Ontology-based Expert System for a Generic Drug Production of Pharmaceutical Dosage Forms

Test Record

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**Dr. Chartchai Doungsa-ard**

# Document History

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[[1]](#footnote-1)

Table of Contents

[Document History 2](#_Toc401699062)

[Chapter | 1 Introduction 4](#_Toc401699063)

[1.1 Purpose 4](#_Toc401699064)

[1.2 Responsibility 4](#_Toc401699065)

[Chapter | 2 Unit Test Record 1](#_Toc401699066)

[2.1 Unit Test Record for Client Side (UTR-CI). 1](#_Toc401699067)

[2.1.1 SubstanceCtrl Class. 1](#_Toc401699068)

[2.1.2 ExcipientCtrl Class. 6](#_Toc401699069)

[2.1.3 FormulationCtrl Class. 10](#_Toc401699070)

[2.1.4 FormulationCtrl Class. 14](#_Toc401699071)

[2.1.5 ReformulationHisCtrl Class. 15](#_Toc401699072)

[2.2 Unit Test Record for Server Side (UTR-SV). 17](#_Toc401699073)

[2.2.1 SubstanceServiceImpl Class. 17](#_Toc401699074)

[2.2.2 ExcipientServiceImpl Class. 22](#_Toc401699075)

[2.2.3 FormulationServiceImpl Class. 27](#_Toc401699076)

[2.2.4 ReformulationHistoryServiceimpl Class. 31](#_Toc401699077)

[2.2.5 InferenceEngineDirector Class. 35](#_Toc401699078)

# Introduction

## Purpose

The purpose of test record for Ontology Base Expert System for Generic Drug Production of Pharmaceutical Dosage Form is for recording the actual result and pass/fail criteria of each test case that have designed in the test plan and executed.

This document will include Unit Testing Record which contains Test date, Person who responsibility of Testing Record and Testing Record Table.

**Test Record** is a document, which recording the actual result of each test case that have designed in the test plan.

## Acronyms

|  |  |
| --- | --- |
| OEGP | Ontology-based Expert System for a Generic Drug Production of Pharmaceutical Dosage Forms |
| PDPO | Pharmaceutical Dosage Form Production Ontology |
| URS | User Requirement Specification |
| SRS | System Requirement Specification |
| CD | Class diagram |
| CD-CI | Class diagram For Client Side |
| CD-SV | Class diagram For Server Side. |
| SQD | Sequence Diagram |
| SQD-CI | Sequence Diagram For Client Side |
| SQD-SV | Sequence Diagram For Server Side |
| UI | User interface |
| SDD | Software Design Document |
| UTC-CI | Unit Test Case For Client Side |
| UTC-SV | Unit Test Case For Server Side |
| UTR-CI | Unit Test Record For Client Side |
| UTR-SV | Unit Test Record For Server Side |

## Responsibility

|  |  |
| --- | --- |
| **Item** | **Responsibility** |
| Record unit test of Server Part | Narongrit Saisuwan |
| Record unit test Client Part | Panupak Wichaidit |

# Unit Test Record

## Unit Test Record for Client Side (UTR-CI).

### SubstanceCtrl Class.

#### Unit Test Record for Client Side 01 (UTR-CI-01)

**addNewSubstance(substance : Substance ): Substance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | status |
| Substance object | Substance object | Substance object |
| 1 | Test add substance object which is correct the formal of substance object. | (null,“substancename”,”watersolubility”,{“stability1”,”stability2”},3.4,4.6,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility2”,  ”flowability2”,4,”saltfrom2”,5.34,”iconicity2”} | (not null,“substancename2”,”watersolubility2”,{“stability1”,”stability2”},3.4,4.6,  ”solidstate2”,”hygroscopicity2”,”particlesize2”,”alcohosolubility2”,  ”flowability2”,4,”saltfrom2”,5.34,”iconicity2”} | (not null,“substancename”,”watersolubility1”,{“stability”,”stability1”},3,4,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility”,  ”flowability”,4,”saltfrom”,5,”iconicity”} | N/A |
| 2 | Test add substance object which is correct the formal of substance object. | (null,“substancename1”,”watersolubility1”,{“stability3”,”stability4”},6.32,7.67,  ”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,  ”flowability1”,4.34,”saltfrom1”,5.90,”iconicity1”} | (not null,“substancename1”,”watersolubility1”,{“stability3”,”stability4”},6.32,7.67,  ”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,  ”flowability1”,4.34,”saltfrom1”,5.90,”iconicity1”} | (not null,“substancename1”,”watersolubility1”,  {“stability3”,”stability4”},5,7,”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,”flowability1”,5,”saltfrom1”  ,8,”iconicity1”} | N/A |
| 3 | Test add substance object which is contained in the database already. | (“3”,“substancename2”,”watersolubility2”,{“stability1”,”stability2”},3.45,4.32,  ”solidstate2”,”hygroscopicity2”,”particlesize2”,”alcohosolubility2”,  ”flowability2”,4.3,”saltfrom2”,5.45,”iconicity2”} | null | null | N/A |
| 4 | Test add substance object which is contained in the  database already. | (“4”,“substancename3”,”watersolubility3”,{“stability3”,”stability4”},6.56,7.32,  ”solidstate3”,”hygroscopicity3”,”particlesize3”,”alcohosolubility3”,  ”flowability3”,4.56,”saltfrom3”,5,”iconicity3”} | null | null | N/A |

#### Unit Test Record for Client Side 02 (UTR-CI-02)

**updateSubstance( substance : Substance): Substance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Substance object | Substance object | Substance object |
| 1 | Test update substance object which is correct the formal of substance object and contained in the database. | (“3”,“substancename”,”watersolubility”,{“stability1”,”stability2”},3.34,4.56,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility2”,  ”flowability”,4.67,”saltfrom”,5.12,”iconicity”} | (“3”,“substancename”,”watersolubility”,{“stability1”,”stability2”},3.34,4.56,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility2”,  ”flowability”,4.67,”saltfrom”,5.12,”iconicity”} | (“3”,“substancename2”,”watersolubility2”,{“stability1”,”stability2”},3,4,  ”solidstate2”,”hygroscopicity2”,”particlesize2”,”alcohosolubility2”,  ”flowability2”,4,”saltfrom2”,5,”iconicity2”} | N/A |
| 2 | Test update substance object which is correct the formal of substance object and contained in the database. | (“4”,“substancename1”,”watersolubility3”,{“stability3”,”stability4”},5.32,7.56,  ”solidstate3”,”hygroscopicity3”,”particlesize3”,”alcohosolubility3”,  ”flowability3”,5.89,”saltfrom1”,8.32,”iconicity3”} | (“4”,“substancename1”,”watersolubility3”,{“stability3”,”stability4”},5.32,7.56,  ”solidstate3”,”hygroscopicity3”,”particlesize3”,”alcohosolubility3”,  ”flowability3”,5.89,”saltfrom1”,8.32,”iconicity3”} | (“4”,“substancename3”,”watersolubility3”,{“stability3”,”stability4”},5,7,  ”solidstate3”,”hygroscopicity3”,”particlesize3”,”alcohosolubility3”,  ”flowability3”,5,”saltfrom1”,8,”iconicity3”} | N/A |
| 3 | Test update substance object which is not contained in the database. | (“1”,“substancename4”,”watersolubility4”,{“stability1”,”stability2”},3,4,  ”solidstate4”,”hygroscopicity4”,”particlesize4”,”alcohosolubility4”,  ”flowability4”,4,”saltfrom4”,5,”iconicity4”} | null | null | N/A |
| 4 | Test update substance object which is not contained in the database. | (“2”,“substancename5”,”watersolubility5”,{“stability1”,”stability2”},3,4,  ”solidstate5”,”hygroscopicity5”,”particlesize5”,”alcohosolubility5”,  ”flowability5”,5,”saltfrom5”,5,”iconicity5”} | null | null | N/A |

#### Unit Test Record for Client Side 03 (UTR-CI-03)

**deleteSubstance(substance : Substance): Substance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Substance object | Substance object | Substance object |
| 1 | Test delete substance object which is contained in database. | (“3”,“substancename”,”watersolubility”,{“stability1”,”stability2”},3.43,4.67,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility”,  ”flowability”,4.78,”saltfrom”,5.10,”iconicity”} | (“3”,“substancename”,”watersolubility”,{“stability1”,”stability2”},3.43,4.67,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility”,  ”flowability”,4.78,”saltfrom”,5.10,”iconicity”} | (null,“substancename”,”watersolubility”,  {“stability1”,”stability2”},3,4,”solidstate”,”hygroscopicity”,  ”particlesize”,”alcohosolubility”,”flowability”,4,”saltfrom”,  5,”iconicity”) | N/A |
| 2 | Test delete substance object which is contained in database. | (“4”,“substancename1”,”watersolubility1”,{“stability3”,”stability4”},5.55,7.54,  ”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,  ”flowability1”,5.90,”saltfrom1”,8.45,”iconicity1”} | (“4”,“substancename1”,”watersolubility1”,{“stability3”,”stability4”},5.55,7.54,  ”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,  ”flowability1”,5.90,”saltfrom1”,8.45,”iconicity1”} | (null,“substancename1”,”watersolubility1”  ,{“stability3”,”stability4”},5,7,”solidstate1”,”hygroscopicity1”,  ”particlesize1”,”alcohosolubility1”,”flowability1”,5,”saltfrom1”,  8,”iconicity1”} | N/A |
| 3 | Test delete substance object which is not contained in database. | ( “1”,“substancename2”,”watersolubility2”,  {“stability1”,”stability2”},3.45,4.45,”solidstate2”,”hygroscopicity2”,  ”particlesize2”,”alcohosolubility2”,”flowability2”,4.78,”saltfrom2”,  5.86,”iconicity2”) | null | null | N/A |
| 4 | Test delete substance object which is not contained. | ( “2”,“substancename3”,”watersolubility3”,  {“stability1”,”stability2”},3.34,4.56,”solidstate3”,”hygroscopicity3”,  ”particlesize3”,”alcohosolubility3”,”flowability3”,4.56,”saltfrom2”,  5.56,”iconicity3”) | null | null | N/A |

#### Unit Test Record for Client Side 04 (UTR-CI-04)

**getSubstanceList : Substance[]**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Actual result | Status |
| List of substance object | List of substance object |
| 1 | Test get all substance list | { substance1,substance2} | { substance1,substance2} | N/A |

### ExcipientCtrl Class.

#### Unit Test Record for Client Side 05 (UTR-CI-05)

**addNewExcipient(excipient : Excipient): Excipient**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Excipient object | Excipient object | Excipient object |
| 1 | Test excipient which is correct the formal excipient object. | (null,substance1,{substanceFunction1, substanceFunction1} , 1.45) | (not null, substance1 , { substanceFunction1, substanceFunction3} , 1.45) | (not null, substance1 , { substanceFunction1, substanceFunction3} , 1) | N/A |
| 2 | Test add excipient which is correct the formal of excipient object. | (null, substance2 , { substanceFunction2, substanceFunction4} , 2.04) | (not null, substance4 , { substanceFunction2, substanceFunction4} , 2.04) | (not null, substance4 , { substanceFunction2, substanceFunction4} , 2) | N/A |
| 3 | Test add excipient object which is contained in the database already. | (“3”, substance3 , { substanceFunction1, substanceFunction2} , 3.56) | null | null | N/A |
| 4 | Test add excipient object which is contained in the database already. | ( “4”, substance4, { substanceFunction3, substanceFunction4} , 4.06) | null | null | N/A |

#### Unit Test Record for Client Side 06 (UTR-CI-06)

**updateExcipient(**excipient **:** Excipient**) :** Excipient

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Expect Result | Status |
| Excipient object | Excipient object | Excipient object |
| 1 | Test update excipient which is correct the formal of object excipient and contained in the database. | (“3” , substance1 , { substanceFunction1, substanceFunction2} , 5.3) | (“3” , substance1 , { substanceFunction1, substanceFunction2} , 5.3) | (“3” , substance1 , { substanceFunction1, substanceFunction2} , 5) | N/A |
| 2 | Test update excipient which is correct the formal of excipient object and contained in the database. | (“4” , substance2, { substanceFunction3, substanceFunction4} , 7.6) | (“4” , substance2, { substanceFunction3, substanceFunction4} , 7.6) | (“4” , substance2, { substanceFunction3, substanceFunction4} , 7) | N/A |
| 3 | Test update excipient which is not contained in the database. | (“1” , substance1 , { substanceFunction1, substanceFunction2} , 4) | null | null | N/A |
| 4 | Test update excipient which is not contained in the database. | (“2” , substance2 , { substanceFunction3, substanceFunction4} , 9) | null | null | N/A |

#### Unit Test Record for Client Side 07 (UTR-CI-07)

**deleteExcipient (excipient : Excipient):Excipient**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Excipient object | Excipient object | Excipient object |
| 1 | Test delete excipient which is contained in database. | (“3” , substance3 , { substanceFunction1, substanceFunction2} , 3.4) | (null, substance3 , {substanceFunction1, substanceFunction2} , 3.4) | (null, substance3 , {substanceFunction1, substanceFunction2} , 3) | N/A |
| 2 | Test delete excipient which is contained in database. | (“4” , substance4, { substanceFunction3, substanceFunction4} , 4.9) | (null , substance4, {substanceFunction3, substanceFunction4} , 4.9) | (null , substance4, {substanceFunction3, substanceFunction4} , 4) | N/A |
| 3 | Test delete excipient which is not contained in database. | (“1” , substance1, { substanceFunction3, substanceFunction4} , 5.5) | null | null | N/A |
| 4 | Test delete excipient which is not contained in database. | (“2” , substance2, { substanceFunction1, substanceFunction2} , 7.9) | null | null | N/A |

#### Unit Test Record for Client Side 08 (UTR-CI-08)

**getAllExcipient** **() : Excipient []**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Actual result | Status |
| excipient object List | excipient object List |
| 1 | Test get all excipient list. | { excipient1,excipient2} | { excipient1,excipient2} | N/A |

#### Unit Test Record for Client Side 09 (UTR-CI-09)

**getSubstaneList() : Substance []**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Expect result | Status |
| substance object List | substance object List |
| 1 | Test get all substance list. | { substance1, substance2, substance3, substance4} | { substance1, substance2, substance3, substance4} | N/A |

#### Unit Test Record for Client Side 10 (UTR-CI-10)

**getCurrentSubstanceFnList() : SubstanceFunction []**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Actual result | Status |
| substanceFunction object List | substanceFunction object List |
| 1 | Test get all substanceFunction list. | { substanceFunction1, substanceFunction2, substanceFunction3, substanceFunction4} | { substanceFunction1, substanceFunction2, substanceFunction3, substanceFunction4} | N/A |

### FormulationCtrl Class.

#### Unit Test Record for Client Side 11 (UTR-CI-11)

**addFormulation(formulation : Formulation) : Formulation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Expect Result | Status |
| Formulation object | Formulation object | Formulation object |
| 1 | Test add formulation object which is correct the formal of formulation object. | (null , “name1”, “type1”, 1.9, {excipient1,excipient2}) | (not null , “name1”, “type1”, 1.9, {excipient1,excipient2}) | (not null , “name1”, “type1”, 1, {excipient1,excipient2}) | N/A |
| 2 | Test add formulation which is correct the formal of formulation object. | (null , “name4”, “type4”, 4.3, {excipient3,excipient4}) | (not null, “name4”, “type4”, 4.3, {excipient3,excipient4}) | (not null, “name4”, “type4”, 4, {excipient3,excipient4}) | N/A |
| 3 | Test add formulation object which is contained in the database already. | (“3” , “name3”, “type3”, 3.5, {excipient1,excipient2}) | null | null | N/A |
| 4 | Test add formulation object which is contained in the database already. | (“4” , “name4”, “type4”, 4.7, {excipient3,excipient4}) | null | null | N/A |

#### Unit Test Record for Client Side 12 (UTR-CI-12)

**updateFormulation(formulation : Formulation) : Formulation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Expect Result | Status |
| formulation object | formulation object | formulation object |
| 1 | Test update formulation object which is correct the formal of formulation object. | (“3” , “name1”, “type1”, 1.4, {excipient3,excipient4}) | (“3” , “name1”, “type1”, 1.4, {excipient3,excipient4}) | (“3” , “name1”, “type1”, 1, {excipient3,excipient4}) | N/A |
| 2 | Test update formulation object which is correct the formal of formulation object. | (“4” , “name2”, “type2”, 2.2, {excipient1,excipient2}) | (“4” , “name2”, “type2”, 2.2, {excipient1,excipient2}) | (“4” , “name2”, “type2”, 2, {excipient1,excipient2}) | N/A |
| 3 | Test update formulation object which is not contained in the database. | (“1” , “name1”, “type1”, 1.5, {excipient1,excipient2}) | null | null | N/A |
| 4 | Test update formulation object which is not contained in the database. | (“2” , “name2”, “type2”, 2.7, {excipient3,excipient4}) | null | null | N/A |

#### Unit Test Record for Client Side 13 (UTR-CI-13)

**deleteFormulation(formulation : Formulation) : Formulation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| formulation object | formulation object | formulation object |
| 1 | Test delete formulation object which is contained in database and correct format formulation object. | (“3” , “name3”, “type3”, 3.5, {excipient1,excipient2}) | (“3” , “name3”, “type3”, 3.5, {excipient1,excipient2}) | (“3” , “name3”, “type3”, 3, {excipient1,excipient2}) | N/A |
| 2 | Test delete formulation object which is contained in database and correct format formulation object. | (“4” , “name4”, “type4”, 4.9, {excipient3,excipient4}) | (“4” , “name4”, “type4”, 4.9, {excipient3,excipient4}) | (“4” , “name4”, “type4”, 4, {excipient3,excipient4}) | N/A |
| 3 | Test delete formulation object which is not contained in database. | (“1” , “name1”, “type1”, 1.4, {excipient1,excipient1}) | null | null | N/A |
| 4 | Test delete formulation object which is not contained in database. | (“2” , “name2”, “type2”, 2.8, {excipient3,excipient4}) | null | null | N/A |

#### Unit Test Record for Client Side 14 (UTR-CI-14)

**geFormulationList() : Formulation []**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Actual result | Status |
| List of formulation object | List of formulation object |
| 1 | Test get all formulation object list. | {formulation1,formulation2} | {formulation1,formulation2} | N/A |

#### Unit Test Record for Client Side 15 (UTR-CI-15)

**getExcipientList** **() : Excipient []**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Actual result | Status |
| excipient object List | List of excipient object |
| 1 | Test get all excipient list. | { excipient1,excipient2} | {formulation1,formulation2} | N/A |

### FormulationCtrl Class.

#### Unit Test Record for Client Side 16 (UTR-CI-16)

**getFormulationList() : Formulation []**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| case | Description | Expect result | Expect result | Actual result | Status |
| List of formulation object | List of formulation object | List of formulation object |
| 1 | Test get all formulation list | { reformulation1, reformulationHistory2, reformulationHistory3, reformulationHistory2 } | { reformulation1, reformulationHistory2, reformulationHistory3, reformulationHistory2 } | { reformulation1, reformulationHistory2, reformulationHistory3, reformulationHistory2 } | N/A |

### ReformulationHisCtrl Class.

#### Unit Test Record for Client Side 17 (UTR-CI-17)

**updateReformulationHistory(reformulationHistory : ReformulationHistory) : ReformulationHistory**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Status |
| reformulationHistory object | reformulationHistory object |
| 1 | Test update reformulationHistory object which is correct the formal of reformulationHistory object and contained in the database. | (“3”, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | (“3”, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | N/A |
| 2 | Test update reformulationHistory object which is correct the formal of reformulationHistory object and contained in the database. | (“4”, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | (“4”, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | N/A |
| 3 | Test update reformulationHistory object which is not contained in the database. | (“1”, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | null | N/A |
| 4 | Test update reformulationHistory object which is not contained in the database. | (“2”, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | null | N/A |

#### Unit Test Record for Client Side 18 (UTR-CI-18)

**deleteReformulationHistory(String id) : ReformulationHistory**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Expect Result | Status |
| Id | reformulationHistory object | reformulationHistory object |
| 1 | Test delete reformulationHistory object which is contained in database and correct format reformulationHistory object. | “3” | (“3”, {reformulatedProduction1, reformulatedProduction2},”5/10/2014 “, user1) | (“3”, {reformulatedProduction1, reformulatedProduction2},”5/10/2014 “, user1) | N/A |
| 2 | Test delete reformulationHistory object which is contained in database and correct format reformulationHistory. | “4” | (“4”, {reformulatedProduction3, reformulatedProduction4},”7/4/2008 “, user2) | (“4”, {reformulatedProduction3, reformulatedProduction4},”7/4/2008 “, user2) | N/A |
| 3 | Test delete reformulationHistory object which is not contained in database or incorrect format reformulationHistory object. | “1” | null | null | N/A |
| 4 | Test delete reformulationHistory object which is not contained in database or incorrect format reformulationHistory object. | “2” | null | null | N/A |

## Unit Test Record for Server Side (UTR-SV).

### SubstanceServiceImpl Class.

#### Unit Test Record for Server Side 01 (UTR-SV-01)

**add (substance: Substance): Substance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Substance object | Substance object | Substance object |
| 1 | Test add substance object which is correct the formal of substance object. | (null,“substancename”,”watersolubility”,{“stability1”,”stability2”},3,4,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility”,  ”flowability”,4,”saltfrom”,5,”iconicity”} | (not null,“substancename”,”watersolubility1”,{“stability”,”stability1”},3,4,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility”,  ”flowability”,4,”saltfrom”,5,”iconicity”} | (not null,“substancename”,”watersolubility1”,{“stability”,”stability1”},3,4,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility”,  ”flowability”,4,”saltfrom”,5,”iconicity”} | pass |
| 2 | Test add substance object which is correct the formal of substance object. | (null,“substancename1”,”watersolubility1”,{“stability3”,”stability4”},5,7,  ”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,  ”flowability1”,5,”saltfrom1”,8,”iconicity1”} | (not null,“substancename1”,”watersolubility1”,  {“stability3”,”stability4”},5,7,”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,”flowability1”,5,”saltfrom1”  ,8,”iconicity1”} | (not null,“substancename1”,”watersolubility1”,  {“stability3”,”stability4”},5,7,”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,”flowability1”,5,”saltfrom1”  ,8,”iconicity1”} | pass |
| 3 | Test add substance object which is contained in the database already. | (“3”,“substancename2”,”watersolubility2”,{“stability1”,”stability2”},3,4,  ”solidstate2”,”hygroscopicity2”,”particlesize2”,”alcohosolubility2”,  ”flowability2”,4,”saltfrom2”,5,”iconicity2”} | null | null | pass |
| 4 | Test add substance object which is contained in the  database already. | (“4”,“substancename3”,”watersolubility3”,{“stability3”,”stability4”},6,7,  ”solidstate3”,”hygroscopicity3”,”particlesize3”,”alcohosolubility3”,  ”flowability3”,4,”saltfrom3”,5,”iconicity3”} | null | null | pass |

#### Unit Test Record for Server Side 02 (UTR-SV-02)

**update(substance: Substance): Substance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Substance object | Substance object | Substance object |
| 1 | Test update substance object which is correct the formal of substance object and contained in the database. | (“3”,“substancename2”,”watersolubility2”,{“stability1”,”stability2”},3,4,  ”solidstate2”,”hygroscopicity2”,”particlesize2”,”alcohosolubility2”,  ”flowability2”,4,”saltfrom2”,5,”iconicity2”} | (“3”,“substancename2”,”watersolubility2”,{“stability1”,”stability2”},3,4,  ”solidstate2”,”hygroscopicity2”,”particlesize2”,”alcohosolubility2”,  ”flowability2”,4,”saltfrom2”,5,”iconicity2”} | (not null,“substancename”,”watersolubility1”,{“stability”,”stability1”},3,4,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility”,  ”flowability”,4,”saltfrom”,5,”iconicity”} | pass |
| 2 | Test update substance object which is correct the formal of substance object and contained in the database. | (“4”,“substancename3”,”watersolubility3”,{“stability3”,”stability4”},5,7,  ”solidstate3”,”hygroscopicity3”,”particlesize3”,”alcohosolubility3”,  ”flowability3”,5,”saltfrom1”,8,”iconicity3”} | (“4”,“substancename3”,”watersolubility3”,{“stability3”,”stability4”},5,7,  ”solidstate3”,”hygroscopicity3”,”particlesize3”,”alcohosolubility3”,  ”flowability3”,5,”saltfrom1”,8,”iconicity3”} | (not null,“substancename1”,”watersolubility1”,  {“stability3”,”stability4”},5,7,”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,”flowability1”,5,”saltfrom1”  ,8,”iconicity1”} | pass |
| 3 | Test update substance object which is not contained in the database. | (,“substancename4”,”watersolubility4”,{“stability1”,”stability2”},3,4,  ”solidstate4”,”hygroscopicity4”,”particlesize4”,”alcohosolubility4”,  ”flowability4”,4,”saltfrom4”,5,”iconicity4”} | null | null | pass |
| 4 | Test update substance object which is not contained in the database. | (null,“substancename5”,”watersolubility5”,{“stability1”,”stability2”},3,4,  ”solidstate5”,”hygroscopicity5”,”particlesize5”,”alcohosolubility5”,  ”flowability5”,5,”saltfrom5”,5,”iconicity5”} | null | null | pass |

#### Unit Test Record for Server Side 03 (UTR-SV-03).

**delete(substance : Substance): Substance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Substance object | Substance object | Substance object |
| 1 | Test delete substance object which is contained in database. | (“3”l,“substancename”,”watersolubility”,  {“stability1”,”stability2”},3,4,”solidstate”,”hygroscopicity”,  ”particlesize”,”alcohosolubility”,”flowability”,4,”saltfrom”,  5,”iconicity”) | (null,“substancename”,”watersolubility”,  {“stability1”,”stability2”},3,4,”solidstate”,”hygroscopicity”,  ”particlesize”,”alcohosolubility”,”flowability”,4,”saltfrom”,  5,”iconicity”) | (null,“substancename”,”watersolubility”,  {“stability1”,”stability2”},3,4,”solidstate”,”hygroscopicity”,  ”particlesize”,”alcohosolubility”,”flowability”,4,”saltfrom”,  5,”iconicity”) | pass |
| 2 | Test delete substance object which is contained in database. | (“4”,“substancename1”,”watersolubility1”  ,{“stability3”,”stability4”},5,7,”solidstate1”,”hygroscopicity1”,  ”particlesize1”,”alcohosolubility1”,”flowability1”,5,”saltfrom1”,  8,”iconicity1”} | (null,“substancename1”,”watersolubility1”  ,{“stability3”,”stability4”},5,7,”solidstate1”,”hygroscopicity1”,  ”particlesize1”,”alcohosolubility1”,”flowability1”,5,”saltfrom1”,  8,”iconicity1”} | (null,“substancename1”,”watersolubility1”  ,{“stability3”,”stability4”},5,7,”solidstate1”,”hygroscopicity1”,  ”particlesize1”,”alcohosolubility1”,”flowability1”,5,”saltfrom1”,  8,”iconicity1”} | pass |
| 3 | Test delete substance object which is not contained in database. | ( “1”,“substancename2”,”watersolubility2”,  {“stability1”,”stability2”},3,4,”solidstate2”,”hygroscopicity2”,  ”particlesize2”,”alcohosolubility2”,”flowability2”,4,”saltfrom2”,  5,”iconicity2”) | null | null | pass |
| 4 | Test delete substance object which is not contained. | ( “2”,“substancename3”,”watersolubility3”,  {“stability1”,”stability2”},3,4,”solidstate3”,”hygroscopicity3”,  ”particlesize3”,”alcohosolubility3”,”flowability3”,4,”saltfrom2”,  5,”iconicity3”) | null | null | Pass |

#### Unit Test Record for Server Side 04 (UTR-SV-04)

**getAllSubstance : Substance[]**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Actual Result | status |
| List of substance object | List of substance object | pass |
| 1 | Test get all substance list | { substance1,substance2} | { substance1,substance2} | pass |

#### Unit Test Record for Server Side 05 (UTR-SV-05)

**getSubstanceById (id : String):Substance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| substance id | Substance object | Substance object |
| 1 | Test get substance object which is contained in database by substance id. | 1 | (1,“substancename”,”watersolubility”,{“stability1”,”stability2”},3,4,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility”,  ”flowability”,4,”saltfrom”,5,”iconicity”} | (1,“substancename”,”watersolubility”,{“stability1”,”stability2”},3,4,  ”solidstate”,”hygroscopicity”,”particlesize”,”alcohosolubility”,  ”flowability”,4,”saltfrom”,5,”iconicity”} | pass |
| 2 | Test get substance object which is contained in database by substance id. | 2 | (2,“substancename1”,”watersolubility1”,{“stability3”,”stability4”},5,7,  ”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,  ”flowability1”,5,”saltfrom1”,8,”iconicity1”} | (2,“substancename1”,”watersolubility1”,{“stability3”,”stability4”},5,7,  ”solidstate1”,”hygroscopicity1”,”particlesize1”,”alcohosolubility1”,  ”flowability1”,5,”saltfrom1”,8,”iconicity1”} | pass |
| 3 | Test get substance object which is not contain in database by substance id. | 3 | null | null | pass |
| 4 | Test get substance object which is not contain by substance id in database. | 4 | Null | Null | pass |

### ExcipientServiceImpl Class.

#### Unit Test Record for Server Side 06 (UTR-SV-06)

**addExcipient(excipient : Excipient): Excipient**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Excipient object | Excipient object | Excipient object |
| 1 | Test excipient which is correct the formal excipient object. | (null,substance1,{substanceFunction1, substanceFunction1} , 1) | (not null, substance1 , { substanceFunction1, substanceFunction3} , 1) | (not null, substance1 , { substanceFunction1, substanceFunction3} , 1) | pass |
| 2 | Test add excipient which is correct the formal of excipient object. | (null, substance2 , { substanceFunction2, substanceFunction4} , 2) | (not null, substance4 , { substanceFunction2, substanceFunction4} , 2) | (not null, substance4 , { substanceFunction2, substanceFunction4} , 2) | pass |
| 3 | Test add excipient object which is contained in the database already. | (“3”, substance3 , { substanceFunction1, substanceFunction2} , 3) | null | null | pass |
| 4 | Test add excipient object which is contained in the database already. | ( “4”, substance4, { substanceFunction3, substanceFunction4} , 4) | null | null | pass |

#### Unit Test Record for Server Side 07 (UTR-SV-07)

**updateExcipient(excipient : Excipient) : Excipient**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Excipient object | Excipient object | Excipient object |
| 1 | Test update excipient which is correct the formal of object excipient and contained in the database. | (“3” , substance1 , { substanceFunction1, substanceFunction2} , 5) | (“3” , substance1 , { substanceFunction1, substanceFunction2} , 5) | (“3” , substance1 , { substanceFunction1, substanceFunction2} , 5) | pass |
| 2 | Test update excipient which is correct the formal of excipient object and contained in the database. | (“4” , substance2, { substanceFunction3, substanceFunction4} , 7) | (“4” , substance2, { substanceFunction3, substanceFunction4} , 7) | (“4” , substance2, { substanceFunction3, substanceFunction4} , 7) | pass |
| 3 | Test update excipient which is not contained in the database. | (“1” , substance1 , { substanceFunction1, substanceFunction2} , 4) | null | null | pass |
| 4 | Test update excipient which is not contained in the database. | (“2” , substance2 , { substanceFunction3, substanceFunction4} , 9) | null | null | pass |

#### Unit Test Record for Server Side 08 (UTR-SV-08)

**deleteExcipient (excipient : Excipient):Excipient**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Excipient object | Excipient object | Excipient object |
| 1 | Test delete excipient which is contained in database. | (“3” , substance3 , { substanceFunction1, substanceFunction2} , 3) | (null, substance3 , {substanceFunction1, substanceFunction2} , 3) | (null, substance3 , {substanceFunction1, substanceFunction2} , 3) | pass |
| 2 | Test delete excipient which is contained in database. | (“4” , substance4, { substanceFunction3, substanceFunction4} , 4) | (null , substance4, {substanceFunction3, substanceFunction4} , 4) | (null , substance4, {substanceFunction3, substanceFunction4} , 4) | pass |
| 3 | Test delete excipient which is not contained in database. | (“1” , substance1, { substanceFunction3, substanceFunction4} , 5) | null | null | pass |
| 4 | Test delete excipient which is not contained in database. | (“2” , substance2, { substanceFunction1, substanceFunction2} , 7) | null | null | pass |

#### Unit Test Record for Server Side 09 (UTR-SV-09)

**getExcipientById** **(id : String) : Excipient**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| case | Description | Input | Expect result | Actual Result | Status |
| Id | Excipient object | Excipient object |
| 1 | Test get excipient object by excipient id. | “3” | (“3” , substance3 , { substanceFunction1, substanceFunction2} , 3) | (“3” , substance3 , { substanceFunction1, substanceFunction2} , 3) | pass |
| 2 | Test get excipient object by excipient id. | “4” | (“4” , substance4, { substanceFunction3, substanceFunction4} , 4) | (“4” , substance4, { substanceFunction3, substanceFunction4} , 4) | pass |
| 3 | Test get excipient object which is not contain in database. | 1 | null | null | pass |
| 4 | Test get excipient object which is not contain in database. | 2 | null | null | pass |

#### Unit Test Record for Server Side 10 (UTR-SV-10)

**getSubstaneFunction() : SubstanceFunction []**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Expect result | Status |
| Excipient object List | Excipient object List |
| 1 | Test get all substanceFunction list. | { substanceFunction1, substanceFunction2, substanceFunction3, substanceFunction4} | { substanceFunction1, substanceFunction2, substanceFunction3, substanceFunction4} | pass |

#### Unit Test Record for Server Side 11 (UTR-SV-11)

**getSubstanceForExcipient() : Substance[]**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Actual Result | Status |
| Excipient object List | Excipient object List |
| 1 | Test get all substance list that. | { substance1, substanc2, substance3, substance4} | { substance1, substanc2, substance3, substance4} | pass |

### FormulationServiceImpl Class.

#### Unit Test Record for Server Side 12 (UTR-SV-12)

**addFormulation (formulation: Formulation): Formulation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| Formulation object | Formulation object | Formulation object |
| 1 | Test add formulation object which is correct the formal of formulation object. | (null , “name1”, “type1”, 1, {excipient1,excipient2}) | (not null , “name1”, “type1”, 1, {excipient1,excipient2}) | (not null , “name1”, “type1”, 1, {excipient1,excipient2}) | pass |
| 2 | Test add formulation which is correct the formal of formulation object. | (null , “name4”, “type4”, 4, {excipient3,excipient4}) | (not null, “name4”, “type4”, 4, {excipient3,excipient4}) | (not null, “name4”, “type4”, 4, {excipient3,excipient4}) | pass |
| 3 | Test add formulation object which is contained in the database already. | (“3” , “name3”, “type3”, 3, {excipient1,excipient2}) | null | null | pass |
| 4 | Test add formulation object which is contained in the database already. | (“4” , “name4”, “type4”, 4, {excipient3,excipient4}) | null | null | pass |

#### Unit Test Record for Server Side 13 (UTR-SV-13)

**updateFormulation(formulation : Formulation) : Formulation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| formulation object | formulation object | formulation object |
| 1 | Test update formulation object which is correct the formal of formulation object. | (“3” , “name1”, “type1”, 1, {excipient3,excipient4}) | (“3” , “name1”, “type1”, 1, {excipient3,excipient4}) | (“3” , “name1”, “type1”, 1, {excipient3,excipient4}) | pass |
| 2 | Test update formulation object which is correct the formal of formulation object. | (“4” , “name2”, “type2”, 2, {excipient1,excipient2}) | (“4” , “name2”, “type2”, 2, {excipient1,excipient2}) | (“4” , “name2”, “type2”, 2, {excipient1,excipient2}) | pass |
| 3 | Test update formulation object which is not contained in the database. | (“1” , “name1”, “type1”, 1, {excipient1,excipient2}) | null | null | pass |
| 4 | Test update formulation object which is not contained in the database. | (“2” , “name2”, “type2”, 2, {excipient3,excipient4}) | null | null | pass |

#### Unit Test Record for Server Side 14 (UTR-SV-14)

**deleteFormulation (formulation: Formulation): Formulation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Expect Result | Status |
| formulation object | formulation object | formulation object |
| 1 | Test delete formulation object which is contained in database and correct format formulation object. | (“3” , “name3”, “type3”, 3, {excipient1,excipient2}) | (“3” , “name3”, “type3”, 3, {excipient1,excipient2}) | (“3” , “name3”, “type3”, 3, {excipient1,excipient2}) | pass |
| 2 | Test delete formulation object which is contained in database and correct format formulation object. | (“4” , “name4”, “type4”, 4, {excipient3,excipient4}) | (“4” , “name4”, “type4”, 4, {excipient3,excipient4}) | (“4” , “name4”, “type4”, 4, {excipient3,excipient4}) | pass |
| 3 | Test delete formulation object which is not contained in database. | (“1” , “name1”, “type1”, 1, {excipient1,excipient1}) | null | null | pass |
| 4 | Test delete formulation object which is not contained in database. | (“2” , “name2”, “type2”, 2, {excipient3,excipient4}) | null | null | pass |

#### Unit Test Record for Server Side 15 (UTR-SV-15)

**getAllFormulation() : Formulation []**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Actual Result | Status |
| List formulation object | List formulation object |
| 1 | Test get all formulation object list. | {formulation1,formulation2} | {formulation1,formulation2} | pass |

#### Unit Test Record for Server Side 16 (UTR-SV-16)

**getFormulationByid(id : String) : Formulation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| case | Description | Input | Expect result | Actual Result | Status |
| Id | formulation object | formulation object |
| 1 | Test get formulation object by formulation id. | 3 | (“3” , “name3”, “type3”, 3, {excipient1,excipient2}) | (“3” , “name3”, “type3”, 3, {excipient1,excipient2}) | pass |
| 2 | Test get formulation object by formulation id. | 4 | (“4” , “name4”, “type4”, 4, {excipient3,excipient4}) | (“4” , “name4”, “type4”, 4, {excipient3,excipient4}) | pass |
| 3 | Test get formulation object which is not contain in database. | 1 | null | null | pass |
| 4 | Test get formulation object which is not contain in database. | 2 | null | null | pass |

### ReformulationHistoryServiceimpl Class.

#### Unit Test Record for Server Side 17 (UTR-SV-17)

**createHistory(reformulationHistory : ReformulationHistory) : ReformulationHistory**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | status |
| reformulationHistory object | reformulationHistory object | reformulationHistory object |
| 1 | Test add reformulationHistory object which is correct the formal of reformulationHistory object. | (null, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | (null, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | (null, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | pass |
| 2 | Test add reformulationHistory object which is correct the formal of reformulationHistory object. | (null, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | (null, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | (null, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | pass |
| 3 | Test add reformulationHistory t object which is contained in the database already. | (“3”, {reformulatedProduction1, reformulatedProduction2},”5/10/2014 “, user1) | null | null | pass |
| 4 | Test add reformulationHistory object which is contained in the database already. | (“4”, {reformulatedProduction3, reformulatedProduction4},”7/4/2008 “, user2) | null | null | pass |

#### Unit Test Record for Server Side 18 (UTR-SV-18)

**updateHistory(reformulationHistory : ReformulationHistory) : ReformulationHistory**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Expect Result | Status |
| reformulationHistory object | reformulationHistory object | reformulationHistory object |
| 1 | Test update reformulationHistory object which is correct the formal of reformulationHistory object and contained in the database. | (“3”, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | (“3”, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | (“3”, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | pass |
| 2 | Test update reformulationHistory object which is correct the formal of reformulationHistory object and contained in the database. | (“4”, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | (“4”, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | (“4”, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | pass |
| 3 | Test update reformulationHistory object which is not contained in the database. | (“1”, {reformulatedProduction1, reformulatedProduction3},”4/11/209 “, user1) | null | null | pass |
| 4 | Test update reformulationHistory object which is not contained in the database. | (“2”, {reformulatedProduction2, reformulatedProduction4},”6/6/2013 “, user2) | null | null | pass |

#### Unit Test Record for Server Side 19 (UTR-SV-19)

**removeHistory(String id) : ReformulationHistory**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case No. | Description | Input data | Expect Result | Actual Result | Status |
| id | reformulationHistory object | reformulationHistory object |
| 1 | Test delete reformulationHistory object which is contained in database and correct format reformulationHistory object. | “3” | (“3”, {reformulatedProduction1, reformulatedProduction2},”5/10/2014 “, user1) | (“3”, {reformulatedProduction1, reformulatedProduction2},”5/10/2014 “, user1) | pass |
| 2 | Test delete reformulationHistory object which is contained in database and correct format reformulationHistory. | “4” | (“4”, {reformulatedProduction3, reformulatedProduction4},”7/4/2008 “, user2) | (“4”, {reformulatedProduction3, reformulatedProduction4},”7/4/2008 “, user2) | pass |
| 3 | Test delete reformulationHistory object which is not contained in database or incorrect format reformulationHistory object. | “1” | null | null | pass |
| 4 | Test delete reformulationHistory object which is not contained in database or incorrect format reformulationHistory object. | “2” | null | null | pass |

#### Unit Test Record for Server Side 20 (UTR-SV-20)

**getAllHistory() : ReformulationHistory**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| case | Description | Expect result | Actual result | Status |
| List of reformulationHistory object | List of reformulationHistory object |
| 1 | Test get all reformulationHistory list | { reformulationHistory3, reformulationHistory3 } | { reformulationHistory3, reformulationHistory3 } | Pass |

#### Unit Test Record for Server Side 21 (UTR-SV-21)

**getHistoryById(String id) : ReformulationHistory**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| case | Description | Input | Expect result | Actual result | Status |
| Id | reformulationHistory | reformulationHistory |
| 1 | Test get reformulationHistory object by reformulationHistory id. | 3 | (“3”, {reformulatedProduction1, reformulatedProduction2},”5/10/2014 “, user1) | (“3”, {reformulatedProduction1, reformulatedProduction2},”5/10/2014 “, user1) | pass |
| 2 | Test get reformulationHistory object by reformulationHistory id. | 4 | (“4”, {reformulatedProduction3, reformulatedProduction4},”7/4/2008 “, user2) | (“4”, {reformulatedProduction3, reformulatedProduction4},”7/4/2008 “, user2) | pass |
| 3 | Test get reformulationHistory which is not contain in database. | 1 | null | null | pass |
| 4 | Test get reformulationHistory which is not contain in database. | 2 | null | null | pass |

### InferenceEngineDirector Class.

#### Unit Test Record for Server Side 22 (UTR-SV-22)

**getReformulationResult(production : Production) : ReformulatedProduction []**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| case | Description | Input | Expect result | Actual result | Status |
| Reformulation object | List of Reformulated Production object | List of Reformulated Production object |
| 1 | Test get all reformulaProduction list | (“1” , formulation1 , dfProperty1 , “instruction1” , 1.12) | { reformulatedProduction1, reformulatedProduction2, reformulatedProduction3 , reformulatedProduction4 } | { reformulatedProduction1, reformulatedProduction2, reformulatedProduction3 , reformulatedProduction4 } | pass |

1. NS – Narongrit Saisuwan , PW – Panupak Wichaidit , CD - Chartchai Doungsa-ard [↑](#footnote-ref-1)