, 研发和使用。他们按照国家和国际规范提供生物技术制造的操作和质量管理, 原料, 半成本和成品的管理和质量控制

The objects of agricultural biotechnologist's professional activity are: microorganisms, plant cell cultures, viruses, biologically active and chemical compounds obtained from it; technological processes of their production; Systems and vehicles for technological processes conduction; Devices and methods for properties research of used microorganisms, cell cultures and substances obtained from it in the laboratory and industrial conditions.

农业生物学家专业活动的对象是: 微生物, 植物细胞培养, 病毒, 具有生物活性的化合物, 生产的技术流程, 技术流程实施的系统和工具, 微生物性能研究的设备和方法, 细胞培养以及在实验室和工业条件下获得的物质。

Biotechnologist job also includes: 生物技术专家工作还包括

- implementation of plant clonal multiplication and adaptation technologies; 实施植物克隆繁殖和适应技术
- implementation of cultivation, storage, transportation and preselling preparation of crop production; 实施种植业的培养, 储存, 运输和预售准备
- crop production management. 种植业管理

### **1.2. Application area 应用领域**

1.2.1. Each Expert and Member is required to familiarize themselves with this Technical Description. 每一位专家和成员都应该熟悉技术描述

### **1.3. Supporting documentation 支持文件**

1.3.1. Since this Technical Description contains only information relating to the relevant professional skill, it must be used in conjunction with the following documents: 既然这份技术描述只包含和技能有关的信息, 它必须和下面的文件一起使用:

"WorldSkills Russia", Technical description. Agricultural biotechnologies; 俄罗

斯世界技能，技术描述，农业生物技术

- WorldSkills Russia, Rules of the Championship 俄罗斯世界技能比赛规则
- Host – Safety rules and sanitary norms. 主办方——安全规则和卫生规范

## 2. FORMS OF PARTICIPATION IN THE COMPETITION 参与比赛的形式

Individual competition. 个人比赛

### 3. TASK FOR THE COMPETITION 比赛任务

The content of the competition task is the research on clonal plants micropropagation. Competitors receive a script for the nutrient media preparation, supplies, equipment and reagents. Competitors receive a task. The competitive task has several modules that are executed sequentially. 比赛任务的内容是克隆植物繁殖，参赛者将会收到一份营养介质准备，供应，设备和试剂的脚本。选手接受任务，比赛任务有几个模块，这些模块需要按照顺序执行。

The competition includes the preparation of mother-liquors of nutrient media, the nutrient media themselves, the preparation and introduction of plant tissues into *in vitro* culture, the induction of callus formation and morphogenesis from sterile plant tissues, the analysis of species and varietal features of plants *in vitro*, the determination of the multiplication factor, rhizogenesis effectiveness and adaptation of micro plants.

比赛包含营养介质母液的准备，营养介质自身的准备，将植物组织引入体外培养，引导形成愈伤组织和来自不育植物组织的形态发生，物种分析和植物的品种特性，倍增因素的决定，生根效率和微植物的适应性。

The final aspects of the evaluation criteria are specified by the jury. The evaluation is carried out both with regard to the modules implementation, and to the process of competitive research conduction. If a Competitor does not comply with safety requirements, endangers himself or other Competitors, such participant may be removed from the competition. 评分标准的最终得分点是由裁判委员会规定的，评分是在模块执行过程中实施的，并对竞争研究过程进行传导，如果选手没有遵循安全要求，伤及自己或者其他选手，这样的参与者将会退出比赛。

Time and details of the competitive task, depending on the competitive conditions, can be changed by the members of the jury. 比赛任务的时间和细节，取决于比赛条件，可以有评审委员会做出改变。

Modules of competitive task must be executed sequentially. Evaluation also occurs from module to module. 比赛任务的模块必须按照顺序执行，评分

也是按照模块来进行。

#### 4. TASK MODULES AND REQUIRED TIME 任务模块和所需时间

Modules and time are summarized in Table 1 模块和时间在表 1 中汇总  
Table 1.

Item No.	Module name 模块名称	Labor hours 比赛时间段	Time for task 任务用时
1	Module 1: Preparation of Mother-liquors of nutrient media, including growth regulators and vitamins. 模块 1: 准备营养介质母液, 包含生长调节剂和维生素	S1 9.00–12.00	3 hours
2	Module 2: Preparation of nutrient media. 模块 2: 准备营养介质	S1 14.00–16.00	2 hours
3	Module 3: Preparation and introduction of plant tissues into <i>in vitro</i> culture. 模块 3: 植物组织的制备和体外培养	S2 09.00–12.00	3 hours
4	Module 4: Induction of callus formation and morphogenesis from sterile plant tissues. 模块 4: 从无菌植物组织引导愈伤组织的形成和形态发生	S2 14.00–16.00	2 hours
5	Module 5. Analysis of species and varietal features of plants <i>in vitro</i> , determination of the multiplication factor. 模块 5: 植物品种和特征的体外分析, 倍增因素的确定	S3 9.00–11.30	2.5 hours
6	Module 6: Determination of microplants rhizogenesis and adaptation effectiveness.微植物生根的测定和适应效率	SC3 13.00–15.30	2.5 hours

**Module 1: Preparation of Mother-liquors of nutrient media, including growth regulators and vitamins. 模块1: 营养介质母液的准备, 包含调节剂和维生素。**

The participant needs to compile and implement an algorithm for performing the experimental task in compliance with the script. The participant needs to prepare the necessary supplies. Choose the needed chemicals, break them into groups. Calculate the required amount of salts for the preparation of mother-liquors of macro and microelements, vitamins and growth regulators. Sign the solutions

选手需要按照脚本编译和实施一个算法用于执行实验任务, 选手需要准备必要的物品, 选择所需化学品, 把他们分成几份。计算为准备大量和微量母液所需的盐量, 维生素和生长调节剂, 签订方案

**Module 2: Preparation of nutrient media. 营养介质的准备**

To perform this module, it is necessary to compile and implement a research algorithm in compliance with the normative document. Prepare the equipment for the experiment. Choose the necessary mother-liquors of salts, growth regulators, vitamins. Calculate the required quantity of starting compounds for the preparation of 1 liter of a specified medium. Weigh agar, sucrose, inositol. Prepare a nutrient

medium according to the script. Determine the pH of the culture medium and set the required. Add growth regulators. Pour over the vessels, cork, sign.

为了操作这个模块，有必要按照标准文件编制和实施一个研发算法，准备实验设备，选择必要的盐的母液，生产调节剂，维生素，计算制备1升指定介质，称量琼脂，蔗糖，肌醇所需的起始化合物的数量。按照脚本准备营养介质，确定培养介质的PH值和设定所需数值，增加生产调节剂，倒在容器里，用木塞塞上，做好标记。

### **Module 3: Preparation and introduction of plant tissues into *in vitro* culture.** 植物组织的制备和体外培养

The participant needs to compile and implement an algorithm for performing the experimental task in compliance with the methodology. Prepare the necessary supplies. Perform preliminary plant tissues preparation for introduction *in vitro*. Calculate and prepare sterilization agent suitable for explants presented on the Championship. Perform plant tissues sterilization. Using a microscope, isolate and place the meristem on the nutrient medium in a test tube.

选手需要按照研究方法编制和实施执行实验任务的一个算法，准备必要的供给，为体外导入进行初步的植物组织准备。计算和准备在比赛中展示的外植体的杀菌灭藻剂。进行植物组织灭菌，使用显微镜，把营养介质上的分省组织隔离并放置在一个试管内。

### **Module 4: Induction of callus formation and morphogenesis from sterile plant tissues.** 从无菌植物组织引导愈伤组织的形成和形态发生

The participant needs to compile and implement an algorithm for performing the experimental task in compliance with the methodology. Choose a nutrient medium for callus formation and induction of adventitious shoots. Choose and prepare vegetative explants. Place explants on nutrient media. Perform hermetic sealing of culture vessels.

选手需要按照研究方法编制和实施执行实验任务的一个算法，选择营养介质用于愈伤组织形成和不定芽诱导，选择和准备植物的外植体，把外植体放在营养介质上，对培养容器进行密封。

### **Module 5. Analysis of species and varietal features of plants *in vitro*, determination of the multiplication factor.**

植物品种和特征的体外分析，确定倍增因素。

The participant needs to compile and implement an algorithm for performing the experimental task in compliance with the methodology. Select the environment for reproduction and rooting. Transplant the plants for reproduction and rooting. Determine the multiplication factor.

选手需要按照研究方法编制和实施执行实验任务的一个算法，选择繁殖和生根的环境，移植植物以繁殖和生根，确定倍增因子。

### **Module 6: Determination of microplants rhizogenesis and adaptation**

**effectiveness.** 微植物生根的测定和适应效率

The participant needs to compile and implement an algorithm for performing the experimental task in compliance with the methodology. Count the number of rooted plants, roots per plant, measure the length of the roots. Prepare cassettes with a substrate and sown the plants for adaptation.

选手需要按照研究方法编制和实施执行实验任务的一个算法，统计已生根植物数量，每根植物根数，跟的长度。准备带酶的盒子并播种来适应。

This section defines the evaluation criteria and the number of points awarded (subjective and objective) table 2. The total points of the task/module for all evaluation criteria is 100.表2明确了评分标准和获得的分值（主观和客观），评分标准中任务/模块的总分是100

Table 2.表2

Section	Criterion 标准	Rating 等级		
		Subjective主观 (如有) (if applicable)	Objective客 观	Total 总分
A	Safety at work 安全操作 Selection of supplies and preparation of solutions 供应选择和方案准备 The workplace organization 工作场所组织 Technique for the selected task 所选任务的技巧 Decoding and analysis of the received data解码和分析接收到的数据	0	15	15
B	Safety at work 安全操作 Selection of supplies 供应选择 The workplace organization 工作场所组织 Technique for the selected task所选任务的技巧 Decoding and analysis of the received data对接收到的数据进行解码和分析 Recycling 循环	0	15	15
C	Safety at work 安全操作 Selection of supplies and preparation of reagents 供应选择和准备试剂 The workplace organization工作场所组织 Technique for the selected task 任务技巧 Decoding and analysis of the received data对接收数据进行解码和分析 Recycling 循环	0	20	20
D	Safety at work安全操作 Selection of media 选择介质 The workplace organization 工作场所组织 Technique for the selected task 任务技巧 Decoding and analysis of the received data对接收数据进行解码和分析 Recycling 循环	0	15	15

<b>E</b>	Safety at work安全操作 Selection of media选择介质 The workplace organization工作场所组织 Technique for the selected task任务技巧 Decoding and analysis of the received data对接收数据进行解码和分析 Recycling循环	0	20	20
<b>F</b>	Safety at work安全操作 Selection of media选择介质 The workplace organization工作场所组织 Technique for the selected task任务技巧 Decoding and analysis of the received data对接收数据进行解码和分析 Recycling循环	0	15	15
Total = 总计			100	100

**Subjective assessment** – Not applicable. 主观评分- 不适用