Molecular Dimensions ACHIEVE MORE.
A Calibre Scientific Company

Membrane and Soluble Proteins

Morpheus® Fusion 10 mL, HT-96 and FX-96 pre-filled plate MD1–129, MD1-130 and MD1-130-FX

Morpheus® Fusion is a 96-condition incomplete factorial protein crystallization screen incorporating a range of low-molecular weight ligands. Unlock novel chemical space previously inaccessible using conventional screens.

MD1-129 is presented as 96 x 10 mL conditions. MD1-130 is presented as 96 x 1 mL conditions. MD1-130-FX is presented as 96 x 100 µL conditions.

Features of Morpheus® Fusion:

- Incomplete Factorial design covering a range of pH, precipitants, PEGs and salt additives.
- 19 Additive mixes integrating all reagents from MORPHEUS I, most reagents from Morpheus II and some from Morpheus III
- Suitable for membrane proteins with PEGS and polyols as main precipitants.
- Morpheus® ligands promote initial crystal formation and lattice stability.
- Reduced crystal "stress" – all conditions are cryoprotected*.
- Easy optimization of 'hits'.
- Readily available Morpheus® Fusion Optimization reagents including the Mixes and Stock reagents.

Introduction

The Morpheus® crystallisation screen family has been designed and developed by Dr Fabrice Gorrec in collaboration with the scientists at the Medical Research Council Laboratory of Molecular Biology (LMB) at Cambridge and is manufactured exclusively under license by Molecular Dimensions Limited.

The 96 crystallisation conditions of Morpheus® FUSION are prepared with pre-existing stock solutions of Morpheus I, II and III. To expand the theoretical chemical space being screened, the number of PDB stand-alone ligands integrated as additives was increased.
For this, there are two additive mixes in each FUSION condition (instead of one for the Morpheus screens). Nineteen additive stock solutions are sampled systematically across the standard 96-well plate layout. The backbone of the formulation is based on the precipitant mixes and buffer systems of the initial Morpheus are arranged to produce an incomplete factorial screen formulation.

The chemistry of the conditions can be considered as 'mild' because they are made of PEG-based precipitant mixes and have no extreme pH.
FUSION is hence virtually suitable for samples with challenging stability (including macromolecular complexes and membrane proteins) and for soaking the resulting crystals with drug compounds.

The universal ratio of stock solutions to prepare a FUSION condition is as follows:
5/10 precipitant mix + 1/10 additive mix 1 + 1/10 additive mix 2 + 1/10 buffer system + 2/10 water.

Due to the composition comprising 1/5th water, there is space for making an optimization screen with higher concentration of any mix/component.

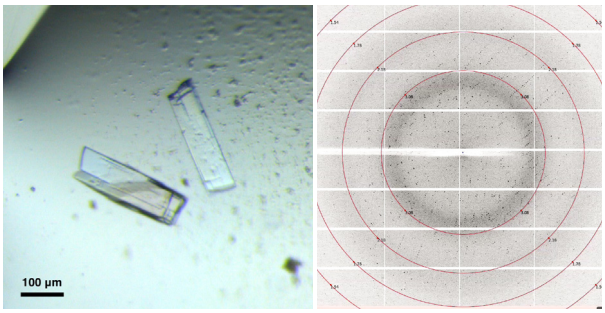
*All the conditions of **Morpheus®** Fusion are to some extent cryo-protected to minimize further mechanical stress on the crystals. For example, all PEG 4000 conditions contain a suitable amount of Glycerol.

References

1. Gorrec, F (2009) The MORPHEUS protein crystallization screen *J Appl Cryst* **42**, 1035-1042.

2. Morpheus Fusion Publication submitted

Crystal picture of a 'human retinoblastoma binding protein' obtained during preliminary trials of the Morpheus® Fusion at the LMB and the corresponding diffraction pattern collected at Diamond Light Source.



PLEASE NOTE
Polyamine Additive Mix - For 10 mL kit only. HT and FX plates already contain the polyamines.

The polyamine mix must be prepared fresh and added to the 8 corresponding tubes by the user prior to setting up the crystal lisation experiments. The raw chemicals are provided as a powder mix in a 15 mL glass vial. Sufficient ultrapure (>18.0 MΩ) water should be added to this bottle to make up a 13 mL solution.

Once the liquid polyamine mix has been made:

Add 1.1ml to the following tubes:

- 1-11
- 1-23
- 1-35
- 1-47
- 2-11
- 2-23
- 2-35

Add 2.2ml to the following tube:

- 2-47

Formulation Notes

Morpheus® Fusion reagents are formulated using ultrapure water (>18.0 MΩ) and are sterile-filtered using 0.22 µm filters. No preservatives are added.

Final pH may vary from that specified on the datasheet. Molecular Dimensions will be happy to discuss the precise formulation of individual reagents.

Individual reagents and stock solutions for optimization are available from Molecular Dimensions.

Enquiries regarding Morpheus® formulation, interpretation of results or optimization strategies are welcome. Please e-mail, fax or phone your query to Molecular Dimensions.

Contact and product details can be found at www.moleculardimensions.com

Manufacturer's safety data sheets are available from our website or by scanning the QR code here:

Morpheus® Fusion Optimization

Although the screen is composed of various mixes, consider each condition as for any other screen, with four stock solutions:

- mix of precipitants
- mix of additive 1
- mix of additive 2
- mix of buffers.

The standard initial optimization approach can be based on a 2D concentration gradient screen, considering the precipitant mix as a component and the two additive mixes together as the other component. The upper limit of concentration based on the stock solution ratio then becomes:

6/10 precipitant mix + 1.5/10 additive mix 1 + 1.5/10 additive mix 2 + 1/10 buffer system.

The buffer-pH component forms a third dimension to be investigated, taking advantages of the Morpheus buffer system to generate different pH values, by changing the ratio of the two buffers within the buffer stock (i.e. change ratio of two non-titrated 1M buffer stocks).
Once you know more about the chemical space within Morpheus you can eventually investigate further, trying to reveal specificity of a single chemical.
For example, what happens when you replace the group of chemicals from a stock with only one chemical of this mix? (e.g. only one divalent cations instead of the corresponding mix of additives).

At this stage you may (or not) have a simpler condition to work with. You can also proceed to other "classic" optimization approaches such as using an additive screen, scale-up or seeding.

Table 1: Mixes of additives used in Morpheus® Fusion

Mix name	Composition	Catalogue Number (100 mL)	Catalogue Number (250 mL)
Divalent cations 1	0.3M Magnesium chloride hexahydrate; 0.3M Calcium chloride dihydrate	MD2-100-70	MD2-250-70
Divalent cations 2	0.005M Manganese(II) chloride tetrahydrate, 0.005M Cobalt(II) chloride hexahydrate , 0.005M Nickel(II) chloride hexahydrate, 0.005M Zinc acetate dihydrate	MD2-100-232	MD2-250-232
NPS†	0.3M Sodium nitrate, 0.3 Sodium phosphate dibasic, 0.3M Ammonium sulfate	MD2-100-72	MD2-250-72
Carboxylic acids	0.2M Sodium formate; 0.2M Ammonium acetate; 0.2M Sodium citrate tribasic dihydrate; 0.2M Potassium sodium tartrate tetrahydrate; 0.2M Sodium oxamate	MD2-100-76	MD2-250-76
Amino acids	0.2M DL-Glutamic acid monohydrate; 0.2M DL-Alanine; 0.2M Glycine; 0.2M DL-Lysine monohydrochloride; 0.2M DL-Serine	MD2-100-77	MD2-250-77
LiNaK	0.3 M Lithium sulfate, 0.3 M Sodium sulfate, 0.3 M Potassium sulfate	MD2-100-231	MD2-250-231
Halides	0.3M Sodium fluoride; 0.3M Sodium bromide; 0.3M Sodium iodide	MD2-100-71	MD2-250-71
Alkalis	0.01M Rubidium chloride, 0.01M Strontium acetate, 0.01M Cesium acetate, 0.01M Barium acetate	MD2-100-233	MD2-250-233
Oxometalates	0.005M Sodium chromate tetrahydrate, 0.005M Sodium molybdate dihydrate, 0.005M Sodium tungstate dihydrate, 0.005M Sodium orthovanadate	MD2-100-234	MD2-250-234
Vitamins*	3% w/v Sodium-L ascorbate, 3% w/v Choline Chloride, 3% v/v D-Panthenol, 3% w/v Pyridoxine hydrochloride, 3% w/v Thiamine hydrochloride	MD2-50-314	MD2-100-314
Polyamines (provided as powder for 10mL kits)^	0.1M Spermine tetrahydrochloride, 0.1M Spermidine trihydrochloride, 0.1M 1,4-Diaminobutane dihydrochloride, 0.1M DL-Ornithine monohydrochloride	MD2-100-238	MD2-250-238
Anesthetic alkaloids	2% w/v Lidocaine hydrochloride monohydrate, 2% w/v Procaine hydrochloride, 2% w/v Proparacaine hydrochloride, 2% w/v tetracaine hydrochloride	MD2-50-320	MD2-100-320
Alcohols	0.2M 1,6-Hexanediol; 0.2M 1-Butanol 0.2M 1,2-Propanediol; 0.2M 2-Propanol; 0.2M 1,4-Butanediol; 0.2M 1,3-Propanediol	MD2-100-73	MD2-250-73
Ethylene glycols	0.3M Diethylene glycol; 0.3M Triethylene glycol; 0.3M Tetraethylene glycol; 0.3M Pentaethylene glycol	MD2-100-74	MD2-250-74
Monosaccharides 1	0.2M D-Glucose; 0.2M D-Mannose; 0.2M D-Galactose; 0.2M L-Fucose; 0.2M D-Xylose; 0.2M N-Acetyl-D-Glucosamine	MD2-100-75	MD2-250-75
Monosaccharides 2	0.2 M xylitol, 0.2 M D-(−)-fructose, 0.2 M D-sorbitol, 0.2 M myo-inositol, 0.2 M L-rhamnose monohydrate	MD2-100-236	MD2-250-236
Cholic Acids	3% w/v CHAPS, 3% w/v CHAPSO, 3% w/v sodium glycocholate hydrate, 3% w/v taurocholic acid sodium salt hydrate	MD2-100-319	MD2-250-319
Cryo-polyols	5% w/v 1,2,4-butanetriol, 5% w/v 1,2,6-hexanetriol, 5% w/v 1,5 -pentanediol, 5% w/v 1,1,1-tris(hydroxymethyl)propane, 5% w/v meso-erythritol	MD2-100-400	MD2-250-400
NDSBs	3% w/v NDSB 195, 3% w/v NDSB 201, 3% w/v NDSB 211, 3% w/v NDSB 221, 3% w/v NDSB 256	MD2-100-401	MD2-250-401

†**NPS;** Nitrate Phosphate Sulfate

*Please note that the Vitamin mixes may darken with age.
^ **Polyamines;** The polyamine mix must be prepared and added to the 8 corresponding tubes by the user

Table 2: Buffer systems used in Morpheus® Fusion

Mix name	Conc.	pH @ 20°C	Composition	Catalogue Number (100 mL)	Catalogue Number (250 mL)
Buffer System 1	1.0M	6.5	0.4M Imidazole; 0.6M MES monohydrate (acid)	MD2-100-100	MD2-250-100
Buffer System 2	1.0M	7.5	0.5M Sodium HEPES; 0.5M MOPS (acid)	MD2-100-101	MD2-250-101
Buffer System 3	1.0M	8.5	0.5M Tris (base); 0.5M BICINE	MD2-100-102	MD2-250-102

Table 3: Mixes of Precipitants used in Morpheus® Fusion

Mix name	Old Mix Name	Composition	Catalogue Number (100 mL)	Catalogue Number (250 mL)
60% Precipitant Mix 1	P500MME_P20K	40% v/v PEG 500 MME; 20 % w/v PEG 20000	MD2-100-81	MD2-250-81
60% Precipitant Mix 2	EDO_P8K	40% v/v Ethylene glycol; 20 % w/v PEG 8000	MD2-100-82	MD2-250-82
60% Precipitant Mix 3	GOL_P4K	40% v/v Glycerol; 20% w/v PEG 4000	MD2-100-83	MD2-250-83
75% Precipitant Mix 4	MPD_P1K_P3350	25% v/v MPD; 25% PEG 1000; 25% w/v PEG 3350	MD2-100-84	MD2-250-84

RE-ORDERING INFORMATION

Code	Pack Size	Description
MD1-129	96 x 10 mL	Morpheus® Fusion
MD1-130	96 x 1 mL	Morpheus® Fusion HT-96
MD1-130-FX	96x 100 µL	Morpheus® Fusion FX-96 pre-filled plate
Other Morpheus screens		
MD1-46	96 x 10 mL	Morpheus®
MD1-47	96 x 1 mL	Morpheus® HT-96
MD1-47-FX	96x 100 µL	Morpheus® FX-96 pre-filled plate
MD1-91	96 x 10 mL	Morpheus® II
MD1-92	96 x 1 mL	Morpheus® II HT-96
MD1-92-FX	96x 100 µL	Morpheus® II FX-96 pre-filled plate
MD1-93	48 x 100 µL	The Morpheus® Additive screen
MD1-116	96 x 10 mL	Morpheus® III
MD1-117	96 x 1 mL	Morpheus® III HT-96
MD1-118	48 x 100 µL	Hippocrates™ additive screen
Green screens (contain green fluorescent dye – ideal for UV)		
MD1-46-GREEN	96 x 10 mL	Morpheus® Green screen
MD1-47-GREEN	96 x 1 mL	Morpheus® HT-96 Green screen
Combo Packs		
MD1-76	192 x 10 mL	Power combo value pack (Morpheus® + MIDASplus)
MD1-76-HT	192 x 1 mL	Power combo value pack HT-96 (Morpheus® + MIDASplus HT-96)
MD1-123	288 x 10 ml	Morpheus® Complete (Morpheus® I, II and III)
MD1-124	288 x 1 ml	Morpheus® Complete HT-96 (Morpheus® I, II and III HT-96)
Single reagents		
MDSR-130-tube number	100 mL	Morpheus® Fusion single reagents

Tube #	Well #	Conc.		Additive Mix 1	Conc.		Additive mix 2	Conc.		Buffer	pH	Conc.		Precipitant
1-1	A1	0.06	M	Divalents cation 1	0.12	M	Alcohol	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 1
1-2	A2	2	M	Divalents cation 2	0.12	M	Alcohol	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 2
1-3	A3	90	mM	NPS	0.12	M	Alcohol	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 3
1-4	A4	0.1	M	Carboxylic Acids	0.12	M	Alcohol	0.1	M	Buffer System 1	6.5	37.5	%	Precipitant Mix 4
1-5	A5	0.1	M	Amino Acids	0.12	M	Alcohol	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 1
1-6	A6	90	mM	LiNaK	0.12	M	Alcohol	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 2
1-7	A7	30	mM	Halides	0.12	M	Alcohol	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 3
1-8	A8	4	mM	Alkalis	0.12	M	Alcohol	0.1	M	Buffer System 2	7.5	37.5	%	Precipitant Mix 4
1-9	A9	2	mM	Oxometalates	0.12	M	Alcohol	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 1
1-10	A10	1.5	%	Vitamins	0.12	M	Alcohol	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 2
1-11	A11	40	mM	Polyamines	0.12	M	Alcohol	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 3
1-12	A12	0.8	%	Alkaloids	0.12	M	Alcohol	0.1	M	Buffer System 3	8.5	37.5	%	Precipitant Mix 4
1-13	B1	0.06	M	Divalents cation 1	0.12	M	Ethyleneglycol	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 2
1-14	B2	2	M	Divalents cation 2	0.12	M	Ethyleneglycol	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 3
1-15	B3	90	mM	NPS	0.12	M	Ethyleneglycol	0.1	M	Buffer System 3	8.5	37.5	%	Precipitant Mix 4
1-16	B4	0.1	M	Carboxylic Acids	0.12	M	Ethyleneglycol	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 1
1-17	B5	0.1	M	Amino Acids	0.12	M	Ethyleneglycol	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 2
1-18	B6	90	mM	LiNaK	0.12	M	Ethyleneglycol	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 3
1-19	B7	30	mM	Halides	0.12	M	Ethyleneglycol	0.1	M	Buffer System 1	6.5	37.5	%	Precipitant Mix 4
1-20	B8	4	mM	Alkalis	0.12	M	Ethyleneglycol	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 1
1-21	B9	-	-	-	0.24	M	Ethyleneglycol	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 2
1-22	B10	1.5	%	Vitamins	0.12	M	Ethyleneglycol	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 3
1-23	B11	40	mM	Polyamines	0.12	M	Ethyleneglycol	0.1	M	Buffer System 2	7.5	37.5	%	Precipitant Mix 4
1-24	B12	0.8	%	Alkaloids	0.12	M	Ethyleneglycol	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 1
1-25	C1	0.06	M	Divalents cation 1	0.12	M	Monosaccharide 1	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 3
1-26	C2	2	M	Divalents cation 2	0.12	M	Monosaccharide 1	0.1	M	Buffer System 2	7.5	37.5	%	Precipitant Mix 4
1-27	C3	90	mM	NPS	0.12	M	Monosaccharide 1	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 1
1-28	C4	0.1	M	Carboxylic Acids	0.12	M	Monosaccharide 1	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 2
1-29	C5	0.1	M	Amino Acids	0.12	M	Monosaccharide 1	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 3
1-30	C6	90	mM	LiNaK	0.12	M	Monosaccharide 1	0.1	M	Buffer System 3	8.5	37.5	%	Precipitant Mix 4
1-31	C7	30	mM	Halides	0.12	M	Monosaccharide 1	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 1
1-32	C8	4	mM	Alkalis	0.12	M	Monosaccharide 1	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 2
1-33	C9	2	mM	Oxometalates	0.12	M	Monosaccharide 1	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 3
1-34	C10	1.5	%	Vitamins	0.12	M	Monosaccharide 1	0.1	M	Buffer System 1	6.5	37.5	%	Precipitant Mix 4
1-35	C11	40	mM	Polyamines	0.12	M	Monosaccharide 1	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 1
1-36	C12	0.8	%	Alkaloids	0.12	M	Monosaccharide 1	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 2
1-37	D1	0.06	M	Divalents cation 1	0.1	M	Monosaccharide 2	0.1	M	Buffer System 1	6.5	37.5	%	Precipitant Mix 4
1-38	D2	2	M	Divalents cation 2	0.1	M	Monosaccharide 2	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 1
1-39	D3	90	mM	NPS	0.1	M	Monosaccharide 2	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 2
1-40	D4	0.1	M	Carboxylic Acids	0.1	M	Monosaccharide 2	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 3
1-41	D5	0.1	M	Amino Acids	0.1	M	Monosaccharide 2	0.1	M	Buffer System 2	7.5	37.5	%	Precipitant Mix 4
1-42	D6	90	mM	LiNaK	0.1	M	Monosaccharide 2	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 1
1-43	D7	30	mM	Halides	0.1	M	Monosaccharide 2	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 2
1-44	D8	4	mM	Alkalis	0.1	M	Monosaccharide 2	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 3
1-45	D9	2	mM	Oxometalates	0.1	M	Monosaccharide 2	0.1	M	Buffer System 3	8.5	37.5	%	Precipitant Mix 4
1-46	D10	1.5	%	Vitamins	0.1	M	Monosaccharide 2	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 1
1-47	D11	40	mM	Polyamines	0.1	M	Monosaccharide 2	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 2
1-48	D12	0.8	%	Alkaloids	0.1	M	Monosaccharide 2	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 3

Morpheus® Fusion 10 mL MD1-129
Morpheus® Fusion HT-96 MD1-130
Morpheus® Fusion FX-96 MD1-130-FX

Conditions 1-48 (Box 2)
Conditions E1-H12

Tube #	Well #	Conc.		Additive Mix 1	Conc.		Additive mix 2	Conc.		Buffer	pH	Conc.		Precipitant
2-1	E1	0.06	M	Divalents cation 1	1.2	%	Cholic acid derivative	0.1	M	Buffer System 3	8.5	37.5	%	Precipitant Mix 4
2-2	E2	2	M	Divalents cation 2	1.2	%	Cholic acid derivative	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 1
2-3	E3	90	mM	NPS	1.2	%	Cholic acid derivative	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 2
2-4	E4	0.1	M	Carboxylic Acids	1.2	%	Cholic acid derivative	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 3
2-5	E5	0.1	M	Amino Acids	1.2	%	Cholic acid derivative	0.1	M	Buffer System 1	6.5	37.5	%	Precipitant Mix 4
2-6	E6	90	mM	LiNaK	1.2	%	Cholic acid derivative	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 1
2-7	E7	30	mM	Halides	1.2	%	Cholic acid derivative	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 2
2-8	E8	4	mM	Alkalis	1.2	%	Cholic acid derivative	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 3
2-9	E9	-	-	-	2.4	%	Cholic acid derivative	0.1	M	Buffer System 2	7.5	37.5	%	Precipitant Mix 4
2-10	E10	1.5	%	Vitamins	1.2	%	Cholic acid derivative	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 1
2-11	E11	40	mM	Polyamines	1.2	%	Cholic acid derivative	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 2
2-12	E12	0.8	%	Alkaloids	1.2	%	Cholic acid derivative	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 3
2-13	F1	0.06	M	Divalents cation 1	2.5	%	Cryo-polyol	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 1
2-14	F2	2	M	Divalents cation 2	2.5	%	Cryo-polyol	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 2
2-15	F3	90	mM	NPS	2.5	%	Cryo-polyol	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 3
2-16	F4	0.1	M	Carboxylic Acids	2.5	%	Cryo-polyol	0.1	M	Buffer System 3	8.5	37.5	%	Precipitant Mix 4
2-17	F5	0.1	M	Amino Acids	2.5	%	Cryo-polyol	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 1
2-18	F6	90	mM	LiNaK	2.5	%	Cryo-polyol	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 2
2-19	F7	30	mM	Halides	2.5	%	Cryo-polyol	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 3
2-20	F8	4	mM	Alkalis	2.5	%	Cryo-polyol	0.1	M	Buffer System 1	6.5	37.5	%	Precipitant Mix 4
2-21	F9	2	mM	Oxometalates	2.5	%	Cryo-polyol	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 1
2-22	F10	1.5	%	Vitamins	2.5	%	Cryo-polyol	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 2
2-23	F11	40	mM	Polyamines	2.5	%	Cryo-polyol	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 3
2-24	F12	0.8	%	Alkaloids	2.5	%	Cryo-polyol	0.1	M	Buffer System 2	7.5	37.5	%	Precipitant Mix 4
2-25	G1	0.06	M	Divalents cation 1	1.5	%	NDSB	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 2
2-26	G2	2	M	Divalents cation 2	1.5	%	NDSB	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 3
2-27	G3	90	mM	NPS	1.5	%	NDSB	0.1	M	Buffer System 2	7.5	37.5	%	Precipitant Mix 4
2-28	G4	0.1	M	Carboxylic Acids	1.5	%	NDSB	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 1
2-29	G5	0.1	M	Amino Acids	1.5	%	NDSB	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 2
2-30	G6	90	mM	LiNaK	1.5	%	NDSB	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 3
2-31	G7	30	mM	Halides	1.5	%	NDSB	0.1	M	Buffer System 3	8.5	37.5	%	Precipitant Mix 4
2-32	G8	4	mM	Alkalis	1.5	%	NDSB	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 1
2-33	G9	-	-	-	3	%	NDSB	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 2
2-34	G10	1.5	%	Vitamins	1.5	%	NDSB	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 3
2-35	G11	40	mM	Polyamines	1.5	%	NDSB	0.1	M	Buffer System 1	6.5	37.5	%	Precipitant Mix 4
2-36	G12	0.8	%	Alkaloids	1.5	%	NDSB	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 1
2-37	H1	0.12	M	Divalents cation 1	-	-	-	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 3
2-38	H2	4	mM	Divalents cation 2	-	-	-	0.1	M	Buffer System 1	6.5	37.5	%	Precipitant Mix 4
2-39	H3	0.18	M	NPS	-	-	-	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 1
2-40	H4	0.2	M	Carboxylic Acids	-	-	-	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 2
2-41	H5	0.2	M	Amino Acids	-	-	-	0.1	M	Buffer System 2	7.5	30	%	Precipitant Mix 3
2-42	H6	0.18	M	LiNaK	-	-	-	0.1	M	Buffer System 2	7.5	37.5	%	Precipitant Mix 4
2-43	H7	60	mM	Halides	-	-	-	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 1
2-44	H8	8	mM	Alkalis	-	-	-	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 2
2-45	H9	4	mM	Oxometalates	-	-	-	0.1	M	Buffer System 3	8.5	30	%	Precipitant Mix 3
2-46	H10	3	%	Vitamins	-	-	-	0.1	M	Buffer System 3	8.5	37.5	%	Precipitant Mix 4
2-47	H11	80	mM	Polyamines	-	-	-	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 1
2-48	H12	1.6	%	Alkaloids	-	-	-	0.1	M	Buffer System 1	6.5	30	%	Precipitant Mix 2