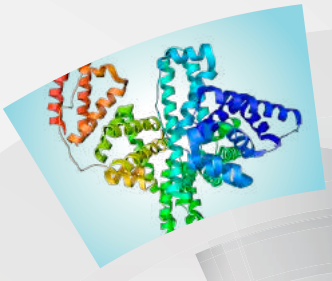

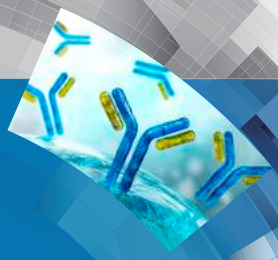

BIOCHEMICALS

for Diagnostics and Research

ORIENTAL YEAST CO.,LTD.

Thank you for choosing Oriental Yeast Co., Ltd. biochemicals products

We are one of the world's largest manufacturers of biochemical products such as enzymes, coenzymes, substrates, and recombinant proteins. We established the mass production technology for these products applying our core competency in fermentation, protein purification, and recombinant protein expression.

Our products are developed, produced and quality controlled in facilities in Nagahama, Japan. Our production facilities have been certified according to international quality management standards（ISO 9001 and ISO 13485）. Our high quality products are used for the manufacture of clinical diagnostic reagents, and for laboratory research applications worldwide.

It is our goal to respond to the progress of in vitro diagnostics and research by providing you with the highest quality products through our research and development efforts. We provide solutions that fit each customer's individual needs by leveraging our capabilities.

Contents

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Corporate headquarters

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FAX +91 22-27717107

Intended Use

All products in this catalog are intended for in vitro diagnostic or research use only.

Enzymes

Table of Contents

Our enzymes are used for in vitro diagnostics or research, therefore we recognize the importance of high purity and set the strict standards to our products. Especially, the most important point is the activity of contaminant enzymes. The activity of contaminant enzymes is described as the percentage to the activity of product enzyme.

We firmly analyze the contaminants of our each product, and guarantee that they are within our strict standards. Certification of analysis is attached to all products.

If you need enzymes that are different from our standards, please contact us.

ADH

Alcohol dehydrogenase EC 1.1.1.1

from Yeast

Reaction Equation

Alcohol + NAD^+ = Aldehyde or Ketone + NADH

Specification

Specific Activity

U/mg protein	> 300 units

Contaminants

Carboxylase	< 0.05%
Glyceraldehyde-3-phosphate dehydrogenase	< 0.05%
Phosphoglycerate kinase	< 0.05%
Myokinase	< 0.03%
Aldolase	< 0.02%
Pyruvate kinase	< 0.01%
Lactate dehydrogenase	< 0.01%

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Temperature : 25 °C

Pipette the following reagents into a cuvette

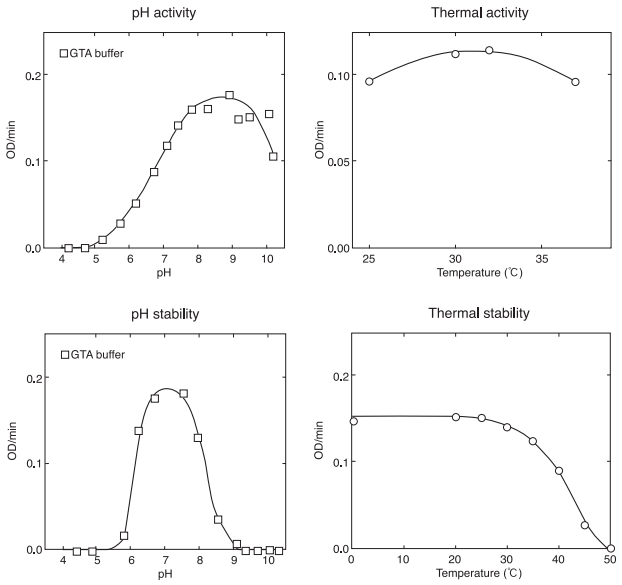
2.75 mL	Na-pyrophosphate buffer (10.9 mmol/L, pH 8.8) containing Ethanol (1.13 mol/L)
0.25 mL	NAD^+ (10 mmol/L)
0.02 mL	ADH (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46410001	15,000 units
46409901	Bulk

For in vitro diagnostic or research use only

rCO

recombinant Cholesterol oxidase EC 1.1.3.6

from Nocardia sp.

Reaction Equation

Cholesterol + O_2 = Cholestenone + H_2O_2

Specification

Specific Activity

U/mg protein > 20 units

Contaminants

Glucose oxidase	< 0.01%
Catalase	< 1.00%
Uricase	< 0.01%

Assay Procedure

I Spectrophotometric Method

Wavelength : 240 nm, Light path length : 1 cm
Temperature : 37℃

Pipette the following reagents into a cuvette

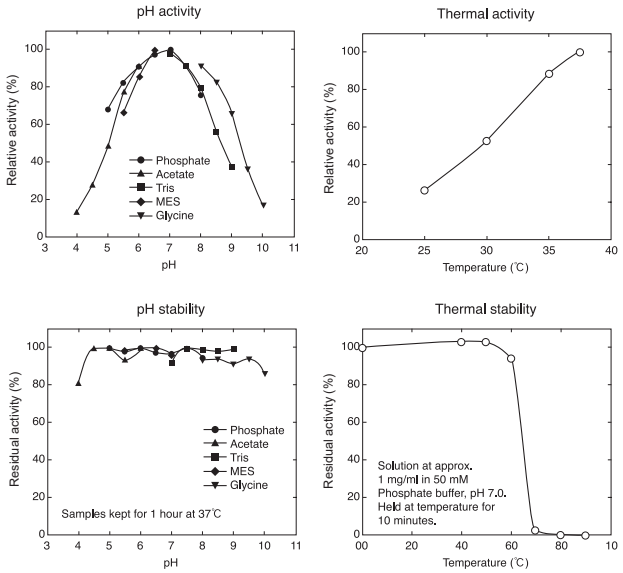
2.95 mL	Potassium phosphate buffer (0.1 mol/L, pH 7.0) containing Triton X-100 (0.05 w/v%)
0.05 mL	Cholesterol (6 mmol/L) dissolved in Isopropanol
0.10 mL	rCO (approx. 0.5 U/mL)

II Calculation

$$\frac{\Delta A/min \cdot V \cdot D}{12.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 240 nm/minute
V = Total volume of reaction mixture (3.10 mL)
D = Enzyme dilution factor
12.3 = mmol/L extinction coefficient of Cholestenone ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.10 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20℃

Cat. No./Package

Cat. No.	Package
46703003	100 units
46438003	1,000 units
46438903	Bulk

For in vitro diagnostic or research use only

Glucoamylase

Glucoamylase EC 3.2.1.3

from Rhizopus sp.

Reaction Equation

Starch + n H_2O = n β-Glucose

Specification

Specific Activity

U/mg protein > 20 units

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Temperature : 37 ℃

Pipette the following reagents into a cuvette

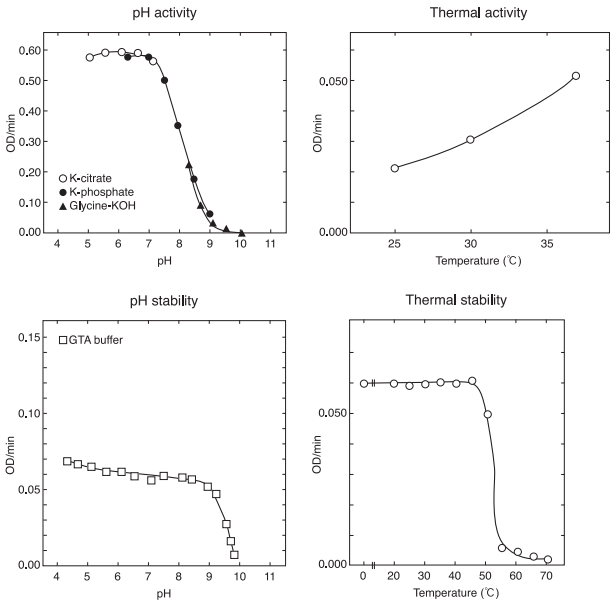
3.00 mL	α-Glycerophosphate buffer (50 mmol/L, pH 6.0) containing NAD^+ (1.3 mmol/L) ATP (1.1 mmol/L) Maltopentaose (3.3 mmol/L) $MgCl_2$ (0.18 mmol/L)
0.01 mL	HK (1,200 U/mL)
0.01 mL	G6PDH (L) (1,200 U/mL)
0.02 mL	Glucoamylase (approx. 2 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.04 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH
(L·mmol^{-1}·cm^{-1})
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 ℃

Cat. No./Package

Cat. No.	Package
46817903	Bulk

For in vitro diagnostic or research use only

GOD(AN)

Glucose oxidase EC 1.1.3.4

from Aspergillus niger

Reaction Equation

β-D-Glucose + O_2 = D-Glucono-1, 5-lactone + H_2O_2

Specification

Specific Activity

U/mg protein	> 350 units

Contaminants

Amylase	< 0.01%
Invertase	< 0.01%
Catalase	< 0.5%

Assay Procedure

I Spectrophotometric Method

Wavelength : 436 nm, Light path length : 1 cm
Temperature : 25 °C

Pipette the following reagents into a cuvette

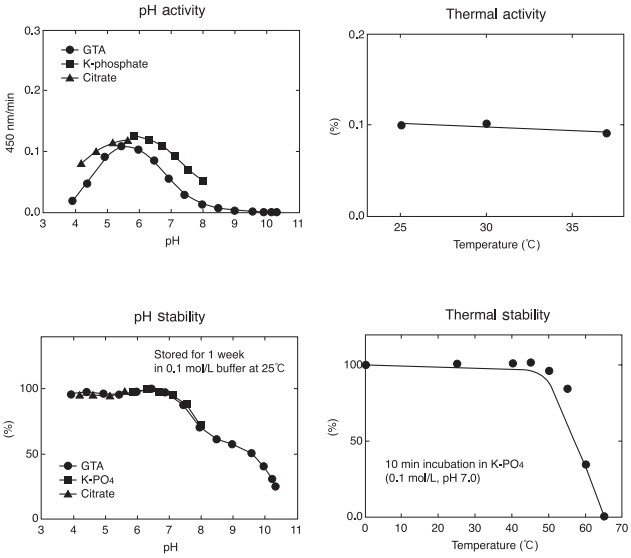
3.00 mL	Potassium phosphate buffer (0.1 mol/L, pH 6.0) containing o-Dianisidine (5.5 mg/100 mL) β-D-Glucose (9.0 g/100 mL)
0.01 mL	POD (10 mg/mL)
0.02 mL	GOD solution in phosphate buffer (0.1 mol/L, pH 7.5) (1 - 2.5 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{8.7 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 436 nm/minute
V = Total volume of reaction mixture (3.03 mL)
8.7 = mmol/L extinction coefficient of o-Dianisidine ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46524003	3,000 units
46526003	10,000 units
46527003	50,000 units

For in vitro diagnostic or research use only

rG6PDH(L)

recombinant Glucose 6-phosphate dehydrogenase EC 1.1.1.49

from Leuconostoc sp.

Reaction Equation

D-Glucose 6-phosphate + NAD(P)$^+$
⇄ D-Glucono-1,5-lactone 6-phosphate + NAD(P)H + H$^+$

Specification

Specific Activity

U/mg protein	> 600 units

Contaminants

Hexokinase	< 0.01%
Phosphoglucose isomerase	< 0.005%
Phosphogluconate dehydrogenase	< 0.001%
Creatine kinase	< 0.001%
Glutathione reductase	< 0.001%
Phosphoglucomutase	< 0.001%
Myokinase	< 0.001%
Lactate dehydrogenase	< 0.01%
Pi	< 0.1%

Properties

pH stability : pH 5.0 - 9.0 (25°C, 1 week)
Thermal stability : ≦ 37°C (pH 7.8, 10 min)
Optimum pH : 7.5
Optimum temp. : 45°C
Km value : 2.2 × 10^{-4} mol/L (G6P, NAD^+-linked)
2.6 × 10^{-4} mol/L (NAD^+)
1.4 × 10^{-4} mol/L (G6P, $NADP^+$-linked)
1.2 × 10^{-5} mol/L ($NADP^+$)
Molecular weight : 54 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.02 mL, Temperature : 30°C

Pipette the following reagents into a cuvette

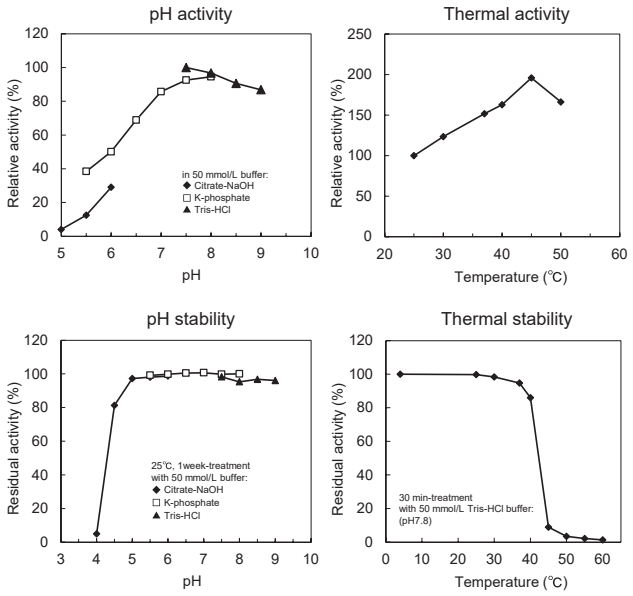
2.80 mL	Tris-HCl buffer (55 mmol/L, pH 7.8, 30°C) containing $MgCl_2$ (3.3 mmol/L)
0.10 mL	NAD^+ (60 mmol/L)
0.10 mL	G6P (0.1 mol/L)
0.02 mL	rG6PDH(L) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH
($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)
Store below -20°C

Cat. No./Package

Cat. No.	Package	Cat. No.	Package
46857003	200 units	46854903	Bulk
46854003	1,000 units		

For in vitro diagnostic or research use only

rG6PDH(Y)

recombinant Glucose 6-phosphate dehydrogenase EC 1.1.1.49

from Yeast

Reaction Equation

D-Glucose 6-phosphate + $NADP^+$

⇄ D-Glucono-1,5-lactone 6-phosphate + NADPH + H^+

Specification

Specific Activity

U/mg protein	> 250 units

Contaminants

Hexokinase	< 0.02%
Phosphoglucose isomerase	< 0.01%
Phosphogluconate dehydrogenase	< 0.01%
Creatine kinase	< 0.001%
Glutathione reductase	< 0.2%
Phosphoglucomutase	< 0.01%
Myokinase	< 0.01%
ATPase	< 0.001%

Properties

pH stability : pH 5.5 - 6.5 (25 °C, 1 week)
Thermal stability : ≦ 40 °C (pH 7.5, 10 min)
Optimum pH : 8.0 - 8.5
Optimum temp. : 50 °C
Km value : 1.0×10^{-4} mol/L (G6P)
5.7×10^{-5} mol/L ($NADP^+$)
Molecular weight : 57 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.12 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

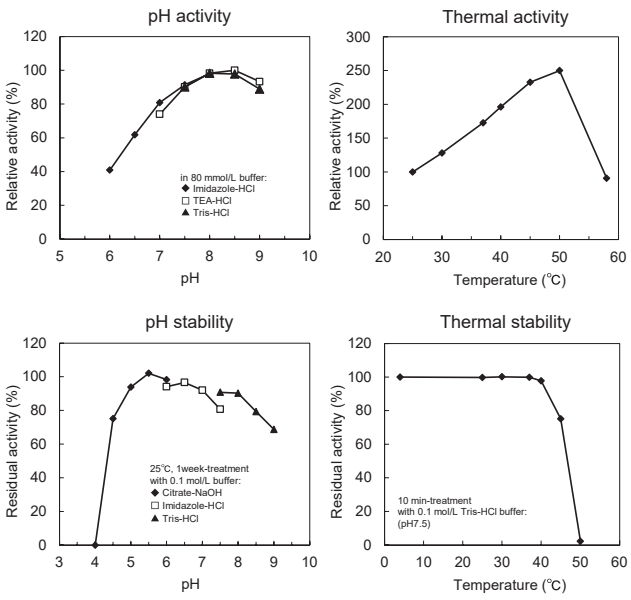
2.50 mL	Glycylglycine buffer (0.1 mol/L, pH 8.5)
0.30 mL	$MgCl_2$ (0.2 mol/L)
0.15 mL	$NADP^+$ (10 mmol/L)
0.15 mL	G6P (10 mmol/L)
0.02 mL	rG6PDH(Y) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.2 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.12 mL)
D = Enzyme dilution factor
6.2 = mmol/L extinction coefficient of NADPH
($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46859053	1,000 units
46864053	5,000 units

Cat. No.	Package
46859903	Bulk

For in vitro diagnostic or research use only

rα-Glucosidase

recombinant α-Glucosidase EC 3.2.1.20

from Bacteria

Reaction Equation

α-D-Glucoside + H_2O → Alcohol + α-D-Glucose

Specification

Specific Activity

U/mg protein > 40 units

Properties

pH stability : pH 5.0 - 10.0 (25 °C, 1 week)
Thermal stability : ≦ 60 °C (pH 7.0, 15 min)
Optimum pH : pH 6.5
Optimum temp. : 60 °C
Km value : 9.8 × 10^{-4} mol/L (PNPG)
Molecular weight : 63 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 400 nm, Light path length : 1 cm
Final volume : 4 mL, Temperature : 37 °C
Total time : 15 min

Pipette the following reagents into a cuvette

1.0 mL	K-phosphate buffer (0.1 mol/L, pH 7.0)
0.5 mL	*p*-Nitrophenyl-α-D-glucopyranoside (20 mmol/L)

incubation at 37 °C for 5 min

0.5 mL	rα-Glucosidase (approx. 0.02 U/mL)

incubation for exactly 15 min at 37 °C

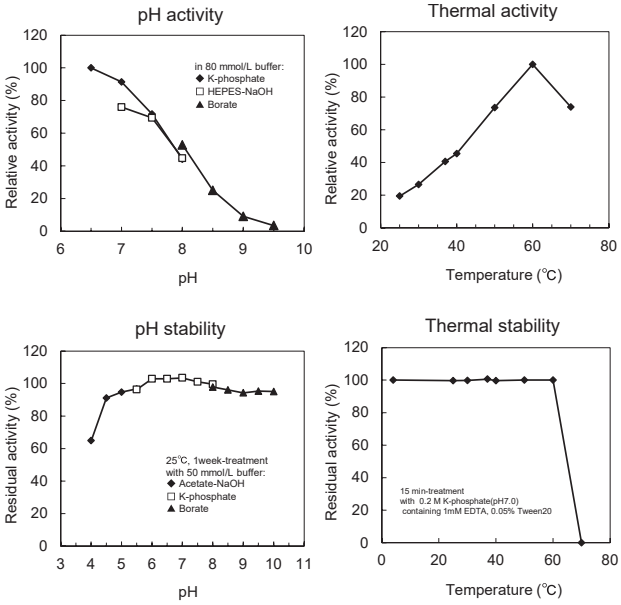
2.0 mL	Na_2CO_3 (0.2 mol/L)

II Calculation

$$\frac{\Delta A \cdot V \cdot D}{18.1 \cdot d \cdot v \cdot t} = U/mL$$

Δ A = The change in absorbance at 400 nm
V = Total volume of reaction mixture (4.0 mL)
D = Enzyme dilution factor
18.1 = mmol/L extinction coefficient of *p*-Nitrophenol ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.5 mL)
t = Reaction time (15 min)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46772900	Bulk

For in vitro diagnostic or research use only

rGlDH(NAD)

recombinant Glutamate dehydrogenase (NAD^+) EC 1.4.1.2

from Bacteria

Reaction Equation

α-Ketoglutarate + NH_3 + NADH + H^+

⇄ L-Glutamate + H_2O + NAD^+

Specification

Specific Activity

U/mg protein	> 350 units

(for reduction of α-Ketoglutarate to L-Glutamate)

Contaminants

NADH oxidase	< 0.01%
Lactate dehydrogenase	< 0.003%
Malate dehydrogenase	< 0.003%
Alcohol dehydrogenase	< 0.003%

Properties

pH stability	: pH 7.5 (37°C 1week)
Thermal stability	: ≦ 60°C (pH 7.8, 10 min)
Optimum pH	: 7.4 - 7.8
Optimum temp.	: 45°C
Km value	: 3.0 × 10^{-2} mol/L (α-Ketoglutarate)
	1.7 × 10^{-4} mol/L (NADH)
	2.0 × 10^{-2} mol/L (Ammonium chloride)
	1.6 × 10^{-2} mol/L (L-Glutamate)
	1.5 × 10^{-4} mol/L (NAD^+)
Molecular weight	: 48 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Final volume : 3.02 mL, Temperature : 30°C

Pipette the following reagents into a cuvette

2.60 mL	Tris-HCl buffer (0.1 mol/L, pH 7.8)
0.10 mL	α-Ketoglutarate (0.33 mol/L)
0.10 mL	NADH (7.5 mmol/L)
0.20 mL	Ammonium chloride (2.0 mol/L)
0.02 mL	rGlDH (NAD) (approx. 1.9 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute

V = Total volume of reaction mixture (3.02 mL)

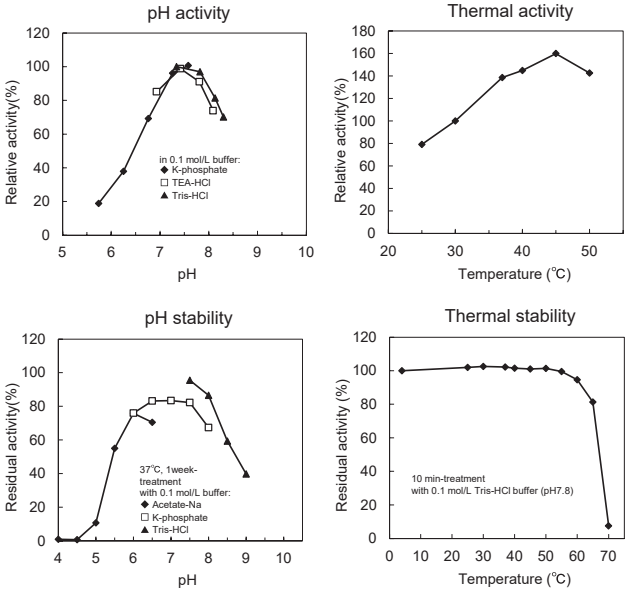
D = Enzyme dilution factor

6.3 = mmol/L extinction coefficient of NADH ($L \cdot mmol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)

Store below -20°C

Cat. No./Package

Cat. No.	Package
46874903	Bulk

For in vitro diagnostic or research use only

rGlDH(NADP)

recombinant Glutamate dehydrogenase (NADP+) EC 1.4.1.4

from Bacteria

Reaction Equation

L-Glutamate + H_2O + $NADP^+$

$\rightleftarrows$ α-Ketoglutarate + NH_3 + NADPH + H^+

Specification

Specific Activity

U/mg protein	> 60 units

(for reduction of α-Ketoglutarate to L-Glutamate)

Contaminants

Glucose 6-phosphate dehydrogenase	< 0.02%
Phosphogluconate dehydrogenase	< 0.1%
Glutamate dehydrogenase (NAD^+)	< 0.03%
Glutathione reductase	< 0.02%
NADPH oxidase	< 0.003%

Properties

pH stability	: pH 5.0 - 10.5 (25°C, 1 week)
Thermal stability	: ≦ 70°C (pH 7.5, 10 min)
Optimum pH	: 7.5 - 8.0
Optimum temp.	: ≧ 70°C
Km value	: 2.5×10^{-2} mol/L (L-Glutamate)
	6.4×10^{-5} mol/L ($NADP^+$)
	4.1×10^{-4} mol/L (α-Ketoglutarate)
	2.4×10^{-5} mol/L (NADPH)
	4.7×10^{-5} mol/L (Ammonium acetate)
Molecular weight	: 46 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.02 mL, Temperature : 25°C

Pipette the following reagents into a cuvette

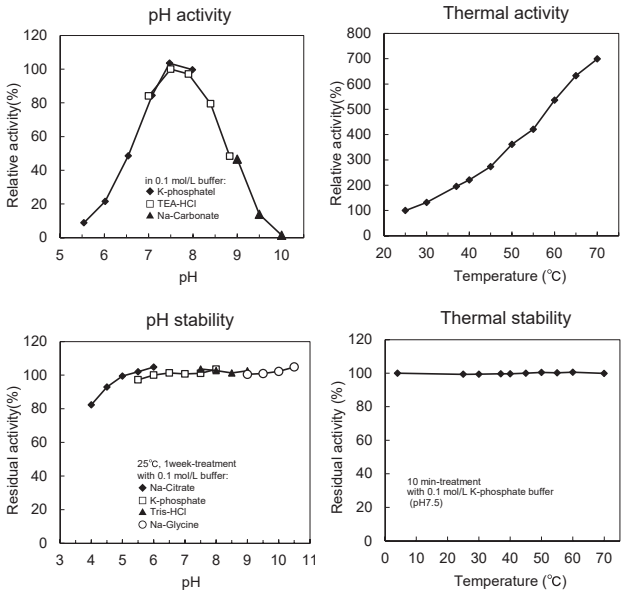
2.50 mL	Triethanolamine-HCl buffer (0.1 mol/L, pH 7.6)
0.15 mL	α-Ketoglutarate (0.1 mol/L)
0.05 mL	NADPH (12 mmol/L)
0.30 mL	Ammonium acetate (2 mol/L)
0.02 mL	rGlDH(NADP) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.2 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
6.2 = mmol/L extinction coefficient of NADPH
($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Solution
Store at 1 - 10°C

Cat. No./Package

Cat. No.	Package
46754904	Bulk

For in vitro diagnostic or research use only

rGlDH(Y)

recombinant Glutamate dehydrogenase (NADP+) EC 1.4.1.4

from Yeast

Reaction Equation

L-Glutamate + H_2O + $NADP^+$

$\rightleftarrows$ α-Ketoglutarate + NH_3 + NADPH + H^+

Specification

Specific Activity

U/mg protein	> 10 units
(for oxidation of L-Glutamate to α-Ketoglutarate)	

Contaminants

Glucose 6-phosphate dehydrogenase	< 0.1%
Phosphogluconate dehydrogenase	< 0.5%
Glutathione reductase	< 0.1%
NADPH oxidase	< 0.01%

Properties

pH stability	: pH 7.5 - 9.5 (25°C, 1 week)
Thermal stability	: ≦ 50°C (pH 7.5, 10 min)
Optimum pH	: 8.5 - 9.0
Optimum temp.	: 37°C
Km value	: 4.1×10^{-2} mol/L (L-Glutamate)
	1.3×10^{-4} mol/L ($NADP^+$)
	1.9×10^{-4} mol/L (α-Ketoglutarate)
	2.2×10^{-5} mol/L (NADPH)
Molecular weight	: 52 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Final volume : 3.02 mL, Temperature : 25°C

Pipette the following reagents into a cuvette

2.85 mL	Na-pyrophosphate buffer (0.1 mol/L, pH 9.0) containing L-Glutamate (0.1 mol/L)
0.15 mL	$NADP^+$ (10 mmol/L)
0.02 mL	rGlDH(Y) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.2 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute

V = Total volume of reaction mixture (3.02 mL)

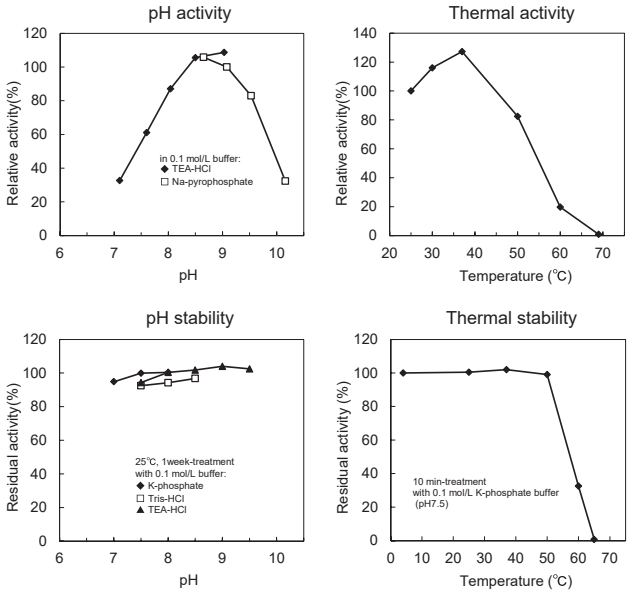
D = Enzyme dilution factor

6.2 = mmol/L extinction coefficient of NADPH ($L \cdot mmol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)

Store below -20°C

Cat. No./Package

Cat. No.	Package
46868003	600 units
46870003	3,000 units
46747903	Bulk

For in vitro diagnostic or research use only

rGK

recombinant Glycerol kinase EC 2.7.1.30

from Bacteria

Reaction Equation

ATP + Glycerol → ADP + L-Glycerol 3-phosphate

Specification

Specific Activity

U/mg protein > 200 units

Contaminants

ATPase	< 0.005%
Catalase	< 0.05%
Hexokinase	< 0.025%
Myokinase	< 0.025%
NADH oxidase	< 0.005%

Properties

pH stability : pH 5.5 - 8.5 (30°C, 1 week)
Thermal stability : ≦ 65°C (pH 7.0, 10 min)
Optimum pH : pH 9.5
Optimum temp. : ≧ 50°C
Km value : 6.0 × 10^{-5} mol/L (ATP)
8.2 × 10^{-5} mol/L (Glycerol)
Molecular weight : 52 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.05 mL, Temperature : 37°C
Lag time : 5 min

Pipette the following reagents into a cuvette

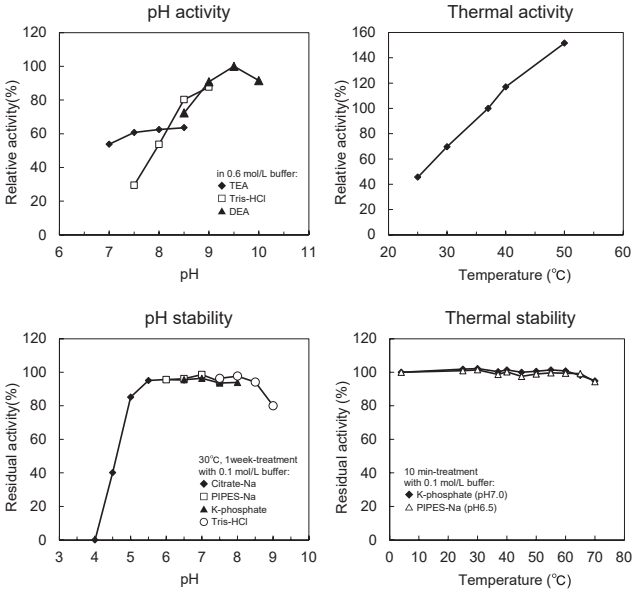
2.40 mL	Diethanolamine buffer (0.7 mol/L, pH 9.5)
0.30 mL	$MgCl_2$ (90 mmol/L)
0.10 mL	ATP (0.24 mol/L)
0.10 mL	PEP (0.21 mol/L)
0.05 mL	NADH (17 mmol/L)
0.05 mL	Glycerol (0.36 mol/L)
0.01 mL	PK (1,300 U/mL)
0.02 mL	LDH (1,000 U/mL)
0.02 mL	rGK (approx. 2 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.05 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH
(L·$mmol^{-1}$·cm^{-1})
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)
Store below -20°C

Cat. No./Package

Cat. No.	Package
46898903	Bulk

For in vitro diagnostic or research use only

rGPO

recombinant Glycerol 3-phosphate oxidase EC 1.1.3.21

from Bacteria

Reaction Equation

L-Glycerol 3-phosphate + O_2

→ Dihydroxyacetone phosphate + H_2O_2

Specification

Specific Activity

U/mg protein > 35 units

Contaminants

ATPase	< 0.002%
Catalase	< 0.002%
Hexokinase	< 0.01%
Lactate oxidase	< 0.003%
Myokinase	< 0.01%
Phosphatase	< 0.0004%

Properties

pH stability : pH 6.0 - 6.5 (30°C, 1 week)
Thermal stability : ≦ 45°C (pH 6.5, 10 min)
Optimum pH : pH 6.0 - 7.0
Optimum temp. : 40°C
Km value : 1.47 × 10^{-1} mol/L (DL-Glycerol 3-phosphate)
Molecular weight : 66 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 505 nm, Light path length : 1 cm
Final volume : 3.04 mL, Temperature : 37°C

Pipette the following reagents into a cuvette

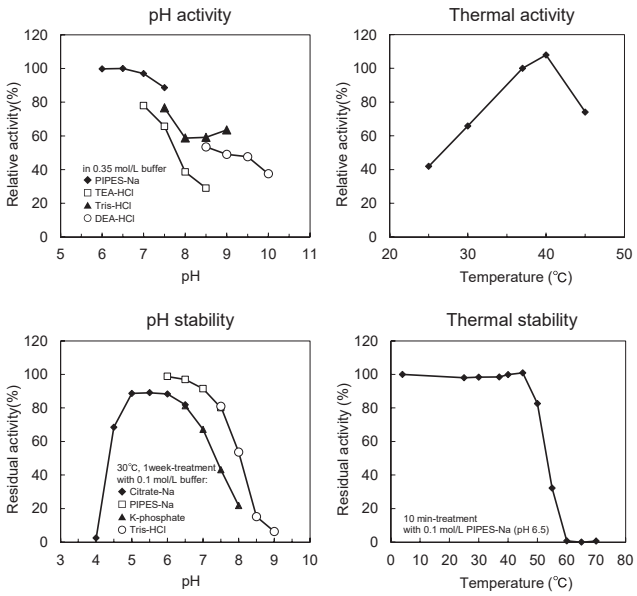
2.80 mL	K-phosphate buffer (0.375 mol/L, pH 6.4) containing DL-Glycerol 3-phosphate (0.43 mol/L)
0.10 mL	4-Aminoantipyrine (6 mmol/L)
0.10 mL	Phenol (0.21 mol/L)
0.02 mL	POD (1,000 U/mL Phenol method)
0.02 mL	rGPO (approx. 2.5 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{13.2 \cdot d \cdot v} \times 2 = U/mL$$

Δ A/min = The change in absorbance at 505 nm/minute
V = Total volume of reaction mixture (3.04 mL)
D = Enzyme dilution factor
13.2 = mmol/L extinction coefficient of quinoneimine dye ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20°C

Cat. No./Package

Cat. No.	Package
46899903	Bulk

rHK(Y)

recombinant Hexokinase EC 2.7.1.1

from Yeast

Reaction Equation

ATP + D-Hexose → ADP + D-Hexose 6-phosphate

Specification

Specific Activity

U/mg protein	> 180 units

Contaminants

Phosphoglucose isomerase	< 0.003%
Glutathione reductase	< 0.005%
Myokinase	< 0.001%
Phosphogluconate dehydrogenase	< 0.001%
Phosphoglucomutase	< 0.001%
Glucose 6-phosphate dehydrogenase	< 0.005%
Creatine kinase	< 0.005%
ATPase	< 0.003%

Properties

pH stability : pH 5.0 - 8.0 (25 °C, 1 week)
Thermal stability : ≦ 40 °C (pH 7.5, 10 min)
Optimum pH : 7.5 - 9.0
Optimum temp. : 50 °C
Km value : 1.8 × 10^{-4} mol/L (ATP)
2.9 × 10^{-4} mol/L (Glucose)
Molecular weight : 54 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.03 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

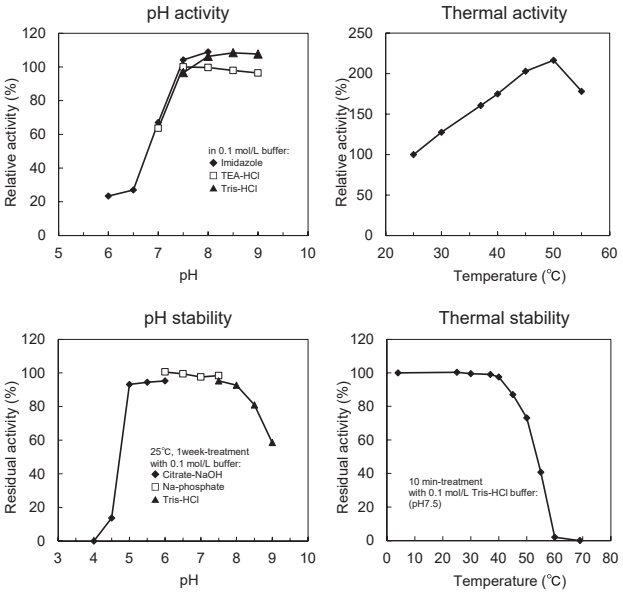
2.40 mL	Triethanolamine-HCl buffer(0.1 mol/L, pH 7.5) containing Glucose (50 mg/mL)
0.30 mL	$MgCl_2$ (0.1 mmol/L)
0.15 mL	ATP (10 mmol/L)
0.15 mL	$NADP^+$ (10 mmol/L)
0.01 mL	G6PDH (500 U/mL)
0.02 mL	rHK (Y) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.2 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.03 mL)
D = Enzyme dilution factor
6.2 = mmol/L extinction coefficient of NADPH
(L·$mmol^{-1}$·cm^{-1})
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46763900	Bulk

For in vitro diagnostic or research use only

rICDH(NADP)

recombinant Isocitrate dehydrogenase (NADP+) EC 1.1.1.42

from Yeast

Reaction Equation

Isocitrate + $NADP^+$ = α-Ketoglutarate + CO_2 + NADPH

Specification

Specific Activity

U/mg protein > 30 units

Contaminants

Isocitrate dehydrogenase (NAD^+) < 0.5%

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Temperature : 25 ℃

Pipette the following reagents into a cuvette

2.50 mL	Tris-HCl buffer (0.1 mol/L, pH 8.5)
0.15 mL	$MgCl_2$ (0.1 mol/L)
0.05 mL	Isocitrate (0.1 mol/L)
0.15 mL	$NADP^+$ (20 mmol/L)
0.02 mL	rICDH (NADP) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.2 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute

V = Total volume of reaction mixture (2.87 mL)

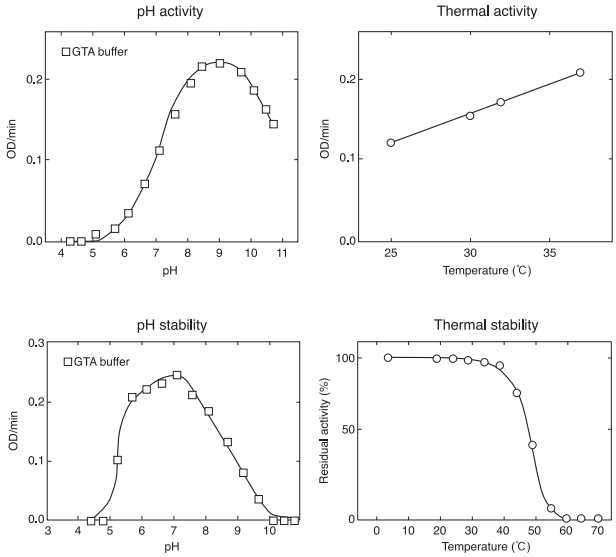
D = Enzyme dilution factor

6.2 = mmol/L extinction coefficient of NADPH ($L \cdot mmol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

50% Glycerol solution

Store below -20 ℃

Cat. No./Package

Cat. No.	Package
46476015	3,000 units
46720905	Bulk

For in vitro diagnostic or research use only

rICDH(Taq)

recombinant Isocitrate dehydrogenase ($NADP^+$) EC 1.1.1.42

from Bacteria

Reaction Equation

D-Isocitrate + $NADP^+$

$\rightleftarrows$ α-Ketoglutarate + CO_2 + NADPH + H^+

Specification

Specific Activity

U/mg protein > 20 units

Contaminants

NADPH oxidase < 0.01%

Phosphatase < 0.00015%

Properties

pH stability : pH 6.5 - 8.5 (25 °C, 1 week)

Thermal stability : ≦ 65 °C (pH 8.0, 10 min)

Optimum pH : 8.5

Optimum temp. : ≧ 37 °C

Km value : 6.0×10^{-5} mol/L (Isocitrate)

5.5×10^{-5} mol/L ($NADP^+$)

Molecular weight : 40 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Final volume : 2.87 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

2.50 mL	Tris-HCl buffer (0.1 mol/L, pH 8.5)
0.15 mL	$MgCl_2$ (0.1 mol/L)
0.05 mL	Isocitrate (0.1 mol/L)
0.15 mL	$NADP^+$ (20 mmol/L)
0.02 mL	rICDH (Taq) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.2 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute

V = Total volume of reaction mixture (2.87 mL)

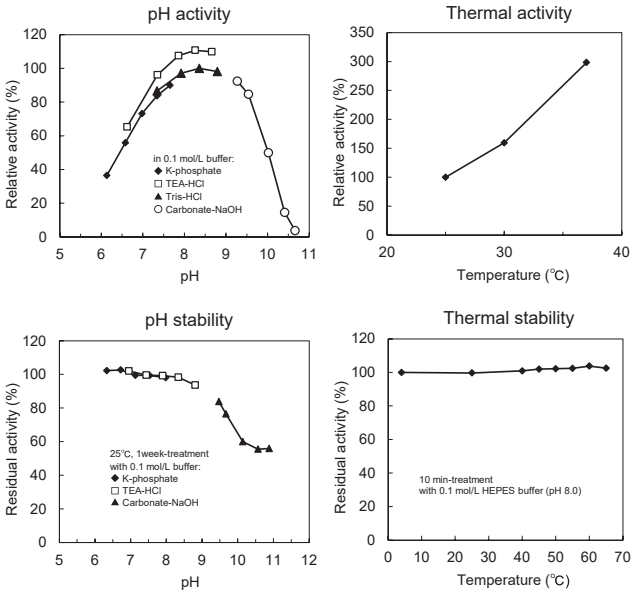
D = Enzyme dilution factor

6.2 = mmol/L extinction coefficient of NADPH ($L \cdot mmol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)

Store below -20 °C

Cat. No./Package

Cat. No.	Package
46746903	Bulk

For in vitro diagnostic or research use only

rLDH(CH)

recombinant Lactate dehydrogenase EC 1.1.1.27

from Chicken heart

Reaction Equation

L-Lactate + NAD^+

$\rightleftarrows$ Pyruvate + NADH + H^+

Specification

Specific Activity

U/mg protein	> 200 units

Contaminants

Malate dehydrogenase	< 0.03%
Myokinase	< 0.01%
Pyruvate kinase	< 0.003%
Glutamic-pyruvic transaminase*	< 0.03%
Glutamic-oxaloacetic transaminase*	< 0.03%

*Including α-Hydroxyglutarate dehydrogenase activity

Properties

pH stability : pH 6.3 - 9.2 (25 °C, 1 week)
Thermal stability : ≦ 65 °C (pH 7.5, 10 min)
Optimum pH : 7.0 - 7.5
Optimum temp. : ≧ 37 °C
Km value : 4.1×10^{-5} mol/L (Pyruvate)
1.8×10^{-5} mol/L (NADH)
Molecular weight : 36 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.17 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

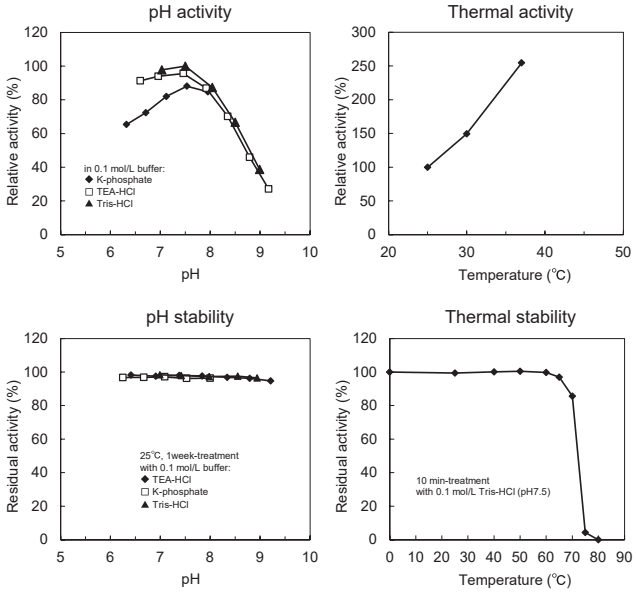
3.00 mL	K-phosphate buffer (0.1 mol/L, pH 7.0)
0.10 mL	Li-pyruvate or Na-pyruvate (25.4 mmol/L)
0.05 mL	NADH (10 mg/mL) dissolved in Tris (10 mmol/L)
0.02 mL	rLDH (CH) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.17 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH
($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46757903	Bulk

For in vitro diagnostic or research use only

rLDH(PH)

recombinant Lactate dehydrogenase EC 1.1.1.27

from Pig heart

Reaction Equation

L-Lactate + NAD^+ ⇄ Pyruvate + NADH + H^+

Specification

Specific Activity

U/mg protein	> 260 units

Contaminants

Malate dehydrogenase	< 0.03%
Myokinase	< 0.01%
Pyruvate kinase	< 0.003%
Glutamic-pyruvic transaminase*	< 0.03%
Glutamic-oxaloacetic transaminase*	< 0.03%

*Including α-Hydroxyglutarate dehydrogenase activity

Properties

pH stability	: pH 5.5 - 8.0 (25 °C, 1 week)
Thermal stability	: ≦ 55 °C (pH 7.5, 10 min)
Optimum pH	: 7.0 - 8.0
Optimum temp.	: 70 °C
Km value	: 6.5 × 10^{-5} mol/L (Pyruvate)
	1.8 × 10^{-5} mol/L (NADH)
Molecular weight	: 36 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.17 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

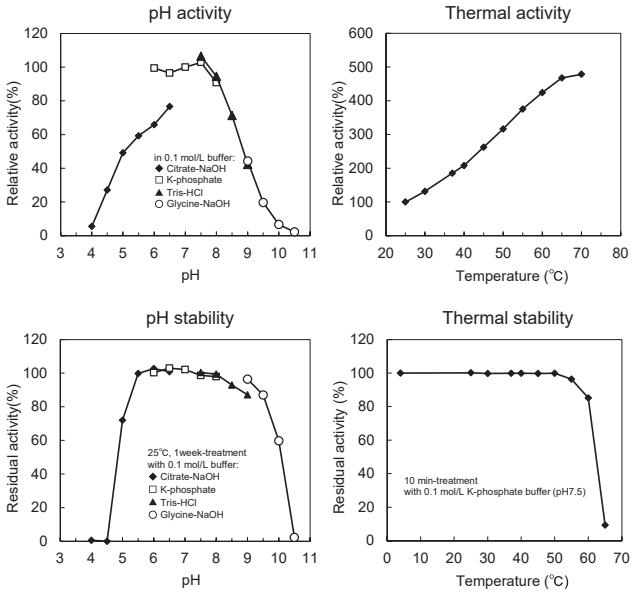
3.00 mL	K-phosphate buffer (0.1 mol/L, pH 7.0)
0.10 mL	Na-pyruvate (25.4 mmol/L)
0.05 mL	NADH (10 mg/mL) dissolved in Tris (10 mmol/L)
0.02 mL	rLDH (PH) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.17 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46775003	10,000 units
46862903	Bulk

For in vitro diagnostic or research use only

rLDH(RM)

recombinant Lactate dehydrogenase EC 1.1.1.27

from Rabbit muscle

Reaction Equation

L-Lactate + NAD^+ ⇄ Pyruvate + NADH + H^+

Specification

Specific Activity

U/mg protein	> 400 units

Contaminants

Malate dehydrogenase	< 0.03%
Myokinase	< 0.01%
Pyruvate kinase	< 0.01%
Glutamic-pyruvic transaminase*	< 0.005%
Glutamic-oxaloacetic transaminase*	< 0.005%

*Including α-Hydroxyglutarate dehydrogenase activity

Properties

pH stability : pH 6.5 - 8.0 (25 °C, 1 week)
Thermal stability : ≦ 45 °C (pH 7.5, 10 min)
Optimum pH : 6.0
Optimum temp. : 50 °C
Km value : 2.1 × 10^{-4} mol/L (Pyruvate)
1.2 × 10^{-5} mol/L (NADH)
Molecular weight : 34 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.17 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

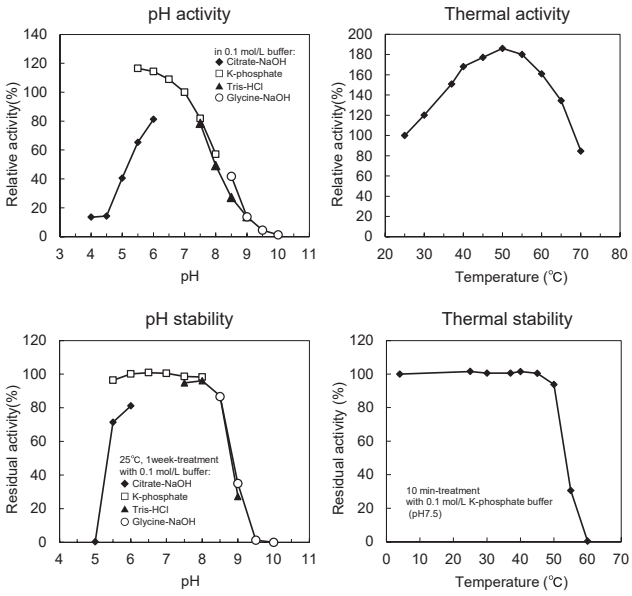
3.00 mL	K-phosphate buffer (0.1 mol/L, pH 7.0)
0.10 mL	Na-pyruvate (25.4 mmol/L)
0.05 mL	NADH (10 mg/mL) dissolved in Tris (10 mmol/L)
0.02 mL	rLDH (RM) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.17 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package	Cat. No.	Package
46776003	10,000 units	46782003	100,000 units
46781003	50,000 units	46764900	Bulk

For in vitro diagnostic or research use only

rD-LDH

recombinant D-Lactate dehydrogenase EC 1.1.1.28

from Bacteria

Reaction Equation

D-Lactate + NAD^+ ⇄ Pyruvate + NADH + H^+

Specification

Specific Activity

U/mg protein	> 800 units

Contaminants

Malate dehydrogenase	< 0.03%
Myokinase	< 0.02%
Pyruvate kinase	< 0.003%
Glutamic-pyruvic transaminase	< 0.001%
Glutamic-oxaloacetic transaminase	< 0.001%
α-hydroxyglutarate dehydrogenase	< 0.001%

Properties

pH stability : pH 5.5 - 9.5 (25°C, 1 week)
Thermal stability : ≦ 55°C (pH 7.5, 15 min)
Optimum pH : 7.0
Optimum temp. : 45 - 50°C
Km value : 2.6 × 10^{-4} mol/L (Pyruvate)
1.1 × 10^{-4} mol/L (NADH)
Molecular weight : 44 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.17 mL, Temperature : 25°C

Pipette the following reagents into a cuvette

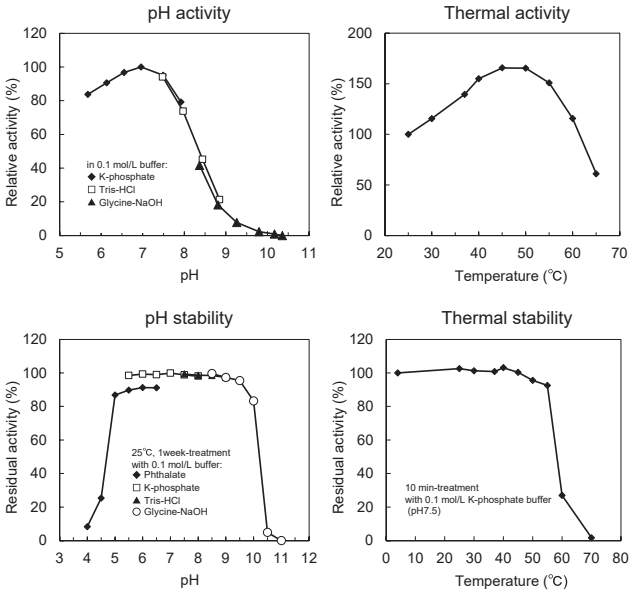
3.00 mL	K-phosphate buffer (0.1 mol/L, pH 7.0)
0.10 mL	Li-pyruvate or Na-pyruvate (25.4 mmol/L)
0.05 mL	NADH (10 mg/mL) dissolved in Tris (10 mmol/L)
0.02 mL	rD-LDH (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.17 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20°C

Cat. No./Package

Cat. No.	Package
46762903	Bulk

For in vitro diagnostic or research use only

rD-LDH(L)

recombinant D-Lactate dehydrogenase EC 1.1.1.28

from Leuconostoc sp.

Reaction Equation

D-Lactate + NAD^+ ⇄ Pyruvate + NADH + H^+

Specification

Specific Activity

U/mg protein	> 1,000 units

Contaminants

Malate dehydrogenase	< 0.01%
Myokinase	< 0.02%
Pyruvate kinase	< 0.003%
Glutamic-pyruvic transaminase*	< 0.001%
Glutamic-oxaloacetic transaminase*	< 0.001%

*Including α-Hydroxyglutarate dehydrogenase activity

Properties

pH stability	: pH 5.5 - 9.5 (25 °C, 1 week)
Thermal stability	: ≦ 40 °C (pH 7.5, 10 min)
Optimum pH	: 6.5
Optimum temp.	: 25 - 30 °C
Km value	: 8.4×10^{-4} mol/L (Pyruvate)
	9.9×10^{-5} mol/L (NADH)
Molecular weight	: 38 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.17 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

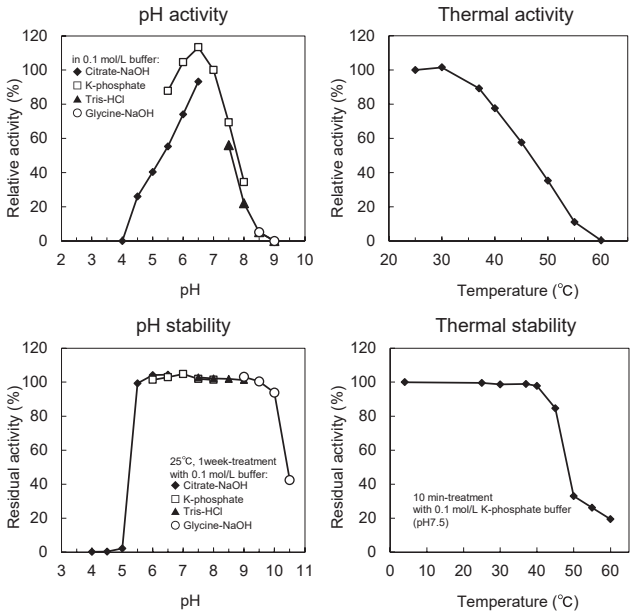
3.00 mL	K-phosphate buffer (0.1 mol/L, pH 7.0)
0.10 mL	Li-pyruvate or Na-pyruvate (25.4 mmol/L)
0.05 mL	NADH (10 mg/mL) dissolved in Tris (10 mmol/L)
0.02 mL	rD-LDH(L) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.17 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46773003	10,000 units
46867903	Bulk

For in vitro diagnostic or research use only

rMDH

recombinant Malate dehydrogenase EC 1.1.1.37

from Bacteria

Reaction Equation

L-Malate + NAD^+ ⇄ Oxaloacetate + NADH + H^+

Specification

Specific Activity

U/mg protein	> 550 units

Contaminants

Fumarase	< 0.01%
L-Lactate dehydrogenase	< 0.01%
Aspartate transaminase	< 0.01%
Glutamate dehydrogenase (NAD^+)	< 0.001%
NADH oxidase	< 0.001%

Properties

pH stability : pH 4.5 - 9.0 (25 °C, 1 week)
Thermal stability : ≦ 80 °C (pH 7.5, 15 min)
Optimum pH : 5.5 - 8.0
Optimum temp. : ≧ 37 °C
Km value : 9.0×10^{-5} mol/L (Oxaloacetate)
3.9×10^{-5} mol/L (NADH)
Molecular weight : 40 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.02 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

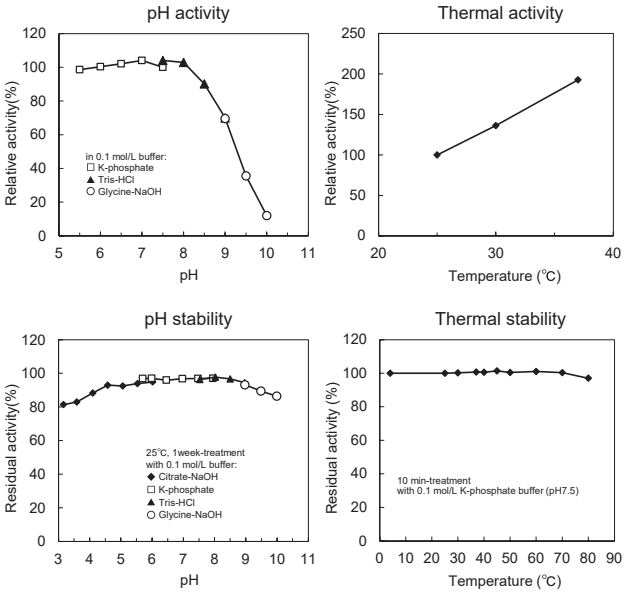
2.80 mL	K-phosphate buffer (0.1 mol/L, pH 7.5)
0.15 mL	Oxaloacetate (10 mmol/L)
0.05 mL	NADH (10 mg/mL) dissolved in Tris (10 mmol/L)
0.02 mL	rMDH (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH
($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46756903	Bulk

For in vitro diagnostic or research use only

rMutarotase

recombinant Mutarotase EC 5.1.3.3

from Pig kidney

Reaction Equation

α-D-Glucose ⇄ β-D-Glucose

Specification

Specific Activity

U/mg protein ＞170 units

Contaminants

Lactate dehydrogenase	＜ 0.1%
NADH oxidase	＜ 0.01%
Glucose oxidase	＜ 0.01%
Catalase	＜ 1.0%

Properties

pH stability ： pH 6.0 - 8.0（25 ℃, 1 week）
Thermal stability ： ≦ 45 ℃（pH 7.5, 10 min）
Optimum pH ： 7.5
Optimum temp. ： 30 ℃
Molecular weight ： 34 kDa（SDS-PAGE）

Assay Procedure

I Spectrophotometric Method

Wavelength ： 340 nm, Light path length ： 1 cm
Final volume ： 3.03 mL, Temperature ： 25 ℃

Pipette the following reagents into a cuvette

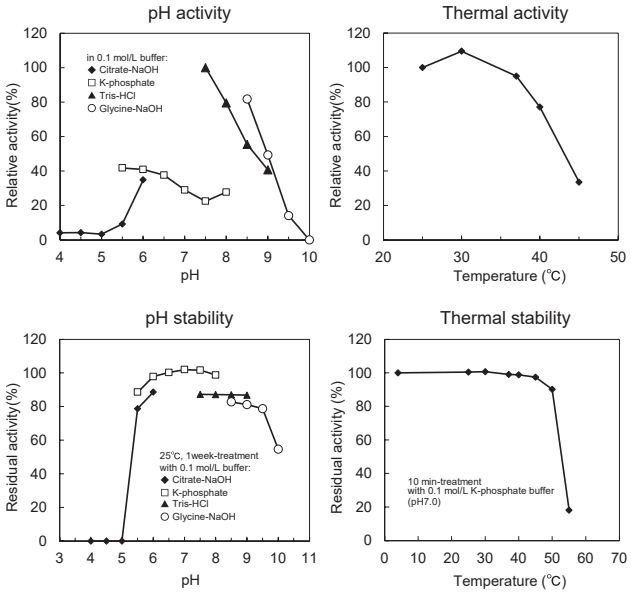
1.50 mL	Tris-HCl buffer（0.1 mol/L, pH 7.2）
0.60 mL	NAD-Na（10 mmol/L）
0.06 mL	Glucose dehydrogenase（1,000 U/mL）
0.80 mL	Distilled water
0.05 mL	α-D-Glucose（30 mmol/L）
0.02 mL	rMutarotase（approx. 3 U/mL）

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min ＝ The change in absorbance at 340 nm/minute
V ＝ Total volume of reaction mixture（3.03 mL）
D ＝ Enzyme dilution factor
6.3 ＝ mmol/L extinction coefficient of NADH
（$L \cdot mmol^{-1} \cdot cm^{-1}$）
d ＝ Light path length（1 cm）
v ＝ Volume of enzyme sample（0.02 mL）

Reference Data



Preparation and Storage

Ammonium sulfate suspension
Store at 1 - 10 ℃

Cat. No./Package

Cat. No.	Package
46858902	Bulk

For in vitro diagnostic or research use only

r6PGDH(Y)

recombinant Phosphogluconate dehydrogenase EC1.1.1.44

from Yeast

Reaction Equation

6-Phospho-D-gluconate + $NADP^+$
⇄ D-Ribulose 5-phosphate + CO_2 + NADPH + H^+

Specification

Specific Activity

U/mg protein	> 10 units

Contaminants

Glucose 6-phosphate dehydrogenase	< 0.05%
Glutathione reductase	< 0.05%
NADPH oxidase	< 0.01%

Properties

pH stability : pH 5.5 - 6.5 (25 °C, 1 week)
Thermal stability : ≦ 50 °C (pH 7.0, 10 min)
Optimum pH : 6.8 - 7.3
Optimum temp. : 50 °C
Km value : 7.8×10^{-5} mol/L (6PG)
1.9×10^{-5} mol/L ($NADP^+$)
Molecular weight : 46 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.12 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

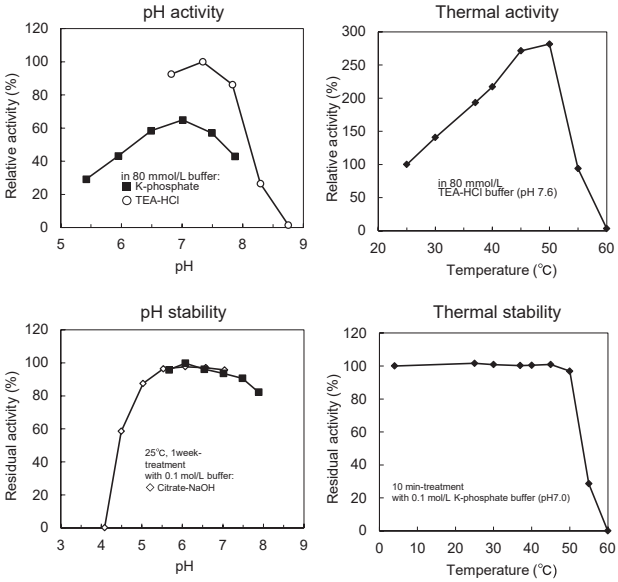
2.50 mL	Triethanolamine-HCl-NaOH buffer (0.1 mol/L, pH 7.6)
0.30 mL	$MgCl_2$ (0.1 mol/L)
0.15 mL	$NADP^+$ (10 mmol/L)
0.15 mL	6PG (10 mmol/L)
0.02 mL	r6PGDH(Y) (approx. 2 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.2 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.12 mL)
D = Enzyme dilution factor
6.2 = mmol/L extinction coefficient of NADPH
($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46861903	Bulk

For in vitro diagnostic or research use only

r6PGL(L)

recombinant 6-Phosphogluconolactonase EC 3.1.1.31

from Leuconostoc sp.

Reaction Equation

6-phospho-D-glucono-1,5-lactone + H_2O

⇄ 6-phospho-D-gluconate

Specification

Specific Activity

U/mg protein > 7,000 units

Properties

pH stability : pH 5.0 - 9.5 (25 °C, 1 week)
Thermal stability : ≦ 60 °C (pH 7.5, 10 min)
Optimum pH : 6.0
Optimum temp. : 25 - 37 °C
Molecular weight : 40 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.05 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

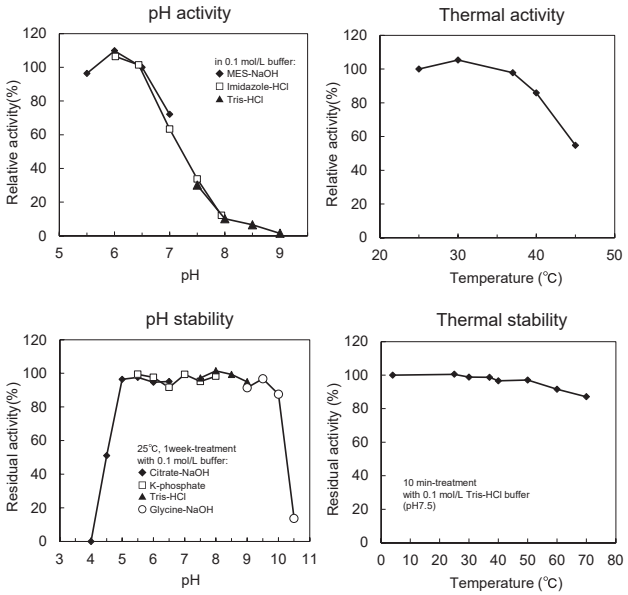
2.84 mL	MES-KOH buffer (32 mmol/L, pH 6.5) containing $MgCl_2$ (2.1 mmol/L)
0.08 mL	D-Glucose 6-phosphate (10 mmol/L)
0.08 mL	NAD^+ (10 mmol/L)
0.03 mL	G6PDH (1,000 U/mL)
0.02 mL	r6PGL (L) (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D \cdot 3.6}{6.3 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.03 mL)
D = Enzyme dilution factor
6.3 = mmol/L extinction coefficient of NADH ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)
3.6 = The 1μmol NADH produced per min should be multiplied by 3.6 to give μmol 6-phophogluconolactone hydrolysed per min.

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46765900	Bulk

For in vitro diagnostic or research use only

rPCO

recombinant Protocatechuate 3,4-dioxygenase EC 1.13.11.3

from Bacteria

Reaction Equation

Protocatecuate + O_2 → 3-Carboxy-muconate

Specification

Specific Activity

U/mg protein	> 3 units

Contaminants

NADPH oxidase	< 0.01%
Alkalin phosphatase	< 0.002%

Properties

pH stability	: pH 5.5 - 9.5 (11 °C, 3 week)
Thermal stability	: ≦ 55 °C (pH 7.5, 15 min)
Optimum pH	: 9.0
Optimum temp.	: 65 °C
Km value	: 2.8 × 10^{-5} mol/L (Protocatechuate)
Molecular weight	: 28 kDa α subunit, 24 kDa β subunit (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 290 nm, Light path length : 1 cm
Final volume : 3.02 mL, Temperature : 37 °C

Pipette the following reagents into a cuvette

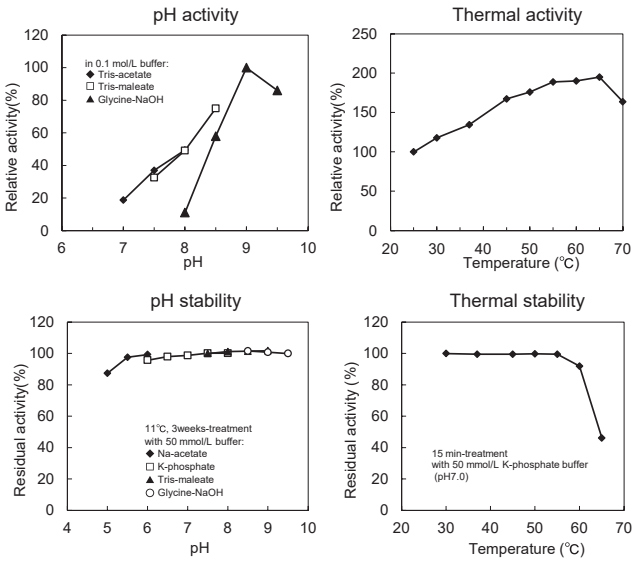
3.00 mL	Tris-acetate buffer (50 mmol/L, pH 7.2) containing Protocatechuate (0.4 mmol/L)
0.02 mL	rPCO (1.2 - 1.6 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{3.8 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 290 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
3.8 = mmol/L extinction coefficient of Protcatechuate ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Solution
Store at 1 - 10 °C (do not freeze)

Cat. No./Package

Cat. No.	Package
46852904	Bulk

For in vitro diagnostic or research use only

rpHBH

recombinant ρ-Hydroxybenzoate hydroxylase EC 1.14.13.2

from Bacteria

Reaction Equation

4-Hydroxybenzoate + NADPH + H^+ + O_2
→ 3,4-Dihydroxybenzoate + $NADP^+$ + H_2O

Specification

Specific Activity

U/mg protein	> 50 units

Contaminants

NADPH oxidase	< 0.01%
Glutathione reductase	< 0.01%
Cholinesterase	< 0.003%

Properties

pH stability : pH 5.5 - 7.5 (4 °C, 2 week)
Thermal stability : ≦ 30 °C (pH 8.0, 15 min)
Optimum pH : 7.0 - 7.5
Optimum temp. : 37 - 40 °C
Km value : 2.1 × 10^{-5} mol/L (ρ-Hydroxybenzoate)
2.5 × 10^{-4} mol/L (NADPH)
2.0 × 10^{-7} mol/L (FAD)
Molecular weight : 44 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Final volume : 3.02 mL, Temperature : 37 °C

Pipette the following reagents into a cuvette

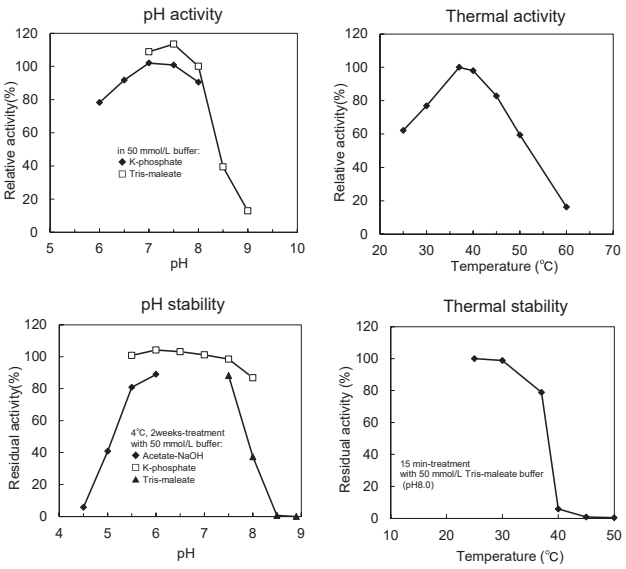
3.00 mL	Tris-maleate buffer (50 mmol/L, pH 8.0) containing ρ-Hydroxybenzoate (0.5 mmol/L) FAD (0.02 mmol/L) and NADPH (0.3 mmol/L)
0.02 mL	rpHBH (approx. 3 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.2 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
6.2 = mmol/L extinction coefficient of NADPH
($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46853903	Bulk

For in vitro diagnostic or research use only

POD

Peroxidase EC 1.11.1.7

from Horseradish roots

Reaction Equation

Donor + H_2O_2 → Oxidized donor + $2H_2O$

Specification

Specific Activity

U/mg protein > 450 units

Contaminants

Catalase < 0.5%

Phosphatase < 0.005%

Assay Procedure

I Spectrophotometric Method

Wavelength : 510 nm, Light path length : 1 cm

Temperature : 25 ℃

Pipette the following reagents into a cuvette

1.40 mL	Phenol solution (0.17 mol/L) containing 4-Aminoantipyrine (2.5 mmol/L)
1.50 mL	Potassium phosphate (0.2 mol/L, pH 7.0) containing Hydrogen peroxide (1.7 mmol/L)
0.10 mL	POD (0.5 - 1.0 U/mL)

II Calculation

$$\frac{\Delta A/min \cdot V \cdot D}{13.2 \cdot d \cdot v} \times 2 = U/mL$$

Δ A/min = The change in absorbance at 510 nm/minute

V = Total volume of reaction mixture (3.00 mL)

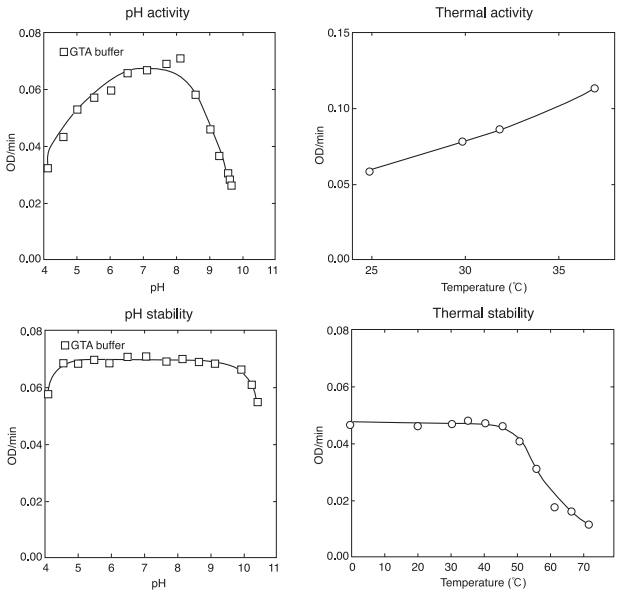
D = Enzyme dilution factor

13.2 = mmol/L extinction coefficient of Quinoneimine dye ($L \cdot mmol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

v = Volume of enzyme sample (0.10 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)

Store below -20 ℃

Cat. No./Package

Cat. No.	Package
46261003	10,000 units
46262003	50,000 units
46260903	Bulk

For in vitro diagnostic or research use only

rUrease

recombinant Urease EC 3.5.1.5

from Bacteria

Reaction Equation

Urea + H_2O + $2H^+ \rightarrow 2NH_4^+ + CO_2$

Specification

Specific Activity

U/mg protein > 150 units

Contaminants

NADPH oxidase < 0.001%

Properties

pH stability : pH 8.0 - 9.5 (37 °C, 1 week)
Thermal stability : ≦ 65 °C (pH 8.0, 10 min)
Optimum pH : 6.0
Optimum temp. : ≧ 37 °C
Km value : 1.94 × 10^{-5} mmol/L (Urea)
Molecular weight : 60.3 kDa α subunit, 11.7 kDa β subunit, 11.1 kDa γ subunit (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Temperature : 25 °C

Pipette the following reagents into a cuvette

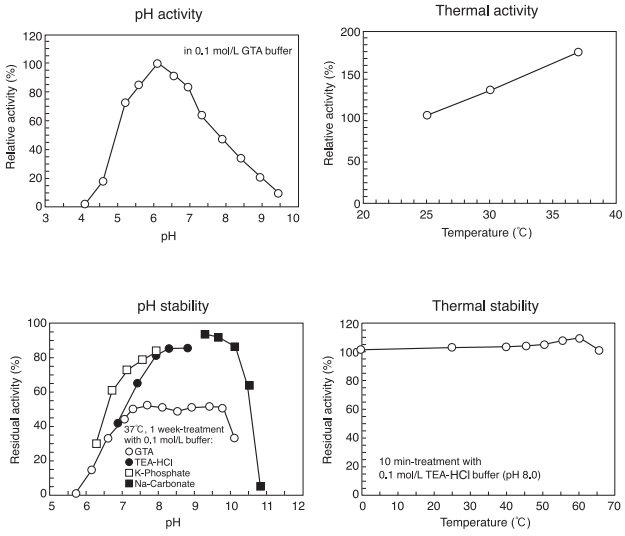
3.00 mL	Triethanolamine-HCl buffer (0.1 mol/L, pH 7.0) containing Urea (1 mol/L) α-Ketoglutarate (5 mmol/L) NADPH (0.24 mmol/L) GlDH (20 U/mL)
0.02 mL	rUrease (approx. 1.5 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{6.2 \cdot d \cdot v \cdot 2} = U/mL$$

Δ A/min = The change in absorbance at 340 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
6.2 = mmol/L extinction coefficient of NADPH ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46753000	1,000 units
46753900	Bulk

For in vitro diagnostic or research use only

rUricase(Y)

recombinant Uricase EC 1.7.3.3

from Yeast

Reaction Equation

Urate + O_2 + H_2O → 5-Hydroxyisourate + H_2O_2

Specification

Specific Activity

U/mg protein > 6 units

Properties

pH stability : pH 7.6 - 10.0 (25 °C, 1 week)
Thermal stability : ≦ 55 °C (pH 8.5, 30 min)
Optimum pH : 8.5
Optimum temp. : 55 °C
Km value : 3.8 × 10^{-5} mol/L (Urate)
Molecular weight : 34 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 293 nm, Light path length : 1 cm
Final volume : 3.02 mL, Temperature : 25 °C

Pipette the following reagents into a cuvette

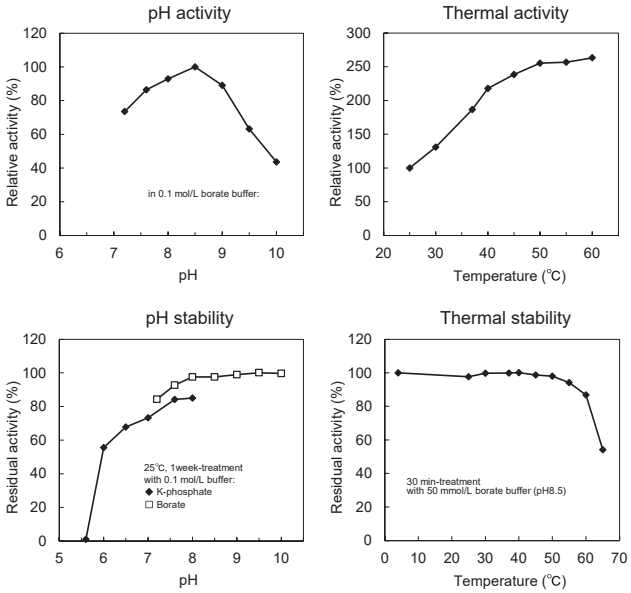
3.00 mL	Borate buffer (50 mmol/L, pH 8.5) containing Urate (0.125 mmol/L)
0.02 mL	rUricase (approx. 1 U/mL)

II Calculation

$$\frac{\Delta A/min \cdot V \cdot D}{12.6 \cdot d \cdot v} = U/mL$$

ΔA/min = The change in absorbance at 293 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
12.6 = mmol/L extinction coefficient of Urate ($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46769003	100 units
46767900	Bulk

For in vitro diagnostic or research use only

rUricase-03

recombinant Uricase EC 1.7.3.3

from Bacteria

Reaction Equation

Urate + O_2 + H_2O → 5-Hydroxyisourate + H_2O_2

Specification

Specific Activity

U/mg protein	> 3 units

Contaminants

Catalase	< 1%

Properties

pH stability	: pH 6.0 - 9.5 (30 °C, 1 week)
Thermal stability	: ≦ 55 °C (pH 8.5, 10 min)
Optimum pH	: 8.5
Optimum temp.	: 45 - 55 °C
Km value	: 1.8 × 10^{-5} mol/L (Urate, pH 7.0)
	1.6 × 10^{-5} mol/L (Urate, pH 8.5)
Molecular weight	: 35 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 293 nm, Light path length : 1 cm
Final volume : 3.02 mL, Temperature : 37 °C

Pipette the following reagents into a cuvette

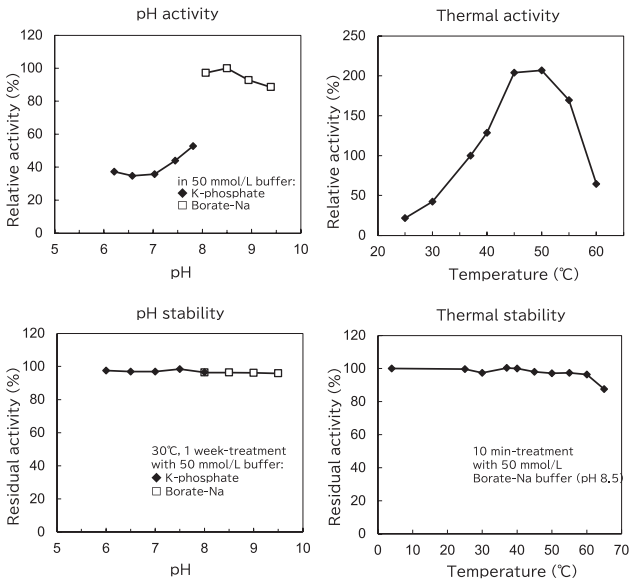
3.00 mL	K-phosphate (50 mmol/L, pH 7.4) containing Borate (50 mmol/L) Urate (0.125 mmol/L)
0.02 mL	rUricase (approx. 1 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{12.6 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 293 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
12.6 = mmol/L extinction coefficient of Urate
($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46785903	Bulk

For in vitro diagnostic or research use only

rUricase-73

recombinant Uricase EC 1.7.3.3

from Bacteria

Reaction Equation

Urate + O_2 + H_2O
→ 5-Hydroxyisourate + H_2O_2

Specification

Specific Activity

U/mg protein > 3 units

Contaminants

Catalase < 1%

Properties

pH stability : pH 6.0 - 9.5 (30 °C, 1 week)
Thermal stability : ≦ 55 °C (pH 8.5, 30 min)
Optimum pH : 8.5
Optimum temp. : 45 - 55 °C
Km value : 1.1 × 10^{-5} mol/L (Urate, pH 7.0)
1.8 × 10^{-5} mol/L (Urate, pH 8.5)
Molecular weight : 35 kDa (SDS-PAGE)

Assay Procedure

I Spectrophotometric Method

Wavelength : 293 nm, Light path length : 1 cm
Final volume : 3.02 mL, Temperature : 37 °C

Pipette the following reagents into a cuvette

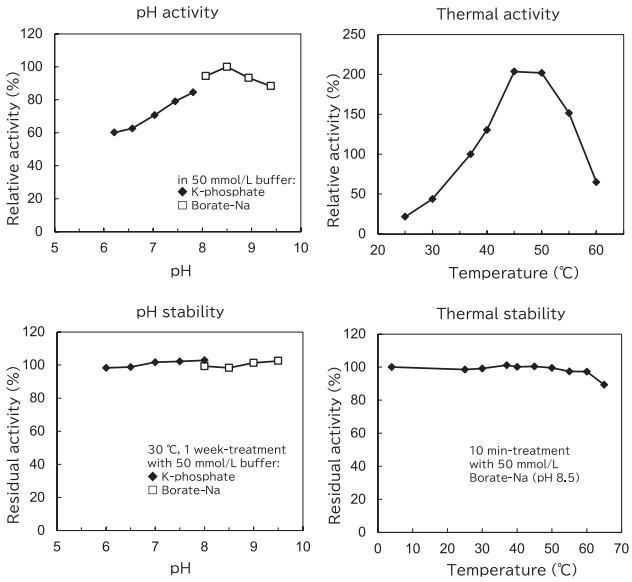
3.00 mL	K-phosphate (50 mmol/L, pH 7.4) containing Borate (50 mmol/L) Urate (0.125 mmol/L)
0.02 mL	rUricase (approx. 1 U/mL)

II Calculation

$$\frac{\Delta\ A/min \cdot V \cdot D}{12.6 \cdot d \cdot v} = U/mL$$

Δ A/min = The change in absorbance at 293 nm/minute
V = Total volume of reaction mixture (3.02 mL)
D = Enzyme dilution factor
12.6 = mmol/L extinction coefficient of Urate
($L \cdot mmol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Volume of enzyme sample (0.02 mL)

Reference Data



Preparation and Storage

Lyophilized powder (Ammonium sulfate free)
Store below -20 °C

Cat. No./Package

Cat. No.	Package
46786903	Bulk

For in vitro diagnostic or research use only

Coenzymes

Table of Contents

Our high purity coenzymes are prepared by extraction from yeast or enzymatic reaction using highly purified materials, and purified by effective ion-exchange chromatography.

Specification

We established the specification of our coenzymes, based on "Specification and Criteria for Biochemical Compounds" by National Academy of Science-National Research Council, Washington, D.C. in U.S.A.

Purity

The purity of our coenzymes is measured by enzymatic analysis. In addition, for stricter quality control, we set the standards of molar extinction coefficient indicated below.

In case of oxidized form of coenzymes such as NAD$^+$ or NADP$^+$, they are evaluated by molar extinction coefficient at 260 nm. When molar extinction efficient is close to the theoretical value, it indicates high purity. Whereas, if they contain other nucleotides, the molar extinction coefficient will be higher than that.

In case of reduced form of coenzymes such as NADH or NADPH, they are evaluated by molar extinction coefficient at 340 nm. If α -form of them or their isomers (such as 1,2 - dihydro form, 1,4 - dihydro form) are contained, the molar extinction coefficient will be higher than that.

If there is discrepancy between the results of spectrum analysis and enzymatic analysis, it is indicated that there are contaminants.

Absorbance Ratio

The absorbance ratio of A340/A260 is one of the important index of the coenzymes' quality.

In case of oxidized form of coenzymes, we use the ratio after reduction by enzymatic reaction (ex. NAD$^+$ → NADH). The theoretical value of A340/A260 is 0.43. If the value is lower than 0.43, it is indicated that coenzymes include other nucleotide contamination. That means the purity of the enzyme decreases. Also, A250/A260 or A280/A260 are auxiliary indexes.

Inhibitors

It is known that during the storage of NADH, inhibitor will generate and increase, and it interferes the enzymatic reaction. The absorbing spectrum peak of inhibitor is approx.340 nm and it is quite close to that of NADH. Therefore, it is difficult to detect and discriminate chemically. If even slight amount of inhibitor exists, the activity of redox enzyme such as lactate dehydrogenase is significantly inhibited.

We have succeeded isolating very strong inhibitors from deteriorated NADH. (1)-(4) The inhibitor is not a single substance, and the types of inhibitors of NADH change over time. Our NADH contains almost no inhibitors.

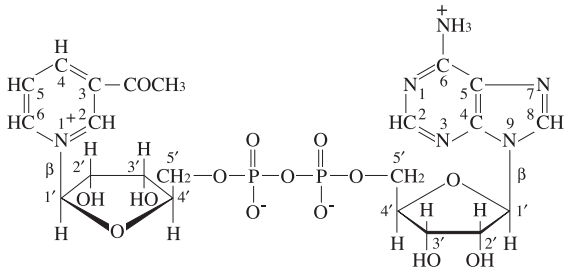
(1) J. Yamauchi, S. Yoshimura, K. Fujii, Biochem., 45, 576 (1973)
(2) J. Yamauchi, S. Yoshimura, K. Fujii, T. Horio, Biochem., 48, 453 (1976)
(3) J. Yamauchi. S. Yoshimura. K. Fujii. T. Horio, Biochem., 49, 770 (1977)
(4) J. Yamauti, S. Yoshimura, I. Takagawara, K. Fujii, A. Tai, J. Yamashita & T. Horio, J. Biochem., 90, 941 - 955 (1981)

APAD+

3-Acetylpyridine-adenine dinucleotide, oxidized form

prepared enzymatically

Structure



Formula

: $C_{22}H_{28}N_6O_{14}P_2$

Formula Weight

: 662.4 (as anhydrous free acid)
: 680.5 (as monohydrate)

Specification

Purity

Determined by Enzymatic Method (ADH) ≧ 92%

Water Content < 8%

UV Spectral Analysis

Ratio at pH 7.5

A_{250}/A_{260} 0.81 ± 0.04

A_{280}/A_{260} 0.24 ± 0.03

Assay Procedure

I Spectrophotometric Method

Wavelength : 363 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Tris-EtOH (0.1 mol/L, 2.4%)	5.0 mL	5.0 mL	5.0 mL
ADH (1 U/mL)	0.3 mL	—	0.3 mL
$APAD^+$ (0.4 mg/mL)	0.5 mL	0.5 mL	—
Distilled water	0.2 mL	0.5 mL	0.7 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{9.1 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - W)} = \text{Purity of } APAD^+$$

$\Delta A = Aa - (Ab + Ac)$

V = Total volume of reaction mixture (6.0 mL)

MW = 662.4, anhydrous free acid

9.1×10^3 = Molar extinction coefficient of APADH at 363 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

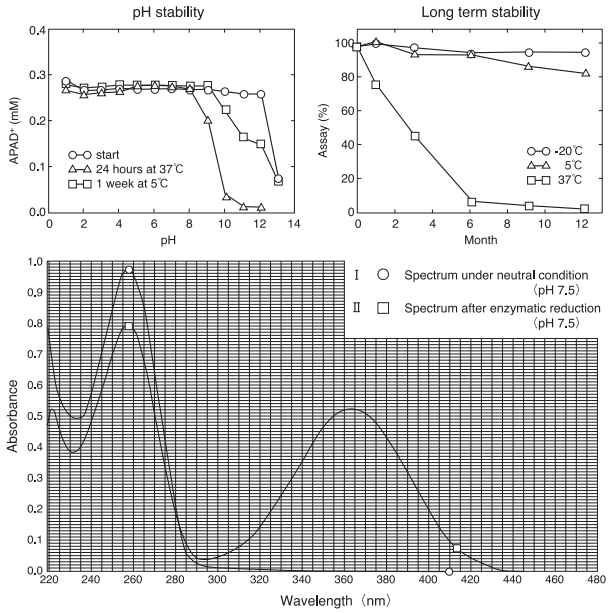
d = Light path length (1 cm)

v = Sample volume (0.5 mL)

s = Sample concentration (0.4 mg/mL)

W = Water content (%)

Reference Data



Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
44047000	100 mg
44046900	Bulk

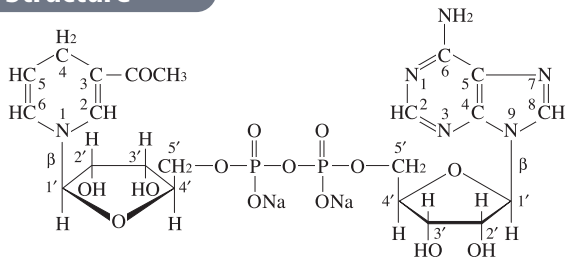
For in vitro diagnostic or research use only

APADH

3-Acetylpyridine-adenine dinucleotide, reduced form (disodium salt)

prepared enzymatically

Structure



Formula

：$C_{22}H_{28}N_6O_{14}P_2 \cdot Na_2$

Formula Weight

：664.5（as anhydrous free acid）
：708.4（as disodium anhydrate）
：744.5（as disodium dihydrate）

Specification

Purity

Determined by Enzymatic Method（ADH） ≧ 92%

Water Content ＜ 8%

Na Content 6.0 ± 2%

UV Spectral Analysis

Ratio at pH 10

A_{250}/A_{260} 0.82 ± 0.04

A_{280}/A_{260} 0.23 ± 0.03

Assay Procedure

I Spectrophotometric Method

Wavelength ： 363 nm, Light path length ： 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Acetaldehyde buffer*	5.0 mL	5.0 mL	5.0 mL
ADH（1 U/mL）	0.2 mL	—	0.2 mL
APADH（0.4 mg/mL）	0.5 mL	0.5 mL	—
Distilled water	0.3 mL	0.5 mL	0.8 mL

*83.3 mmol/L Tris-HCl, pH 7.5 containing 34 mmol/L acetaldehyde

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{9.1 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of APADH}$$

$\Delta A = Ab - (Aa + Ac)$

V ＝ Total volume of reaction mixture（6.0 mL）

MW ＝ 664.5, anhydrous free acid

9.1×10^3 ＝ Molar extinction coefficient of APADH at 363 nm（$L \cdot mol^{-1} \cdot cm^{-1}$）

d ＝ Light path length（1 cm）

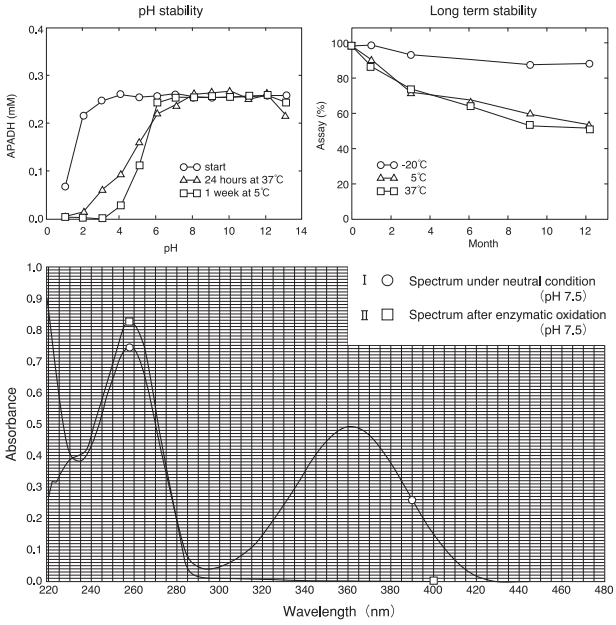
v ＝ Sample volume（0.5 mL）

s ＝ Sample concentration（0.4 mg/mL）

S ＝ Na（%）

W ＝ Water content（%）

Reference Data



Storage

Store below -20℃. Handling during short term such as transportation is allowed at 1 - 10℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
44048900	Bulk

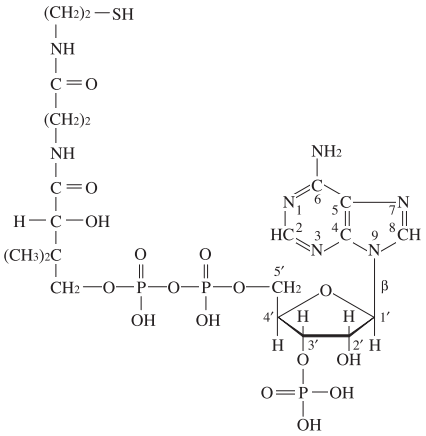
For in vitro diagnostic or research use only

CoA

Coenzyme A (free acid) CoA-SH (free acid)

prepared enzymatically

Structure



Formula

: $C_{21}H_{36}N_7O_{16}P_3S$

Formula Weight

: 767.5 (as anhydrous free acid)
: 803.6 (as dihydrate)

Specification

Purity

Determined by Enzymatic Method (PTA) ≧ 75%

Water Content < 8%

UV Spectral Analysis

Ratio at pH 7.5

A_{250}/A_{260} 0.78 ± 0.03

A_{280}/A_{260} 0.16 ± 0.03

Assay Procedure

I Spectrophotometric Method

Wavelength : 233 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b
Tris-HCl (0.1 mol/L, pH 7.5)	4.00 mL	4.00 mL
Acetyl Phosphate (20 mg/mL)	0.20 mL	0.20 mL
CoA (1.0 mg/mL)	0.50 mL	0.50 mL
PTA (5,000 U/mL)*	0.01 mL	—

*Phosphotransacetylase

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{4.44 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - W)} = \text{Purity of CoA}$$

$\Delta A = Aa - Ab$

V = Total volume of reaction mixture (4.71 mL)

MW = 767.5, anhydrous free acid

4.44×10^3 = Molar extinction coefficient of Acetyl-CoA at 233 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

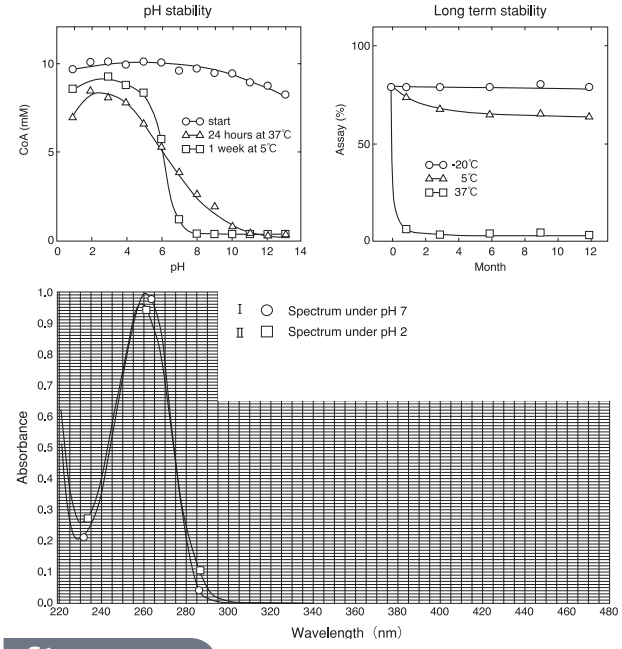
d = Light path length (1 cm)

v = Sample volume (0.5 mL)

s = Sample concentration (1.0 mg/mL)

W = Water content (%)

Reference Data



Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package	Cat. No.	Package
45150000	100 mg	45152900	Bulk
45152000	1 g		

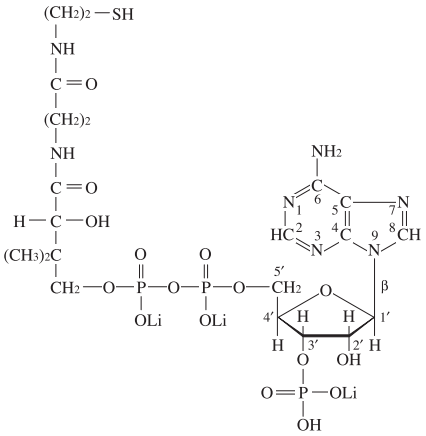
For in vitro diagnostic or research use only

CoA-Li

Coenzyme A (trilithium salt)

prepared enzymatically

Structure



Formula

: $C_{21}H_{33}N_7O_{16}P_3S \cdot Li_3$

Formula Weight

: 767.5 (as anhydrous free acid)
: 785.3 (as trilithium anhydrate)
: 839.4 (as trilithium trihydrate)

Specification

Purity

Determined by Enzymatic Method (PTA) ≧ 75%

Water Content < 8%

Li Content 3.0 ± 1.5%

UV Spectral Analysis

Ratio at pH 7.5

A_{250}/A_{260} 0.78 ± 0.03

A_{280}/A_{260} 0.16 ± 0.03

Assay Procedure

I Spectrophotometric Method

Wavelength : 233 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b
Tris-HCl (0.1 mol/L, pH 7.5)	4.00 mL	4.00 mL
Acetyl Phosphate (20 mg/mL)	0.20 mL	0.20 mL
CoA (1.0 mg/mL)	0.50 mL	0.50 mL
PTA (5,000 U/mL)*	0.01 mL	—

*Phosphotransacetylase

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{4.44 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - L - W)} = \text{Purity of CoA}$$

$\Delta A = Aa - Ab$

V = Total volume of reaction mixture (4.71 mL)

MW = 767.5, anhydrous free acid

4.44×10^3 = Molar extinction coefficient of Acetyl-CoA at 233 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

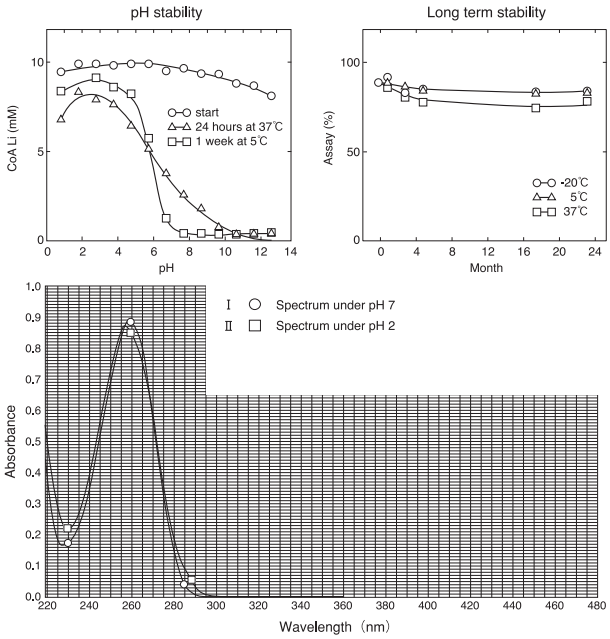
v = Sample volume (0.5 mL)

s = Sample concentration (1.0 mg/mL)

L = Li (%)

W = Water content (%)

Reference Data



Storage

Store below -20℃. Handling during short term such as transportation is allowed at 1 - 10℃.

Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package	Cat. No.	Package
45160000	100 mg	45162900	Bulk
45162000	1 g		

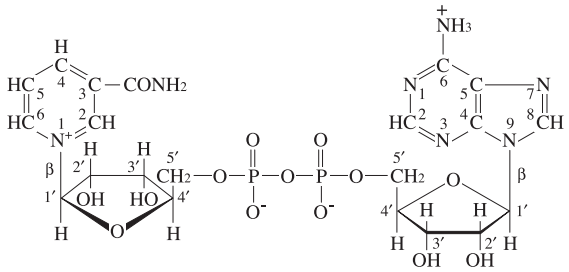
For in vitro diagnostic or research use only

β-NAD+

β-Nicotinamide-adenine dinucleotide, oxdized form (free acid)

from Yeast

Structure



Formula

：$C_{21}H_{27}N_7O_{14}P_2$

Formula Weight

：663.4（as anhydrous free acid）
：681.4（as monohydrate）

Specification

Purity

Determined by Enzymatic Method（ADH）	≧ 95%

Water Content ＜ 8%

UV Spectral Analysis

ε at 260 nm and pH 7.5	$(18.0 \pm 0.5) \times 10^3$
Ratio at pH 7.5	
A_{250}/A_{260}	0.83 ± 0.03
A_{280}/A_{260}	0.21 ± 0.02
ε when reduced with ADH at 340 nm and pH 10	$(6.3 \pm 0.2) \times 10^3$
Ratio when reduced with ADH at pH 10	
A_{340}/A_{260}	0.43 ± 0.01

Assay Procedure

I Spectrophotometric Method

Wavelength ： 340 nm, Light path length ： 1 cm

Pipette the following reagents into a cuvette

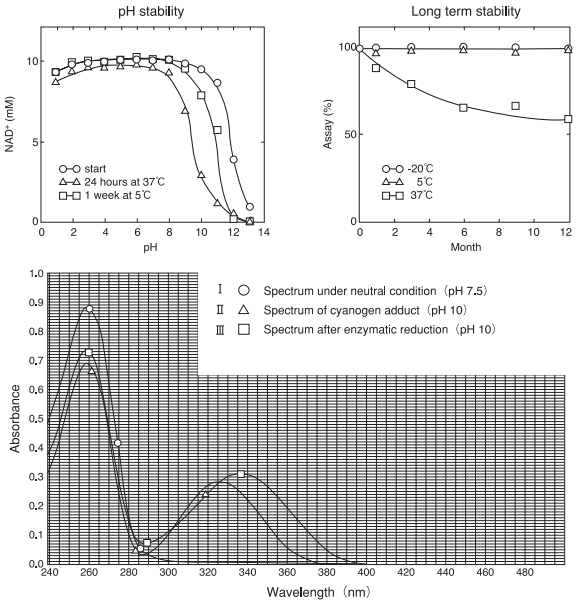
	a	b	c
Tris-EtOH（0.1 mol/L, 2.4%）	5.0 mL	5.0 mL	5.0 mL
ADH（50 U/mL）	0.3 mL	—	0.3 mL
NAD+（0.45 mg/mL）	0.5 mL	0.5 mL	—
Distilled water	0.2 mL	0.5 mL	0.7 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.3 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{100 - W} = \text{Purity of NAD}^+$$

$\Delta A = Aa - (Ab + Ac)$
V = Total volume of reaction mixture（6.0 mL）
MW = 663.4, anhydrous free acid
6.3×10^3 = Molar extinction coefficient of NADH at 340 nm（$L \cdot mol^{-1} \cdot cm^{-1}$）
d = Light path length（1 cm）
v = Sample volume（0.5 mL）
s = Sample concentration（0.45 mg/mL）
W = Water content（%）

Reference Data



Storage

Store below -20℃. Handling during short term such as transportation is allowed at 1 - 10℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package	Cat. No.	Package
44065908	10 g	44065900	Bulk
44065903	500 g		

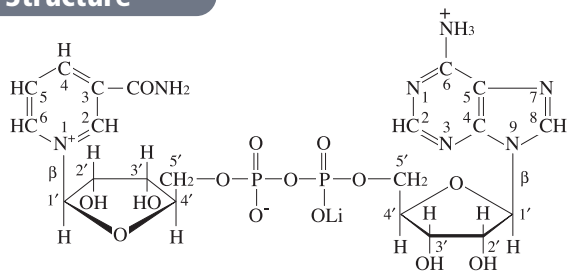
For in vitro diagnostic or research use only

β-NAD⁺-Li

β-Nicotinamide-adenine dinucleotide, oxidized form (monolithium salt)

from Yeast

Structure



Formula

：$C_{21}H_{26}N_7O_{14}P_2 \cdot Li$

Formula Weight

：663.4（as anhydrous free acid）
：669.4（as monolithium anhydrate）
：705.4（as monolithium dihydrate）

Specification

Purity

Determined by Enzymatic Method（ADH）	≧ 95%
Water Content	＜ 8%
Li Content	1.0 ± 0.5%

UV Spectral Analysis

ε at 260 nm and pH 7.5	(18.0 ± 0.5) × 10^3
Ratio at pH 7.5	
A_{250}/A_{260}	0.83 ± 0.03
A_{280}/A_{260}	0.21 ± 0.02
ε when reduced with ADH at 340 nm and pH 10	(6.3 ± 0.2) × 10^3
Ratio when reduced with ADH at pH 10	
A_{340}/A_{260}	0.43 ± 0.01

Assay Procedure

I Spectrophotometric Method

Wavelength ： 340 nm, Light path length ： 1 cm

Pipette the following reagents into a cuvette

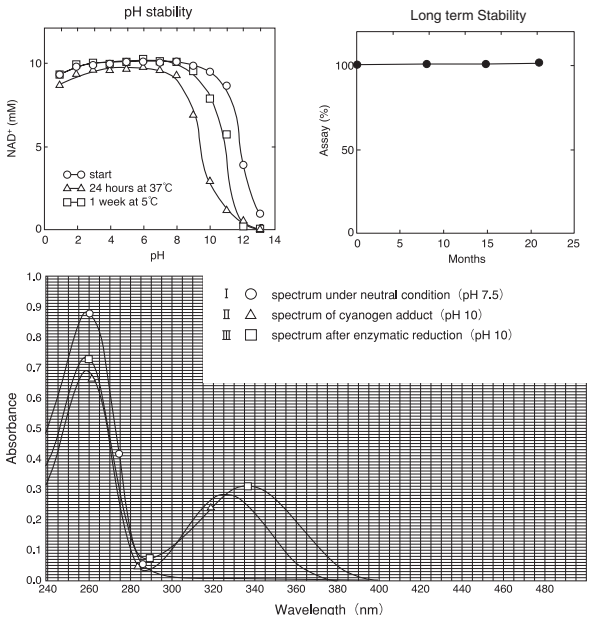
	a	b	c
Tris-EtOH（0.1 mol/L, 2.4%）	5.0 mL	5.0 mL	5.0 mL
ADH（50 U/mL）	0.3 mL	—	0.3 mL
NAD^+（0.45 mg/mL）	0.5 mL	0.5 mL	—
Distilled water	0.2 mL	0.5 mL	0.7 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.3 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{100 - W - L} = \text{Purity of } NAD^+$$

$\Delta A = Aa - (Ab + Ac)$
V = Total volume of reaction mixture（6.0 mL）
MW = 663.4, anhydrate free acid
6.3×10^3 = Molar extinction coefficient of NADH at 340 nm（$L \cdot mol^{-1} \cdot cm^{-1}$）
d = Light path length（1 cm）
v = Sample volume（0.5 mL）
s = Sample concentration（0.45 mg/mL）
W = Water content（%）
L = Li（%）

Reference Data



Storage

Store below -20℃. Handling during short term such as transportation is allowed at 1 - 10℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
44097900	Bulk

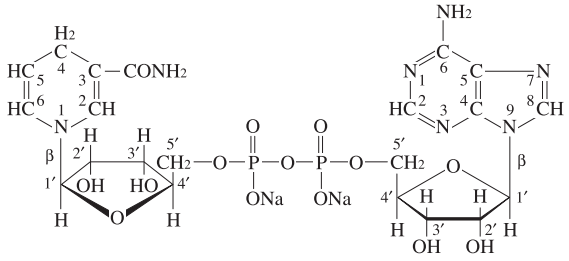
For in vitro diagnostic or research use only

β-NADH

β-Nicotinamide-adenine dinucleotide, reduced form (disodium salt)

reduced enzymatically

Structure



Formula

: $C_{21}H_{27}N_7O_{14}P_2 \cdot Na_2$

Formula Weight

: 665.4 (as anhydrous free acid)
: 709.4 (as disodium anhydrate)
: 763.5 (as disodium trihydrate)

Specification

Purity

Determined by Enzymatic Method (ADH)	≧ 95%
Water Content	< 8%
Na Content	6.5 ± 1.5%

UV Spectral Analysis

ε at 260 nm and pH 10	(14.4 ± 0.5) × 10^3
ε at 340 nm and pH 10	(6.3 ± 0.2) × 10^3
Ratio at pH 10	
A_{250}/A_{260}	0.82 ± 0.03
A_{280}/A_{260}	0.23 ± 0.02
A_{340}/A_{260}	0.43 ± 0.01

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Acetaldehyde buffer*	5.0 mL	5.0 mL	5.0 mL
ADH (50 U/mL)	0.2 mL	—	0.2 mL
NADH (0.50 mg/mL)	0.5 mL	0.5 mL	—
Distilled water	0.3 mL	0.5 mL	0.8 mL

*Mix 8 mL of acetaldehyde (1 mol/L) and 20 mL of Tris buffer (1 mol/L, pH 7.5) and then make up to 240 mL with distilled water.

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.3 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of NADH}$$

$\Delta A = Ab - (Aa - Ac)$

V = Total volume of reaction mixture (6.0 mL)

MW = 665.4, anhydrous free acid

6.3×10^3 = Molar extinction coefficient of NADH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

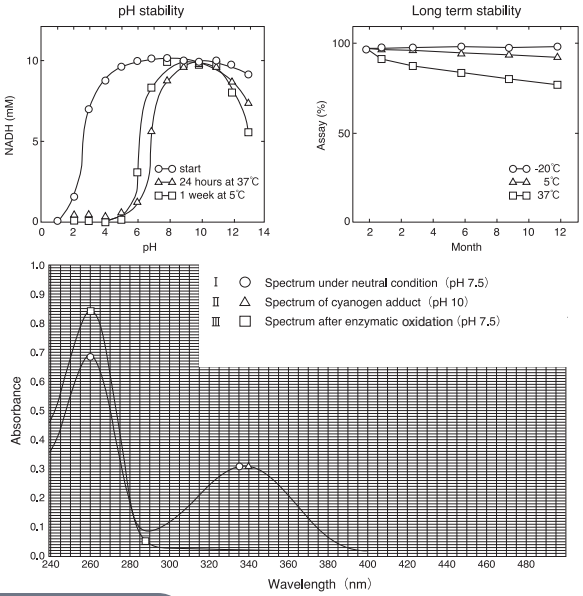
v = Sample volume (0.5 mL)

s = Sample concentration (0.5 mg/mL)

S = Na (%)

W = Water content (%)

Reference Data



Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package	Cat. No.	Package
44326000	5 g	44320900	Bulk
44327000	10 g		

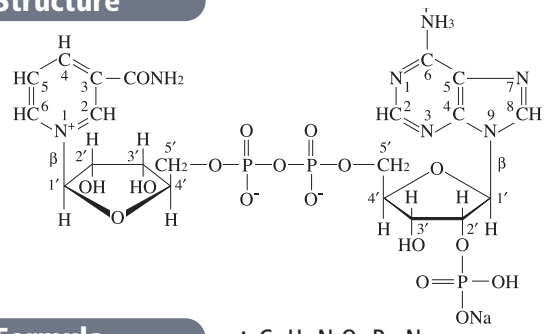
For in vitro diagnostic or research use only

β-NADP+

β-Nicotinamide-adenine dinucleotide phosphate, oxidized form (monosodium salt)

prepared enzymatically

Structure



Formula

: $C_{21}H_{27}N_7O_{17}P_3 \cdot Na$

Formula Weight

: 743.4 (as anhydrous free acid)
: 765.4 (as monosodium anhydrate)
: 801.4 (as monosodium dihydrate)

Specification

Purity

Determined by Enzymatic Method (G6PDH)	≧ 93%

Water Content ＜ 8%

Na Content 3.0 ± 1.5%

UV Spectral Analysis

ε at 260 nm and pH 7.5	(18.0 ± 0.8) × 10^3
Ratio at pH 7.5	
A_{250}/A_{260}	0.83 ± 0.03
A_{280}/A_{260}	0.21 ± 0.02
ε when reduced with G6PDH at 340 nm and pH 7.5	(6.2 ± 0.3) × 10^3
Ratio when reduced with G6PDH at pH 7.5	
A_{340}/A_{260}	0.43 ± 0.02

Assay Procedure

I Spectrophotometric Method

Waveleng : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Tris-HCl (0.1 mol/L, pH 7.5)	5.0 mL	5.0 mL	5.0 mL
G6P (20 mmol/L)	0.2 mL	0.2 mL	—
$NADP^+$ (0.6 mg/mL)	0.5 mL	0.5 mL	—
G6PDH (Y) (50 U/mL)	0.1 mL	—	0.1 mL
Distilled water	0.2 mL	0.3 mL	0.9 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.2 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of } NADP^+$$

$\Delta A = Aa - (Ab + Ac)$

V = Total volume of reaction mixture (6.0 mL)

MW = 743.4, anhydrous free acid

6.2×10^3 = Molar extinction coefficient of NADPH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

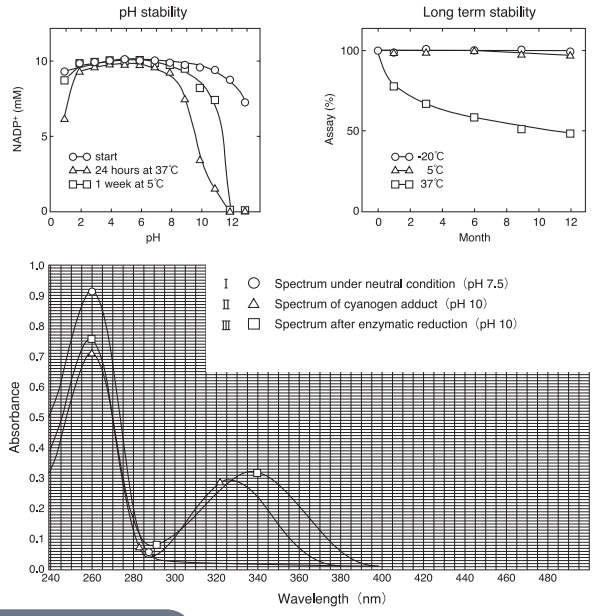
v = Sample volume (0.5 mL)

s = Sample concentration (0.6 mg/mL)

S = Na (%)

W = Water content (%)

Reference Data



Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.

Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package	Cat. No.	Package
44290000	100 mg	44298000	10 g
44292000	1 g	44292900	Bulk
44297000	5 g		

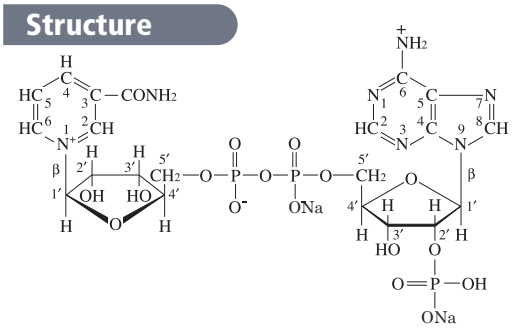
For in vitro diagnostic or research use only

β-NADP$^+$-Na$_2$

β-Nicotinamide-adenine dinucleotide phosphate, oxidized form (disodium salt)

prepared enzymatically

Structure



Formula

: $C_{21}H_{26}N_7O_{17}P_3 \cdot Na_2$

Formula Weight

: 743.4 (as anhydrous free acid)
: 787.4 (as disodium anhydrate)
: 841.4 (as disodium trihydrate)

Specification

Purity

Determined by Enzymatic Method (G6PDH)	≧ 93%
Water Content	< 8%
Na Content	6.0 ± 1.5%
UV Spectral Analysis	
ε at 260 nm and pH 7.5	(18.0 ± 0.8) × 10^3
Ratio at pH 7.5	
A_{250}/A_{260}	0.83 ± 0.03
A_{280}/A_{260}	0.21 ± 0.02
ε when reduced with G6PDH at 340 nm and pH 7.5	(6.2 ± 0.3) × 10^3
Ratio when reduced with G6PDH at pH 7.5	
A_{340}/A_{260}	0.43 ± 0.02

Assay Procedure

I Spectrophotometric Method

Waveleng : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Tris-HCl (0.1 mol/L, pH 7.5)	5.0 mL	5.0 mL	5.0 mL
G6P (20 mmol/L)	0.2 mL	0.2 mL	—
NADP$^+$ (0.6 mg/mL)	0.5 mL	0.5 mL	—
G6PDH (Y) (50 U/mL)	0.1 mL	—	0.1 mL
Distilled water	0.2 mL	0.3 mL	0.9 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.2 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of NADP}^+$$

Δ A = Aa − (Ab + Ac)
V = Total volume of reaction mixture (6.0 mL)
MW = 743.4, anhydrous free acid
6.2 × 10^3 = Molar extinction coefficient of NADPH at 340 nm (L·mol^{-1}·cm^{-1})
d = Light path length (1 cm)
v = Sample volume (0.5 mL)
s = Sample concentration (0.6 mg/mL)
S = Na (%)
W = Water content (%)

Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
44300900	Bulk

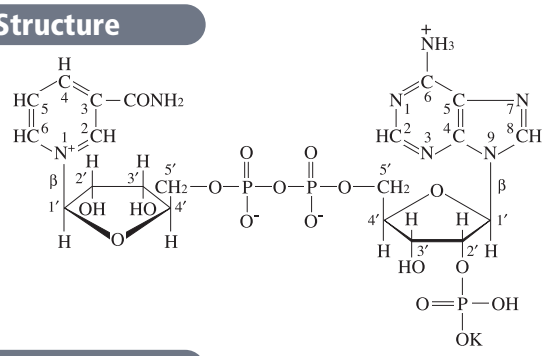
For in vitro diagnostic or research use only

β-NADP⁺-K

β-Nicotinamide-adenine dinucleotide phosphate, oxidized form (monopotassium salt)

prepared enzymatically

Structure



Formula

: $C_{21}H_{27}N_7O_{17}P_3 \cdot K$

Formula Weight

: 743.4 (as anhydrous free acid)
: 781.5 (as monopotassium anhydrate)
: 817.5 (as monopotassium dihydrate)

Specification

Purity
Determined by Enzymatic Method (G6PDH) ≧ 95%

Water Content < 8%

K Content 5.0 ± 1.5%

UV Spectral Analysis

ε at 260 nm and pH 7.5	(18.0 ± 0.8) × 10^3
Ratio at pH 7.5	
A_{250}/A_{260}	0.83 ± 0.03
A_{280}/A_{260}	0.21 ± 0.02
ε when reduced with G6PDH at 340 nm and pH 7.5	(6.2 ± 0.3) × 10^3
Ratio when reduced with G6PDH at pH 7.5	
A_{340}/A_{260}	0.43 ± 0.02

Assay Procedure

I Spectrophotometric Method

Waveleng : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

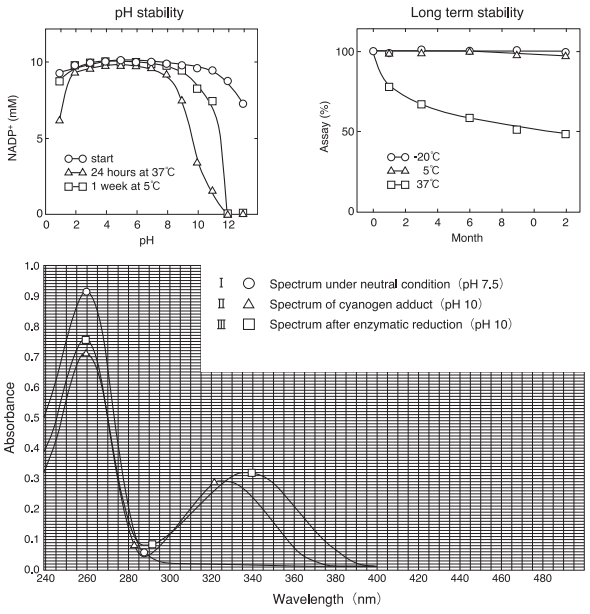
	a	b	c
Tris-HCl (0.1 mol/L, pH 7.5)	5.0 mL	5.0 mL	5.0 mL
G6P (20 mmol/L)	0.2 mL	0.2 mL	—
$NADP^+$ (0.6 mg/mL)	0.5 mL	0.5 mL	—
G6PDH (yeast) (50 U/mL)	0.1 mL	—	0.1 mL
Distilled water	0.2 mL	0.3 mL	0.9 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.2 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - P - W)} = \text{Purity of } NADP^+$$

Δ A = Aa − (Ab + Ac)
V = Total volume of reaction mixture (6.0 mL)
MW = 743.4, anhydrous free acid
6.2×10^3 = Molar extinction coefficient of NADPH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Sample volume (0.5 mL)
s = Sample concentration (0.6 mg/mL)
P = K (%)
W = Water content (%)

Reference Data



Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
44310900	Bulk

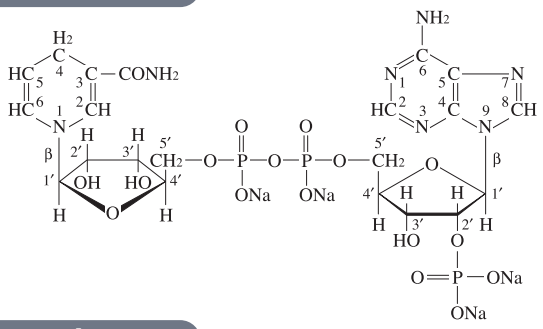
For in vitro diagnostic or research use only

β-NADPH

β-Nicotinamide-adenine dinucleotide phosphate, reduced form (tetrasodium salt)

reduced enzymatically

Structure



Formula

: $C_{21}H_{26}N_7O_{17}P_3 \cdot Na_4$

Formula Weight

: 745.4 (as anhydrous free acid)
: 833.4 (as tetrasodium anhydrate)
: 887.4 (as tetrasodium trihydrate)

Specification

Purity

Determined by Enzymatic Method (GR)	≧ 93%
Water Content	< 8%
Na Content	10.0 ± 2.0%
UV Spectral Analysis	
ε at 260 nm and pH 10	(14.4 ± 0.7) × 10^3
ε at 340 nm and pH 10	(6.2 ± 0.3) × 10^3
Ratio at pH 10	
A_{340}/A_{260}	0.43 ± 0.01

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm
Pipette the following reagents into a cuvette

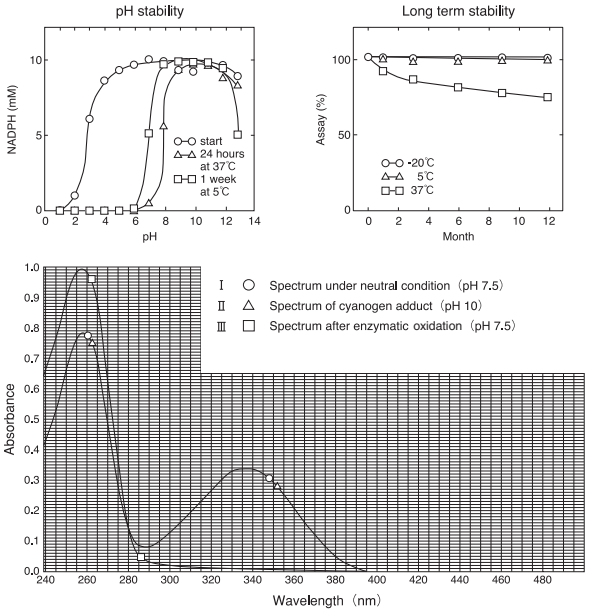
	a	b	c
Tris-HCl (0.1 mol/L, pH 7.5)	5.0 mL	5.0 mL	5.0 mL
GSSG (0.1 mol/L)	0.1 mL	—	0.1 mL
NADPH (0.6 mg/mL)	0.5 mL	0.5 mL	—
GR (50 U/mL)	0.1 mL	—	0.1 mL
Distilled water	0.3 mL	0.5 mL	0.8 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.2 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of NADPH}$$

$\Delta A = (Ab + Ac) - Aa$
V = Total volume of reaction mixture (6.0 mL)
MW = 745.4, anhydrous free acid
6.2×10^3 = Molar extinction coefficient of NADPH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Sample volume (0.5 mL)
s = Sample concentration (0.6 mg/mL)
S = Na (%)
W = Water content (%)

Reference Data



Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package	Cat. No.	Package
44330000	100 mg	44332900	Bulk
44335000	5 g		

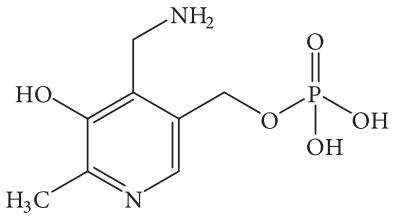
For in vitro diagnostic or research use only

Pyridoxamine phosphate

Pyridoxamine 5'-phosphate

prepared enzymatically

Structure



Formula

: $C_8H_{13}N_2O_5P$

Formula Weight

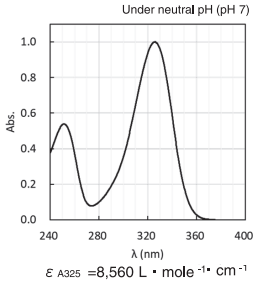
: 248.2 (as anhydrous free acid)
: 284.2 (as dihydrate)

Specification

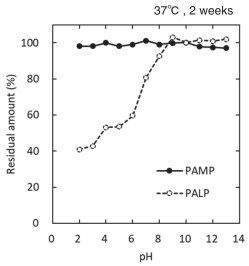
Purity (HPLC)	≧ 98%
Pyridoxamine Phosphate Content	≧ 80%
Water Content	< 8%

Reference Data

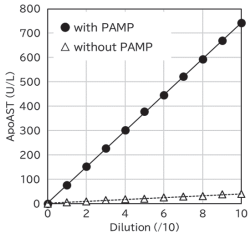
UV spectrum



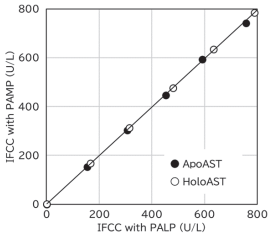
pH stability in solution



ApoAST activation



Correlation between PALP and PAMP methods in AST reagent



Preparation and Storage

Powder
Store below -20 ℃

Cat. No./Package

Cat. No.	Package
44600900	Bulk

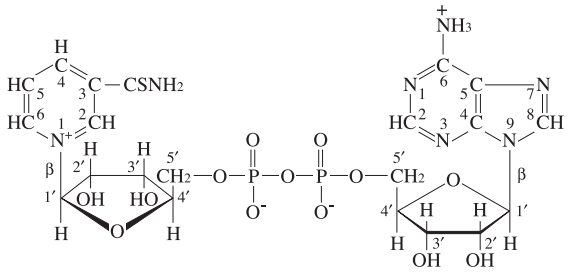
For in vitro diagnostic or research use only

Thio-NAD+

Thionicotinamide-adenine dinucleotide, oxidized form

prepared enzymatically

Structure



Formula

: $C_{21}H_{27}N_7O_{13}P_2S$

Formula Weight

: 679.5 (as anhydrous free acid)
: 697.5 (as monohydrate)

Specification

Purity

Determined by Enzymatic Method (ADH)	≧ 92%

Water Content ＜ 10%

UV Spectral Analysis

Ratio at pH 7.5

A_{250}/A_{260}	0.89 ± 0.03
A_{280}/A_{260}	0.36 ± 0.02

Assay Procedure

I Spectrophotometric Method

Wavelength : 398 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

2.60 mL	Tris-EtOH (0.1 mol/L, 2.4%)	
0.25 mL	Thio-NAD+ (0.45 mg/mL) measure the absorbance at 398 nm	Aa
0.15 mL	ADH (2 U/mL) measure the absorbance at 398 nm	Ab
0.15 mL	ADH (2 U/mL) measure the absorbance at 398 nm	Ac

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{11.9 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - W)} = \text{Purity of Thio-NAD}^+$$

$\Delta A = (Ab \times 3.00/3.15 - Aa \times 2.85/3.15) - (Ac - Ab \times 3.00/3.15)$

V = Total volume of reaction mixture (3.15 mL)

MW = 679.5, anhydrous free acid

11.9×10^3 = Molar extinction coefficient of Thio-NADH at 398 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

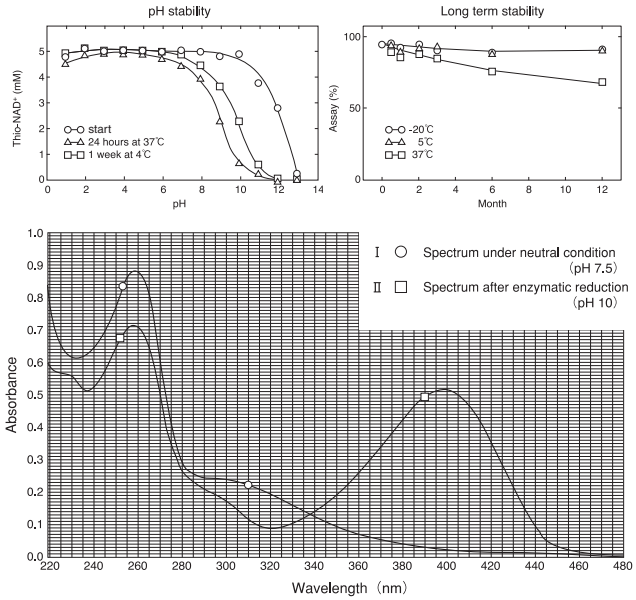
d = Light path length (1 cm)

v = Sample volume (0.25 mL)

s = Sample concentration (0.45 mg/mL)

W = Water content (%)

Reference Data



Storage

Store below -20 °C. Handling during short term such as transportation is allowed at 1 - 10 °C.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
44104001	1 g
44104900	Bulk

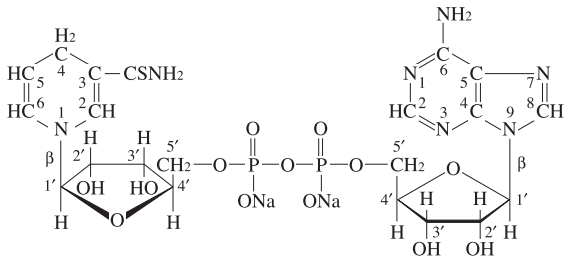
For in vitro diagnostic or research use only

Thio-NADH

Thionicotinamide-adenine dinucleotide, reduced form (disodium salt)

prepared enzymatically

Structure



Formula

: $C_{21}H_{29}N_7O_{13}P_2S$

Formula Weight

: 681.5 (as anhydrous free acid)
: 725.5 (as disodium anhydrate)
: 779.5 (as disodium trihydrate)

Specification

Purity

Determined by Enzymatic Method (ADH)	≧ 90%

Water Content ＜ 10%

Na Content 6.0 ± 3.0%

UV Spectral Analysis

Ratio at pH 7.5

A_{250}/A_{260}	0.86 ± 0.05
A_{280}/A_{260}	0.39 ± 0.03

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

2.75 mL	Acetaldehyde buffer* (1)	
0.25 mL	Thio-NAD$^+$ (0.4 mg/mL)* (2) measure the absorbance at 398 nm	Aa
0.10 mL	ADH (1,780 U/mL) measure the absorbance at 398 nm	Ab
0.10 mL	ADH (1,780 U/mL) measure the absorbance at 398 nm	Ac

* (1) Mix 0.2 mol/L Acetaldehyde and 0.1 mol/L Tris-HCl pH 7.5.
* (2) Dissolve in Tris (10 mmol/L)

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{11.9 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of Thio-NADH}$$

$\Delta A = (Aa \times 3.00/3.20 - Ab \times 3.10/3.20) - (Ac - Ab \times 3.10/3.20)$

V = Total volume of reaction mixture (3.20 mL)

MW = 681.5, anhydrous free acid

11.9×10^3 = Molar extinction coefficient of Thio-NADH at 398 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

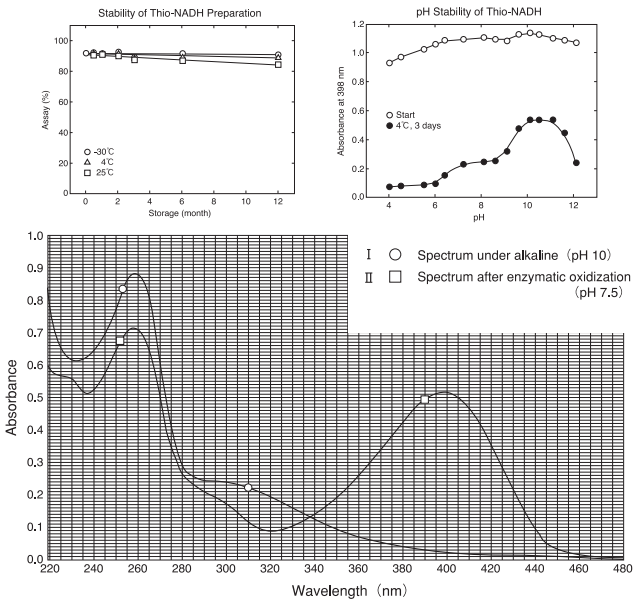
v = Sample volume (0.25 mL)

s = Sample concentration (0.4 mg/mL)

S = Na (%)

W = Water content (%)

Reference Data



Storage

Store below -20℃. Handling during short term such as transportation is allowed at 1 - 10℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
44317900	Bulk

For in vitro diagnostic or research use only

Substrates

Table of Contents

Mainly we manufacture adenine nucleotide and sugar phosphate compound.
Our substrates are used for enzymatic analysis.

Production Method

Our substrates are prepared through enzymatic reaction using highly purified materials and effective ion-exchange chromatography.

Purity

The purity of our substrates is measured by high specific enzymatic analysis.
In manufacturing process, expected inhibitory factors are removed from our products.
For enzymatic analysis, not only high purity but also absence of inhibitory factors are essential.

Quality Assurance

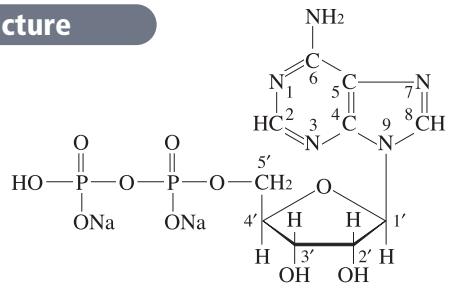
Certification of analysis is attached to all products.

ADP

Adenosine 5′-diphosphate (disodium salt)

prepared enzymatically

Structure



Formula

：$C_{10}H_{13}N_5O_{10}P_2 \cdot Na_2$

Formula Weight

：427.2（as anhydrous free acid）
：471.2（as disodium anhydrate）
：507.2（as disodium dihydrate）

Specification

Purity

Determined by Enzymatic Method（PK, LDH）≧ 93%

Water Content	＜ 8%
Na Content	10.0 ± 2.0%
UV Spectral Analysis	
ε at 260 nm and pH 7.5	（15.4 ± 0.5）× 10^3
Ratio at pH 7.5	
A_{250}/A_{260}	0.78 ± 0.03
A_{280}/A_{260}	0.16 ± 0.02

Assay Procedure

I Spectrophotometric Method

Wavelength：340 nm, Light path length：1 cm
Pipette the following reagents into a cuvette

	a	b	c
Tris-HCl/K^+ & Mg^{2+}（0.1 mol/L, pH 7.5/0.12 mol/L & 0.012 mol/L）	5.0 mL	5.0 mL	5.0 mL
PEP*(1)（14 mg/mL）	0.1 mL	0.1 mL	—
NADH（5 mg/mL）	0.2 mL	0.2 mL	—
ADP（0.5 mg/mL）	0.5 mL	0.5 mL	—
Distilled water	—	0.1 mL	0.9 mL
LDH（50 U/mL）	0.1 mL	0.1 mL	—
PK（50 U/mL）	0.1 mL	—	0.1 mL

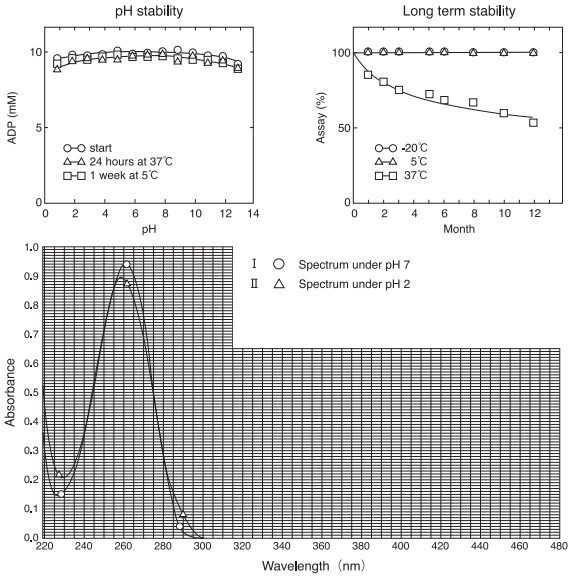
*(1) PEP monocyclohexyl ammonium salt

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.3 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of ADP}$$

Δ A = (Ab + Ac) − Aa
V = Total volume of reaction mixture (6.0 mL)
MW = 427.2, anhydrous free acid
6.3×10^3 = Molar extinction coefficient of NADH at 340 nm (L·mol^{-1}·cm^{-1})
d = Light path length (1 cm)
v = Sample volume (0.5 mL)
s = Sample concentration (0.5 mg/mL)
S = Na (%)
W = Water content (%)

Reference Data



Storage

Store below -20℃. Handling during short term such as transportation is allowed at 1 - 10℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
45120900	Bulk

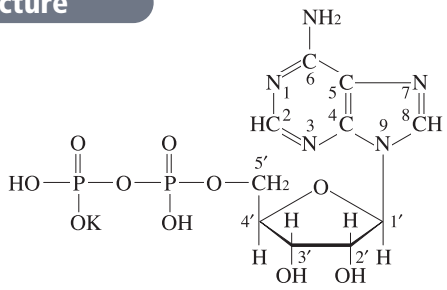
For in vitro diagnostic or research use only

ADP-K

Adenosine 5′-diphosphate (monopotassium salt) Crystalline

prepared enzymatically

Structure



Formula

: $C_{10}H_{14}N_5O_{12}P_2 \cdot K$

Formula Weight

: 427.2 (as anhydrous free acid)
: 465.3 (as monopotassium anhydrate)
: 483.3 (as monolithium monohydrate)

Specification

Purity

Determined by Enzymatic Method (PK, LDH) ≧ 95%

Water Content ＜ 8%

K Content 9.0 ± 2%

UV Spectral Analysis

ε at 260 nm and pH 7.5 (15.4 ± 0.5) × 10^3

Ratio at pH 7.5

A_{250}/A_{260} 0.78 ± 0.03

A_{280}/A_{260} 0.16 ± 0.02

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Tris-HCl/K^+ & Mg^{2+} (0.1 mol/L, pH 7.5/0.12 mol/L & 0.012 mol/L)	5.0 mL	5.0 mL	5.0 mL
PEP* (1) (14 mg/mL)	0.1 mL	0.1 mL	—
NADH (5 mg/mL)	0.2 mL	0.2 mL	—
ADP (0.5 mg/mL)	0.5 mL	0.5 mL	—
Distilled water	—	0.1 mL	0.9 mL
LDH (50 U/mL)	0.1 mL	0.1 mL	—
PK (50 U/mL)	0.1 mL	—	0.1 mL

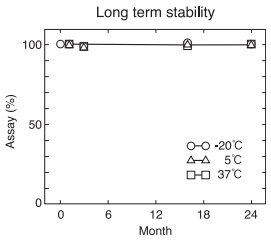
* (1) PEP monocyclohexyl ammonium salt

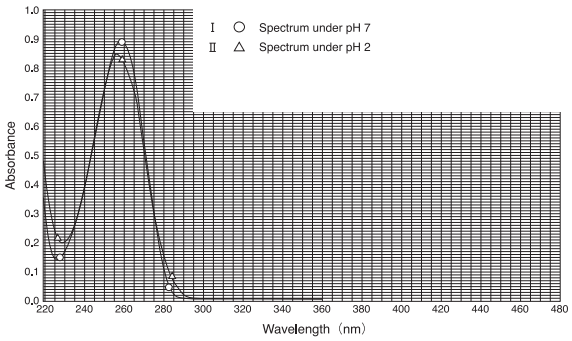
II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.3 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - P - W)} = \text{Purity of ADP}$$

Δ A = (Ab + Ac) − Aa
V = Total volume of reaction mixture (6.0 mL)
MW = 427.2, anhydrous free acid
6.3×10^3 = Molar extinction coefficient of NADH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Sample volume (0.5 mL)
s = Sample concentration (0.5 mg/mL)
P = K (%)
W = Water content (%)

Reference Data





Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
45130900	Bulk

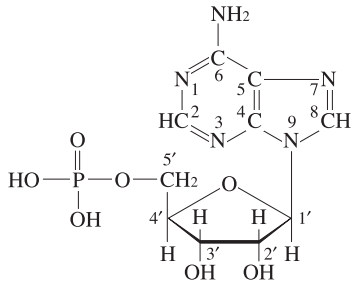
For in vitro diagnostic or research use only

AMP

Adenosine 5′-monophosphate (free acid) Crystalline

from Yeast

Structure



Formula

: $C_{10}H_{14}N_5O_7P$

Formula Weight

: 347.2 (as anhydrous free acid)
: 365.2 (as monohydrate)

Specification

Purity

Determined by Enzymatic Method (PK, LDH, MK) ≧ 95%

Water Content ＜ 8%

UV Spectral Analysis

ε at 260 nm and pH 7.5 (15.4 ± 0.5) × 10^3

Ratio at pH 7.5

A_{250}/A_{260} 0.78 ± 0.03

A_{280}/A_{260} 0.16 ± 0.02

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c	d
Tris-HCl/K^+ & Mg^{2+} (0.1 mol/L, pH 7.5/0.12 mol/L & 0.012 mol/L)	5.0 mL	5.0 mL	5.0 mL	5.0 mL
Substrate mixture*(1)	0.3 mL	0.3 mL	0.3 mL	0.3 mL
AMP (0.2 mg/mL)	0.5 mL	0.5 mL	—	—
Distilled water	—	0.1 mL	0.5 mL	0.6 mL
LDH & PK (200 U/mL & 150 U/mL)	0.1 mL	0.1 mL	0.1 mL	0.1 mL
MK (100 U/mL)	0.1 mL	—	0.1 mL	—

*(1) PEP monocyclohexyl ammonium salt (14 mg/mL) : ATP (3 mg/mL) : NADH (8 mg/mL) = 1 : 1 : 1

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{2^{*(2)} \cdot 6.3 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - W)} = \text{Purity of AMP}$$

$\Delta A = (Ab - Aa) - (Ad - Ac)$

V = Total volume of reaction mixture (6.0 mL)

MW = 347.2, anhydrous free acid

6.3×10^3 = Molar extinction coefficient of NADH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

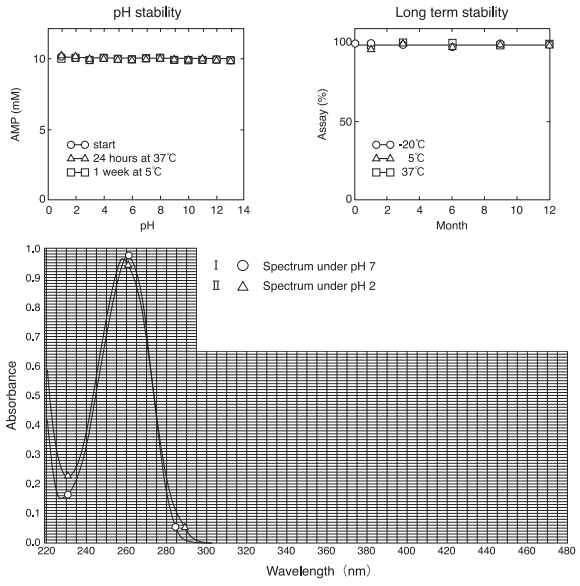
v = Sample volume (0.5 mL)

s = Sample concentration (0.2 mg/mL)

W = Water content (%)

*(2) AMP + ATP = 2 ADP

Reference Data



Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.

Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
45100900	Bulk

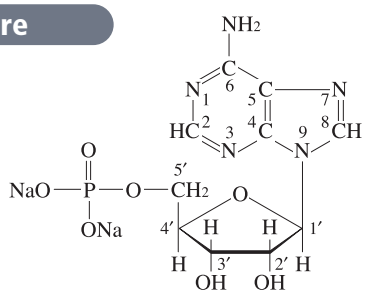
For in vitro diagnostic or research use only

AMP-Na

Adenosine 5′-monophosphate (disodium salt)

from Yeast

Structure



Formula

: $C_{10}H_{12}N_5O_7P \cdot Na_2$

Formula Weight

: 347.2 (as anhydrous free acid)
: 391.2 (as disodium anhydrate)
: 427.2 (as disodium dihydrate)

Specification

Purity

Determined by Enzymatic Method (PK, LDH, MK) ≧ 95%

Water Content ＜ 12%

Na Content 10.0 ± 2%

UV Spectral Analysis

ε at 260 nm and pH 7.5 (15.4 ± 0.5) × 10^3

Ratio at pH 7.5

A_{250}/A_{260} 0.78 ± 0.03

A_{280}/A_{260} 0.16 ± 0.02

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c	d
Tris-HCl/K^+ & Mg^{2+} (0.1 mol/L, pH 7.5/0.12 mol/L & 0.012 mol/L)	5.0 mL	5.0 mL	5.0 mL	5.0 mL
Substrate mixture*(1)	0.3 mL	0.3 mL	0.3 mL	0.3 mL
AMP (0.2 mg/mL)	0.5 mL	0.5 mL	—	—
Distilled water	—	0.1 mL	0.5 mL	0.6 mL
LDH & PK (200 U/mL & 150 U/mL)	0.1 mL	0.1 mL	0.1 mL	0.1 mL
MK (100 U/mL)	0.1 mL	—	0.1 mL	—

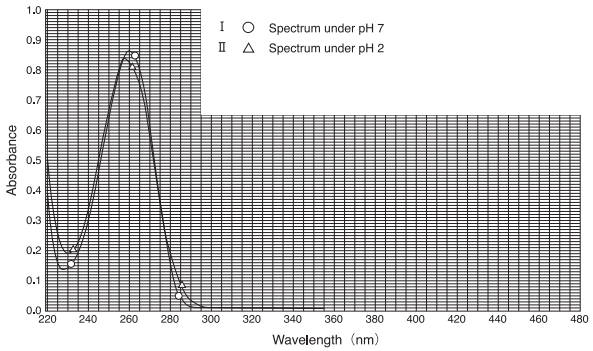
*(1) PEP monocyclohexyl ammonium salt (14 mg/mL) : ATP (3 mg/mL) : NADH (8 mg/mL) = 1 : 1 : 1

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{2^{*(2)} \cdot 6.3 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of AMP}$$

$\Delta A = (Ab - Aa) - (Ad - Ac)$
V = Total volume of reaction mixture (6.0 mL)
MW = 347.2, anhydrous free acid
6.3×10^3 = Molar extinction coefficient of NADH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Sample volume (0.5 mL)
s = Sample concentration (0.2 mg/mL)
S = Na (%)
W = Water content (%)
*(2) AMP + ATP = 2 ADP

Reference Data



Storage

Store below -20 °C. Handling during short term such as transportation is allowed at 1 - 10 °C.
Store in the dark. Keep off humidity.

Cat. No./Package

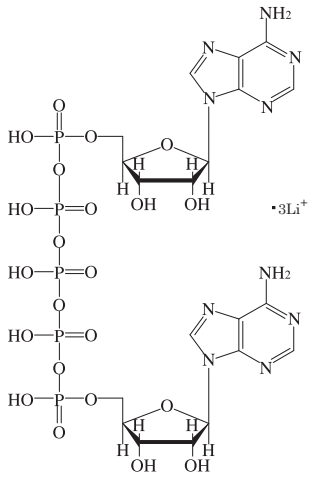
Cat. No.	Package
45110000	1 g
45112000	10 g
45110900	Bulk

For in vitro diagnostic or research use only

AP5A-3Li

Diadenosine pentaphosphate (trilithium salt)

Structure



Storage

Store below -20 °C. Handling during short term such as transportation is allowed at 1 - 10 °C.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
45304900	Bulk

Formula

: $C_{20}H_{26}N_{10}O_{22}P_5 \cdot Li_3$

Formula Weight

: 916.4 (as anhydrous free acid)
: 934.2 (as trilithium anhydrate)
: 1006.2 (as trilithium tetrahydrate)

Specification

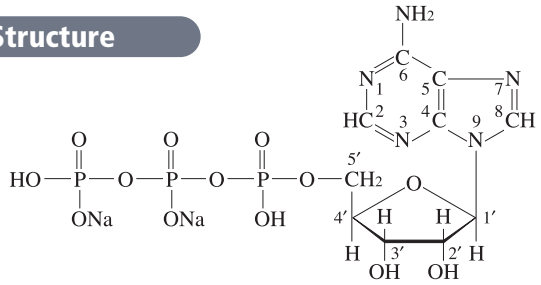
Purity (HPLC)	≧ 90%
Li Content	3.0 ± 1.5%
Water Content	< 10%

For in vitro diagnostic or research use only

ATP

Adenosine 5′-triphosphate (disodium salt)

Structure



Formula

: $C_{10}H_{14}N_5O_{13}P_3 \cdot Na_2$

Formula Weight

: 507.2 (as anhydrous free acid)
: 551.1 (as disodium anhydrate)
: 605.2 (as disodium trihydrate)

Specification

Purity

Determined by Enzymatic Method (G6PDH, HK) ≧ 95%

Water Content ＜ 12%

Na Content 9.0 ± 2.0%

AMP+ADP Contaminants ＜ 1%

UV Spectral Analysis

ε at 260 nm and pH 7.5 (15.4 ± 0.5) × 10^3

Ratio at pH 7.5

A_{250}/A_{260} 0.80 ± 0.03

A_{280}/A_{260} 0.15 ± 0.02

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Tris-Glc and Mg^{2+} (0.12 mol/L, pH 7.5/1.5 mg/mL & 1.2 mmol/L)	5.0 mL	5.0 mL	5.0 mL
$NADP^+$ (20 mmol/L)	0.1 mL	0.1 mL	—
ATP (0.48 mg/mL)	0.5 mL	0.5 mL	—
Distilled water	0.1 mL	0.3 mL	0.8 mL
G6PDH(Y)(50 U/mL)	0.1 mL	0.1 mL	—
HK(Y)(50 U/mL)	0.2 mL	—	0.2 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.2 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of ATP}$$

$\Delta A = Aa - (Ab + Ac)$

V = Total volume of reaction mixture (6.0 mL)

MW = 507.2, anhydrous free acid

6.2×10^3 = Molar extinction coefficient of NADPH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

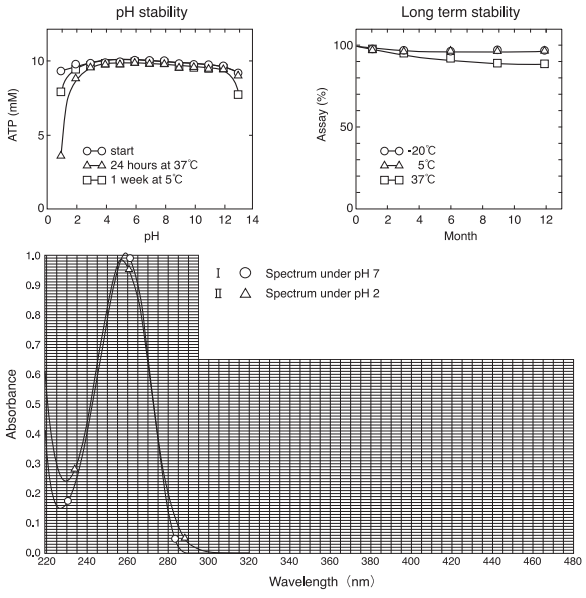
v = Sample volume (0.5 mL)

s = Sample concentration (0.48 mg/mL)

S = Na (%)

W = Water content (%)

Reference Data



Storage

Store below -20°C. Handling during short term such as transportation is allowed at 1 - 10°C.

Store in the dark. Keep off humidity.

Cat. No./Package

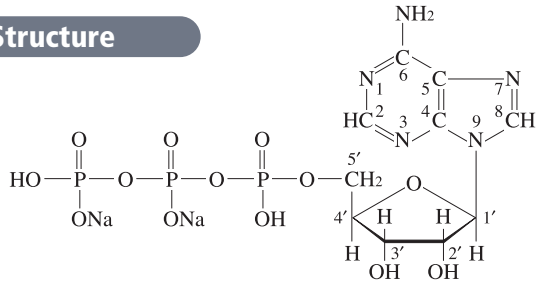
Cat. No.	Package	Cat. No.	Package
45142000	10 g	45140903	500 g
45140902	100 g	45140900	Bulk

For in vitro diagnostic or research use only

ATP-II

Adenosine 5′-triphosphate (disodium salt)

Structure



Formula

: $C_{10}H_{14}N_5O_{13}P_3 \cdot Na_2$

Formula Weight

: 507.2 (as anhydrous free acid)
: 551.1 (as disodium anhydrate)
: 605.2 (as disodium trihydrate)

Specification

Purity

Determined by Enzymatic Method (G6PDH, HK) ≧ 95%

Water Content	＜ 12%
Na Content	9.0 ± 2.0%
UV Spectral Analysis	
ε at 260 nm and pH 7.5	(15.0 ± 0.5) × 10^3
Ratio at pH 7.5	
A_{250}/A_{260}	0.80 ± 0.03
A_{280}/A_{260}	0.15 ± 0.02

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Tris-Glc and Mg^{2+} (0.12 mol/L, pH 7.5/1.5 mg/mL & 1.2 mmol/L)	5.0 mL	5.0 mL	5.0 mL
$NADP^+$ (20 mmol/L)	0.1 mL	0.1 mL	—
ATP (0.48 mg/mL)	0.5 mL	0.5 mL	—
Distilled water	0.1 mL	0.3 mL	0.8 mL
G6PDH(Y)(50 U/mL)	0.1 mL	0.1 mL	—
HK(Y)(50 U/mL)	0.2 mL	—	0.2 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.2 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of ATP}$$

$\Delta A = Aa - (Ab + Ac)$

V = Total volume of reaction mixture (6.0 mL)

MW = 507.2, anhydrous free acid

6.2×10^3 = Molar extinction coefficient of NADPH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

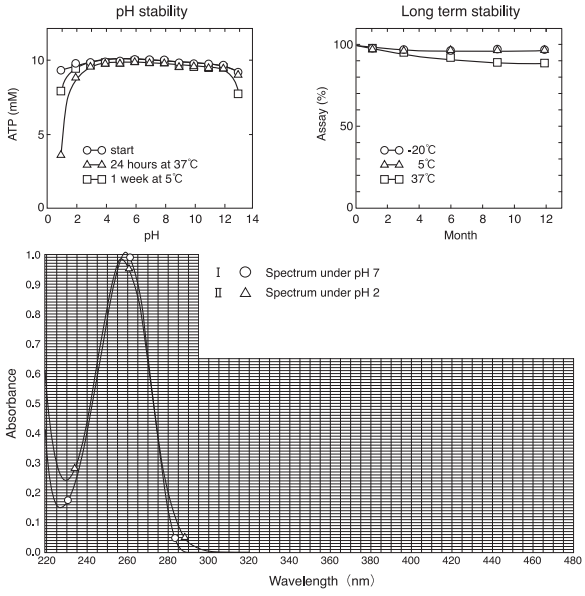
v = Sample volume (0.5 mL)

s = Sample concentration (0.48 mg/mL)

S = Na (%)

W = Water content (%)

Reference Data



Storage

Store below -20℃. Handling during short term such as transportation is allowed at 1 - 10℃.

Store in the dark. Keep off humidity.

Cat. No./Package

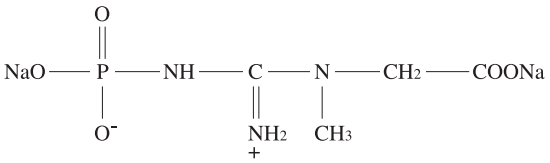
Cat. No.	Package
45147900	Bulk

For in vitro diagnostic or research use only

CP

Creatine phosphate (disodium salt)

Structure



Formula

: $C_4H_8N_3O_5P \cdot Na_2$

Formula Weight

: 211.1 (as anhydrous free acid)
: 255.1 (as disodium anhydrate)
: 327.1 (as disodium tetrahydrate)

Specification

Purity

Determined by Enzymatic Method (CK, HK, G6PDH)	≧ 95%
Creatine content	< 1%
Water Content	< 30%
Na Content	14.0 ± 2.0%

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Imidazole/Glucose, Mg^{2+} & *N*-Acetyl-L-cysteine (0.1 mol/L, pH 7.0/1.5 mg/mL, 1.0 mmol/L & 30 mmol/L)	5.0 mL	5.0 mL	5.0 mL
ADP & $NADP^+$ (2.5 mg/mL & 20 mmol/L)	0.2 mL	0.2 mL	—
CP (0.3 mg/mL)	0.5 mL	0.5 mL	—
Distilled water	0.1 mL	0.2 mL	0.9 mL
G6PDH(Y) & HK(Y) (50 U/mL & 50 U/mL)	0.1 mL	0.1 mL	—
CK(Y) (600 U/mL)	0.1 mL	—	0.1 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.2 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of CP}$$

$\Delta A = Aa - (Ab + Ac)$

V = Total volume of reaction mixture (6.0 mL)

MW = 211.1, anhydrous free acid

6.2×10^3 = Molar extinction coefficient of NADPH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

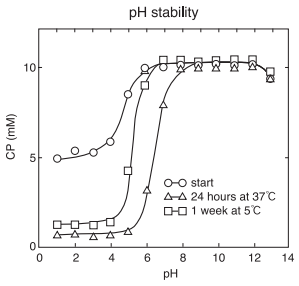
v = Sample volume (0.5 mL)

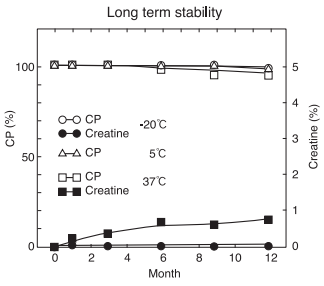
s = Sample concentration (0.3 mg/mL)

S = Na (%)

W = Water content (%)

Reference Data





Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
45180000	1 g
45180900	Bulk

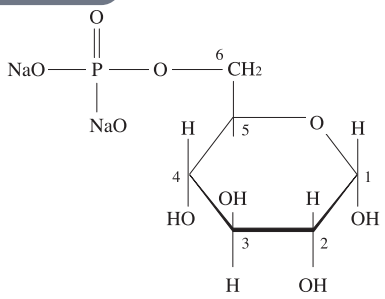
For in vitro diagnostic or research use only

G6P

D-Glucose 6-phosphate (disodium salt)

prepared enzymatically

Structure



Formula

: $C_6H_{11}O_9P \cdot Na_2$

Formula Weight

: 260.1 (as anhydrous free acid)
: 304.1 (as disodium anhydrate)
: 340.1 (as disodium dihydrate)

Specification

Purity

Determined by Enzymatic Method (G6PDH) ≧ 95%

Water Content ＜ 15%

Na Content 9.0 - 15.5%

Assay Procedure

I Spectrophotometric Method

Wavelength : 340 nm, Light path length : 1 cm

Pipette the following reagents into a cuvette

2.65 mL	Tris-HCl (0.1 mol/L, pH 8.5)	
0.10 mL	$NADP^+$ (20 mmol/L)	
0.25 mL	G6P (0.4 mg/mL) measure the absorbance at 340 nm	Aa
0.01 mL	G6PDH (Y) (1,000 U/mL) measure the absorbance at 340 nm	Ab

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.2 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - S - W)} = \text{Purity of G6P}$$

$\Delta A = Ab - Aa$

V = Total volume of reaction mixture (3.01 mL)

MW = 260.1, anhydrous free acid

6.2×10^3 = Molar extinction coefficient of NADPH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

d = Light path length (1 cm)

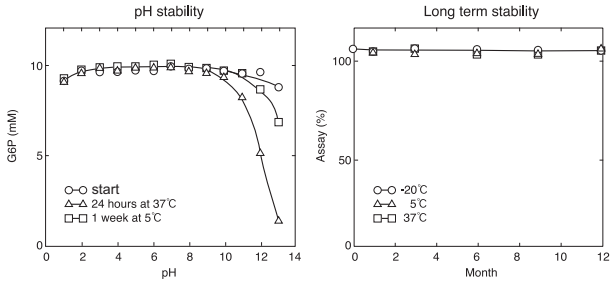
v = Sample volume (0.25 mL)

s = Sample concentration (0.4 mg/mL)

S = Na (%)

W = Water content (%)

Reference Data



Preparation and Storage

Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
45195000	1 g
45197000	10 g
45195900	Bulk

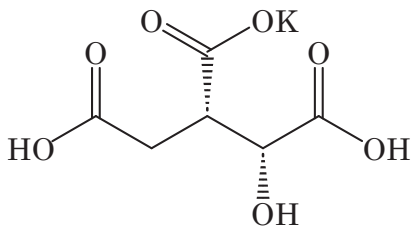
For in vitro diagnostic or research use only

D-Isocitrate-K

D-Isocitrate (monopotassium salt)

prepared enzymatically

Structure



Formula

：$C_6H_8O_7 \cdot K$

Formula Weight

：192.1 (as anhydrous free acid)
：230.2 (as monopotassium anhydrate)

Specification

Appearance	White powder
Solubility	Clear solution
Purity	
Determined by Enzymatic Method (ICDH)	≧ 90%
K Content	17.0 ± 5.0%
Water Content	＜ 5%

Assay Procedure

I Spectrophotometric Method

Wavelength ： 340 nm, Light path length ： 1 cm

Pipette the following reagents into a cuvette

	a	b	c
TEA-NaOH (0.1 mol/L, pH 8.5)	5.0 mL	5.0 mL	5.0 mL
$MgCl_2$ (0.3 mol/L)	0.1 mL	0.1 mL	0.1 mL
$NADP^+$ (20 mmol/L)	0.3 mL	0.3 mL	—
ICDH (P) (200 U/mL)	0.1 mL	—	0.1 mL
D-Isocitrate-K (0.15 mg/mL)	0.5 mL	0.5 mL	—
Distilled water	—	0.1 mL	0.8 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.2 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - P - W)} = \text{Purity of Isocitrate-K}$$

$\Delta A = Aa - (Ab + Ac)$
V = Total volume of reaction mixture (6.0 mL)
MW = 192.1, anhydrous free acid
6.2×10^3 = Molar extinction coefficient of NADPH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)
d = Light path length (1 cm)
v = Sample volume (0.5 mL)
s = Sample concentration (0.15 mg/mL)
P = K (%)
W = Water content (%)

Storage

Store below -20 °C. Handling during short term such as transportation is allowed at 1 - 10 °C.
Store in the dark. Keep off humidity.

Cat. No./Package

Cat. No.	Package
45205900	Bulk

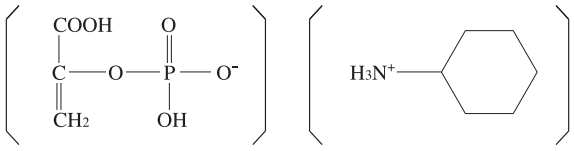
For in vitro diagnostic or research use only

PEP

Phosphoenolpyruvate (monocyclohexyl ammonium salt) Crystalline

prepared enzymatically

Structure



Formula

：$C_3H_4O_6P \cdot C_6H_{14}N$

Formula Weight

：267.2
(as anhydrous monocyclohexyl ammonium salt)

Specification

Purity
Determined by Enzymatic Method (PK,LDH) ≧ 95%

Water Content ＜ 1%

Contaminant Pyruvate ＜ 1%

Assay Procedure

I Spectrophotometric Method

Wavelength ： 340 nm, Light path length ： 1 cm

Pipette the following reagents into a cuvette

	a	b	c
Tris-HCl/K^+ & Mg^{2+} (0.1 mol/L, pH 7.5/0.12 mmol/L & 0.012 mmol/L)	5.0 mL	5.0 mL	5.0 mL
ADP (50 mg/mL)	0.1 mL	0.1 mL	—
NADH (5 mg/mL)	0.1 mL	0.1 mL	—
PEP (0.25 mg/mL)	0.5 mL	0.5 mL	—
Distilled water	0.1 mL	0.2 mL	0.9 mL
LDH (100 U/mL)	0.1 mL	0.1 mL	—
PK (100 U/mL)	0.1 mL	—	0.1 mL

II Calculation

$$\frac{\Delta A \cdot V \cdot MW \times 100}{6.3 \times 10^3 \cdot d \cdot v \cdot s} \times \frac{100}{(100 - W)} = \text{Purity of PEP}$$

$\Delta A = (Ab + Ac) - Aa$

V = Total volume of reaction mixture (6.0 mL)

MW = 267.2

6.3×10^3 = Molar extinction coefficient of NADH at 340 nm ($L \cdot mol^{-1} \cdot cm^{-1}$)

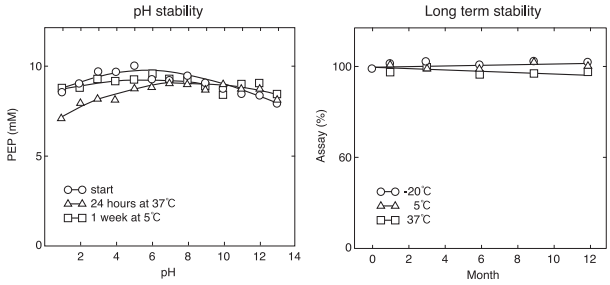
d = Light path length (1 cm)

v = Sample volume (0.5 mL)

s = Sample concentration (0.25 mg/mL)

W = Water content (%)

Reference Data



Storage

Keep container tightly closed when not in use.
Store below -20 ℃. Handling during short term such as transportation is allowed at 1 - 10 ℃. Store dry.

Cat. No./Package

Cat. No.	Package
45170900	Bulk

For in vitro diagnostic or research use only

HUMAN ENZYMES

Table of Contents

HUMAN ENZYMES

recombinant Human enzymes

Features

All 11 enzymes are human type from recombinant cells.
The characteristics of the enzymes are similar to those in human serum.
The enzymes would be suited for making reference materials, calibrators, and control serums.

Product List

Product Name	Cat. No.	Enzyme	Origin	EC Number
rhAST	46887903	Aspartate transaminase	Human liver	EC 2.6.1.1
rhALT	46896903	Alanine transaminase	Human liver	EC 2.6.1.2
rhγGT	46893903	γ-glutamyltransferase	Human liver	EC 2.3.2.2
rhALP	46911903	Alkaline phosphatase	Human liver	EC 3.1.3.1
rhCK-MM*	46906903	Creatine kinase-MM	Human muscle	EC 2.7.3.2
rhCK-MB*	46905903	Creatine kinase-MB	Human heart	EC 2.7.3.2
rhLDH	46886903	Lactate dehydrogenase, LDH-1	Human heart	EC 1.1.1.27
rhP-AMY	46891903	α-amylase, pancreatic	Human pancreas	EC 3.2.1.1
rhS-AMY	46892903	α-amylase, salivary	Human saliva	EC 3.2.1.1
rhLIP	46883903	Lipase, pancreatic	Human pancreas	EC 3.1.1.3
rhChE	46909903	Pseudocholinesterase	Human plasma	EC 3.1.1.8

Availability excluding USA（rhChE）

Preparation and Storage

Lyophilized powder
Store below -20℃

Packing Size

Each 100 U/vial
*Please contact us for bulk order.

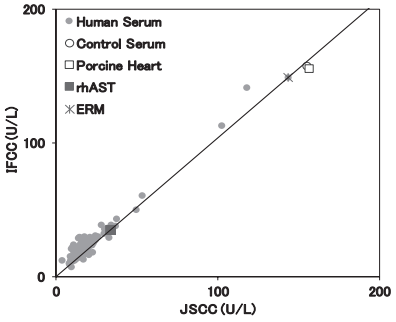
*rhCK-MM and rhCK-MB are also prepared as glycerol solution.
The solution should be stored below -80℃.

For in vitro diagnostic or research use only

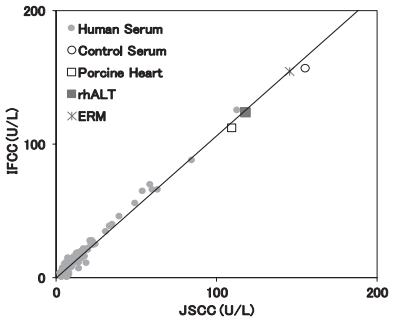
Reference Data

Reactivity of each enzyme is equivalent to that of human serum or ERM.

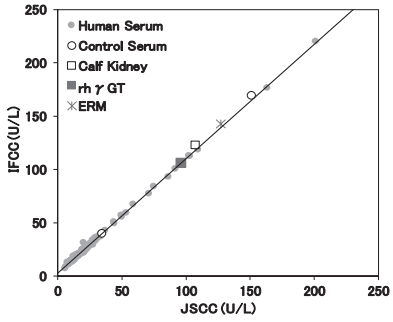
AST



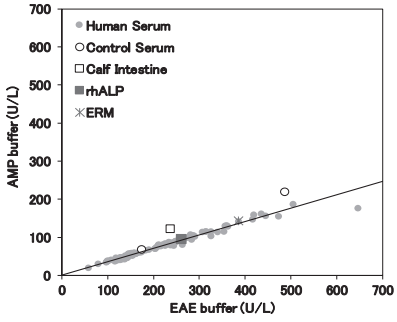
ALT



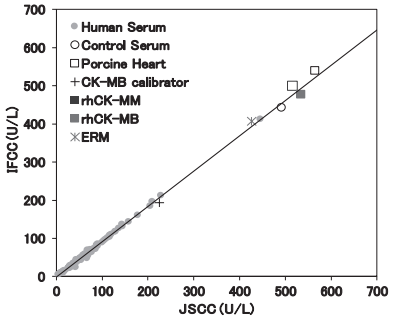
γGT



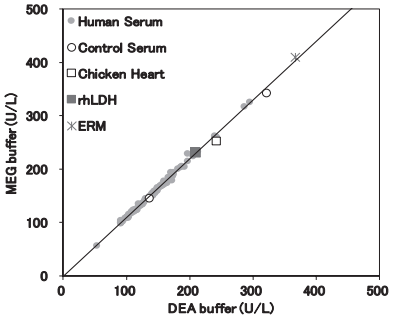
ALP



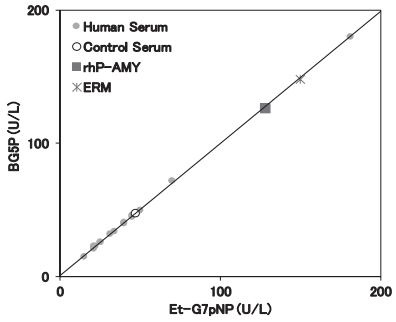
CK



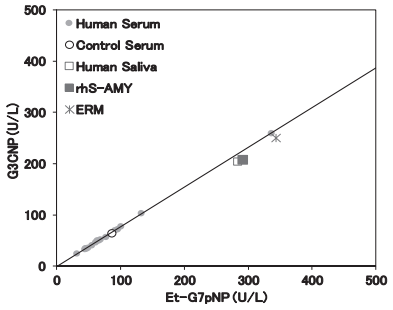
LDH



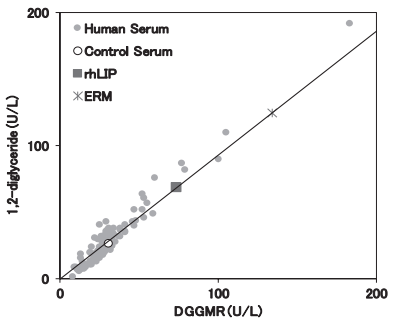
P-AMY



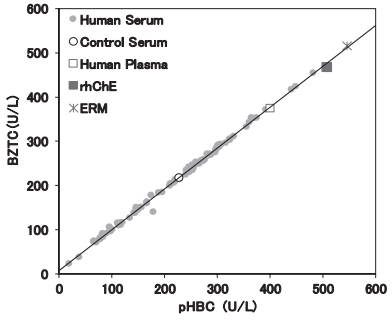
AMY



Lipase



ChE



ERM	:	Japanese Enzyme Reference material
JSCC	:	Japan Society of Clinical Chemistry
IFCC	:	International Federation of Clinical Chemistry and Laboratory Medicine
AMP	:	2-amino-2-methyl-1-propanol（buffer of IFCC method）
EAE	:	2-（Ethylamino）ethanol（buffer of old JSCC method）
MEG	:	N-methyl-D-glucamine（buffer of IFCC method）
DEA	:	Diethanolamine（buffer of old JSCC method）
Et-G7pNP	:	4,6-Ethylidene（G1）-4-nitrophenyl（G7）-α-（1 → 4）-D-maltoheptaoside（substrate of JSCC and IFCC method）
G3CNP	:	2-chloro-4-nitrophenyl -α-D-maltotrioside（other substrate for amylase）
BG5P	:	p-Nitrophenylbenzyl -α-maltopentaoside（other substrate for amylase）
DGGMR	:	1,2-O-dilauryl-rac-glycero-3-glutaric acid-（6'-methylresorufin） ester（substrate for lipase）
pHBC	:	p-Hydroxybenzoylcholine（substrate of JSCC method）
BZTC	:	benzoylthiocholine（other substrate for cholinesterase）

For in vitro diagnostic or research use only

Recombinant proteins

Table of Contents

rβ2M

recombinant β_2-Microglobulin

from Human

Specification

Purity (HPLC)	≧ 95%
Purity (SDS-PAGE)	Single band (1 μg/lane)

Feature

Recombinant human β2-Microgloblin (β2M) is expressed in *E. coli* and prepared by multiple chromatography.

Preparation and Storage

Lyophilized powder (Anmonium sulfate free)
Store below -20 °C

Cat. No./Package

Cat. No.	Package
47183000	1 mg
47184000	5 mg
47183900	Bulk

Reference

1) A.S.V. Suggs, et al., *Proc. Natl. Acad. Sci. USA.*, **78,** 6613 - 6617 (1981)

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rCRP

recombinant C-Reactive protein

from Human

Specification

Purity (SDS-PAGE)	Single band (1 µg/lane)
Concentration	1.0 mg/mL

Feature

Recombinant C-reactive protein (rCRP) is prepared from *E. coli* culture medium by affinity chromatography. rCRP monomer is made of 206 amino acids and has the same amino sequence as natural form.

Preparation and Storage

Solution

Store at 2 - 10 ℃

Cat. No./Package

Cat. No.	Package
47191000	5 mg
47190900	Bulk

Reference

1) P. Woo, et al., *J. Biol. Chem*, **260**, 13384-13388 (1985)

rCystatin C

recombinant Cystatin C

from Human

Specification

Purity (HPLC)	≧ 95%
Purity (SDS-PAGE)	Single band

Feature

Recombinant human Cystatin C is expressed in *E. coli* and purified by chromatography.

Preparation and Storage

Lyophilized powder（Anmonium sulfate free）
Store below -20 °C

Cat. No./Package

Cat. No.	Package
47516900	Bulk

References

1） *Analytical. Biochemistry* 1968, 22, 195 - 210
2） *Biol. Chem. Hoppe-Seyler* 1990, 371, 575 - 580
3） *FEBS Lett* 1987, 216, 229 - 233
4） *Scand. J. Clin. Invest* 1985, 45, 97 - 101

rMb

recombinant Myoglobin

from Human

Specification

Purity (SDS-PAGE) Single major band (1 μg/lane)

Concentration 1.6 - 2.4 mg/mL

Feature

Recombinant myoglobin (rMb) is prepared from *E. coli* by ion-exchange chromatography.
rMb is holoprotein which contains a heme.
Its apoprotein consists of 153 amino acids and has the same amino sequence as natural form.

Preparation and Storage

Solution (PBS containing 0.05% NaN_3, pH 7.4)
Store at 2 - 10 ℃

Cat. No./Package

Cat. No.	Package
47196000	1 mg
47197000	5 mg
47196900	Bulk

References

1) A.E. Romero Herrera, et al., *Nature Nwe Biol.*, **232,** 149 - 152 (1971)
2) A. Rossi-Fanelli, et al., *Arch. Biochem. Biophys.*, **72,** 243 - 246 (1957)

Antibodies

Table of Contents

ALB-IgG / O-RB-ALB-IGG-G1

Anti-human albumin antibody

Host animal : Rabbit

Specification

Appearance	Essentially colorless and free of particulates
Concentration	Report only ($E^{1\%}_{280nm,1cm}$ = 15.0)
Purity (HPLC)	≧ 95%
Specificity	Monospecific precipitin reaction vs. normal Human serum No reaction with Bovine serum albumin
Becker Titer	≧ 2.0 mg Ag/mL

Preparation and Storage

Solution (100 mmol/L Tris-HCl, 0.15 mol/L NaCl, 0.09% NaN_3, pH 7.5)
Store at 2 - 10 °C

Cat. No./Package

Cat. No.	Package
47169000	5 mL
47361900	Bulk

Feature

ALB-IgG is prepared from the antiserum of SPF rabbit immunized with human albumin. It is purified by Protein A affinity chromatography, and absorbed by bovine serum albumin.

β_2M-IGG

Anti-human β_2-microglobulin antibody

Host animal : Rabbit

Specification

Appearance	Essentially colorless and free of particulates
Concentration	9.5 - 10.5 mg/mL ($E^{1\%}_{280nm,1cm}$ = 15.0)
Purity (HPLC)	≧ 95%
Specificity (IEP)	No reaction with human serum component except β_2-microglobulin
Titer	≧ 0.24 (Absorbance change due to immunonephelometry)

Preparation and Storage

Solution (0.15 mol/L NaCl, 0.09% NaN_3)
Store at 2 - 10℃

Cat. No./Package

Cat. No.	Package
47295900	Bulk

Feature

β_2M-IGG is prepared from the antiserum of SPF rabbit immunized with human β_2-microgloblin. It is purified by affinity chromatography.

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CK-MM MCAmL(MX1)-12

Anti-human CK-MM monoclonal antibody mL(MIX1) Affinity purified from Ascites

Host animal : Mouse

Specification

Appearance	Essentially colorless to slightly cloudy and free of particulates
Purity (HPLC)	Report only
Inhibition	Report only (CK-MM : 5,000 U/L) *Inhibition : Determined by CK reagent containing 2 µL protein solution / mL R1.

Feature

CK-MM MCA is purified from mouse ascites by affinity chromatography.

Preparation and Storage

Solution (20 mmol/L Tris-HCl, 0.15 mol/L NaCl, 0.09% NaN_3, pH 7.5)
Store at 1 - 10 °C

Cat. No./Package

Cat. No.	Package
47099900	Bulk

*For China and India, Cat. No. 47097900.

CRP-IgG/O-RB-CRP-IGG-BT35

Anti-human C-reactive protein antibody

Host animal : Rabbit

Specification

Appearance	Essentially colorless and free of particulates
Concentration	Report only ($E^{1\%}_{280nm,1cm} = 15.0$)
Purity (HPLC)	≧ 95%
Specificity	Monospecific precipitin reaction vs.CRP control serum
Becker Titer	≧ 3.5 mg Ag/mL

Preparation and Storage

Solution (100 mmol/L Tris-HCl, 0.5 mol/L NaCl, 0.09% NaN_3, pH 7.5)
Store at 2 - 10 °C

Cat. No./Package

Cat. No.	Package
47872900	Bulk

Feature

CRP-IgG is prepared from the antiserum of SPF rabbit immunized with human C-reactive protein. It is purified by Protein A affinity chromatography.

For in vitro diagnostic or research use only

CRP-MCA/O-CRP-MCA(12D-2C)

Anti-human C-reactive protein monoclonal antibody

Host animal : Mouse

Specification

Appearance	Essentially colorless and free of particulates
Concentration	8 - 12mg/mL（$E^{1\%}_{280nm,1cm}$ = 14.5）
Purity (HPLC)	≧ 95%
Specificity (IEP)	No reaction with human serum component except CRP

Feature

CRP-MCA is purified from mouse ascites by Protein A affinity chromatography.

Preparation and Storage

Solution（10 mmol/L Phosphate buffer, 0.15 mol/L NaCl, 0.05% NaN_3, pH 7.5）
Store at 2 - 10°C

Cat. No./Package

Cat. No.	Package
47858000	1 mg
47155000	5 mg
47858900	Bulk

For in vitro diagnostic or research use only

Cystatin C-IgG / O-RB-rCystatin C IgG

Anti-human recombinant Cystatin C, IgG Fraction

Host animal : Rabbit

Specification

Appearance	Essentially colorless and free of particulates
Concentration	14 - 16 mg/mL ($E^{1\%}_{280nm,1cm}$ = 15.0)
Purity (HPLC)	≧ 90%
Becker Titer	Report only

Feature

O-RB-rCystatin C IgG is prepared from the antiserum of SPF rabbit immunized with recombinant human Cystatin C. It is purified by affinity chromatography.

Preparation and Storage

Solution (0.15 mol/L NaCl, 0.09% NaN_3)
Store at 2 - 10 ℃

Cat. No./Package

Cat. No.	Package
47880900	Bulk

For in vitro diagnostic or research use only

Enzymes for conjugation

Table of Contents

ALP

Alkaline phosphatase EC 3.1.3.1

from Calf intestine

Specification

Specific Activity

U/mg protein ＞ 2,500 units

Purity (HPLC) ≧ 97%

State

Highly purified enzyme in sodium chloride solution

One mL of solution contains the following

Protein	15 - 19 mg
Triethanolamine-HCl	30 mmol/L ± 5%
$MgCl_2$	1.0 mmol/L ± 5%
$ZnCl_2$	0.1 mmol/L ± 5%
NaCl	3.0 mol/L ± 5%
pH	7.6 ± 0.5

Preparation and Storage

Solution

Store at 1 - 10℃

Cat. No./Package

Cat. No.	Package
47828024	3 mg
47825924	Bulk

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ALP(High specific activity)

Alkaline phosphatase EC 3.1.3.1

from Calf intestine

Specification

Specific Activity

U/mg protein ＞ 5,000 units

Purity (HPLC) ≧ 97%

State

Highly purified enzyme in solution

One mL of solution contains the following

Protein	10 - 15 mg
Tris-HCl	10 mmol/L ± 5%
$MgCl_2$	5.0 mmol/L ± 5%
$ZnCl_2$	0.1 mmol/L ± 5%
Glycerol	50%
pH	7.5 ± 0.5

Preparation and Storage

Solution

Store below -20℃ (do not freeze)

Cat. No./Package

Cat. No.	Package
47785055	1 mg
47787055	5 mg
47785955	Bulk

Scavenger ALP

Scavenger Alkaline phosphatase (INACTIVE)

from Calf intestine

Specification

Protein ≧ 5 mg/mL

Contaminants

Alkaline phosphatase ≦ 0.005 U/mg protein

State

One mL of solution contains the following

Tris-HCl	10 mmol/L ± 5%
$MgCl_2$	1.0 mmol/L ± 5%
$ZnCl_2$	0.1 mmol/L ± 5%
NaN_3	0.1%
pH	8.0 ± 0.5

Storage

Store at 1 - 10 °C

Cat. No./Package

Cat. No.	Package
47814900	Bulk

For in vitro diagnostic or research use only

Serum

Table of Contents

BSA

Bovine serum albumin (Fraction V)

Specification

Albumin	≧ 98.0%
Total nitrogen	≧ 15.4%
Moisture (Karl Fischer)	≦ 5.0%
Ash	≦ 2.0%
pH (2% solution)	7.0 ± 0.2

Preparation and Storage

Lyophilized
Store at 1 - 10℃

Cat. No./Package

FAF Grade (RIA Grade)

Cat. No.	Packing Size
47408903	Bulk

STANDARD-I Grade

Cat. No.	Packing Size
47400903	Bulk

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CRP-FREE-SERUM

Human C-reactive protein free serum

Specification

CRP concentration ≦ 1 μg/dL

Feature

CRP-FREE-SERUM is prepared from normal human delipidated serum.
CRP is removed by absorption with affinity chromatography.

Application

For control serum and base serum of standard product.

Preparation and Storage

Liquid form (containing < 0.1% NaN_3)
Store at 2 - 10℃

Cat. No./Package

Cat. No.	Package
47936900	Bulk

For in vitro diagnostic or research use only

H-IgG

Immunoglobulin G

from Human serum

Specification

Appearance		Essentially colorless and free of particulates
Concentration		≧ 1.0 mg/mL
Purity	**GFC (HPLC)**	≧ 97%
	IEP	Single arc by IEP against antiserum to human whole serum and human IgG.
	Ouchterlony	Single precipitin line by ouchterlony against antiserum to human IgG. No reaction with antiserum to human IgA and human IgM.

Preparation and Storage

Solution (10 mmol/L sodium phosphate, 0.15 mol/L NaCl, 0.05% NaN_3, pH 7.3)
Store below -20 ℃

Cat. No./Package

Cat. No.	Package
47364000	10 mg

*Please contact us for bulk order.

For in vitro diagnostic or research use only

Analytical reagents

Table of Contents

Allergen checker

PCR primer kits

Features

This kit is designed to detect the presence of genetic contamination derived from food ingredients by PCR method.

Product List

Product name	Cat. No.	Package
Allergen checker "Abalone"	49596000	20 Reactions
Allergen checker "Apple"	49555000	20 Reactions
Allergen checker "Banana"	49559000	20 Reactions
Allergen checker "Beef"	49004000	20 Reactions
Allergen checker "Buckwheat"	49543000	100 Reactions
Allergen checker "Buckwheat"(S)	49041000	20 Reactions
Allergen checker "Chicken"	49020000	20 Reactions
Allergen checker "Crustacean"	49592000	20 Reactions
Allergen checker "Japanese yam"	49575000	20 Reactions
Allergen checker "Kiwi fruit"	49563000	20 Reactions
Allergen checker "Mackerel"	49583000	20 Reactions
Allergen checker "Peanut"	49546000	100 Reactions
Allergen checker "Peanut"(S)	49536000	20 Reactions
Allergen checker "Pork"	49010000	20 Reactions
Allergen checker "Salmon"	49579000	20 Reactions
Allergen checker "Sesame"	49053000	20 Reactions
Allergen checker "Soybean"	49571000	20 Reactions
Allergen checker "Squid"	49587000	20 Reactions
Allergen checker "Walnut"	49567000	20 Reactions
Allergen checker "Wheat"	49540000	100 Reactions
Allergen checker "Wheat"(S)	49532000	20 Reactions
Allergen checker "Universal primer for plants"	49531000	20 Reactions
Allergen checker "Universal primer for animals"	49030000	20 Reactions

*The presence or absence of allergens is determined as follows
Positive: universal primer(+), target primer(+)
Negative: universal primer(+), target primer(-)
Undetectable: universal primer(-), target primer(-)
*The presence or absence of allergens by this test should be determined not only by the test results, but also by checking the food ingredients and manufacturing process.

Components

20 Reactions
- 5 μM F-primer
- 5 μM R-primer
- Positive control template

*Enzymes and buffers are not included.

100 Reactions
- 25 μM F-primer
- 25 μM R-primer
- Positive control template

*Universal primer for plants and universal positive template for plants are included.
*Enzymes and buffers are not included.

Storage

Store below -20℃

For in vitro diagnostic or research use only

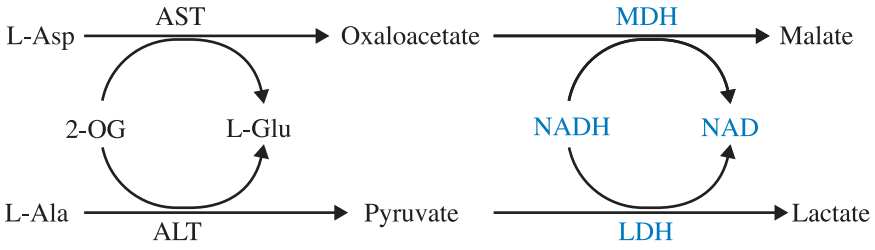
Appendix

Table of Contents

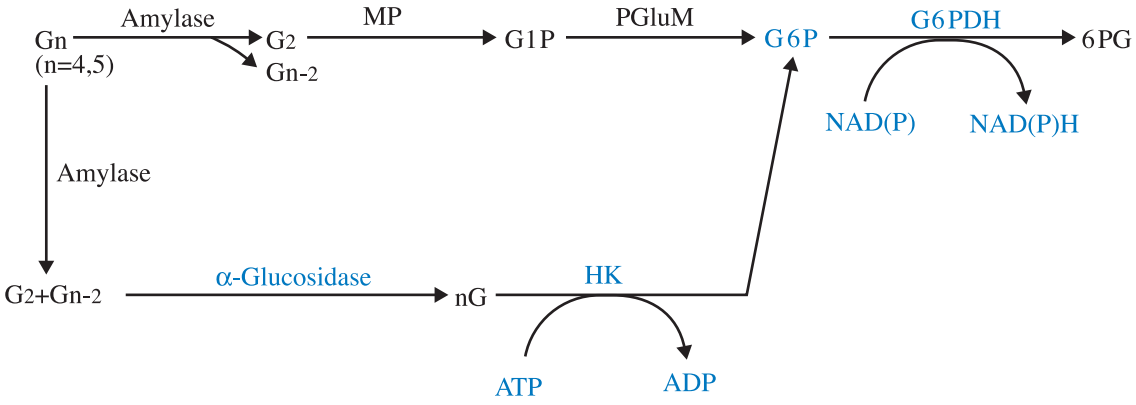
Metabolic response series

Our product is indicated in blue.

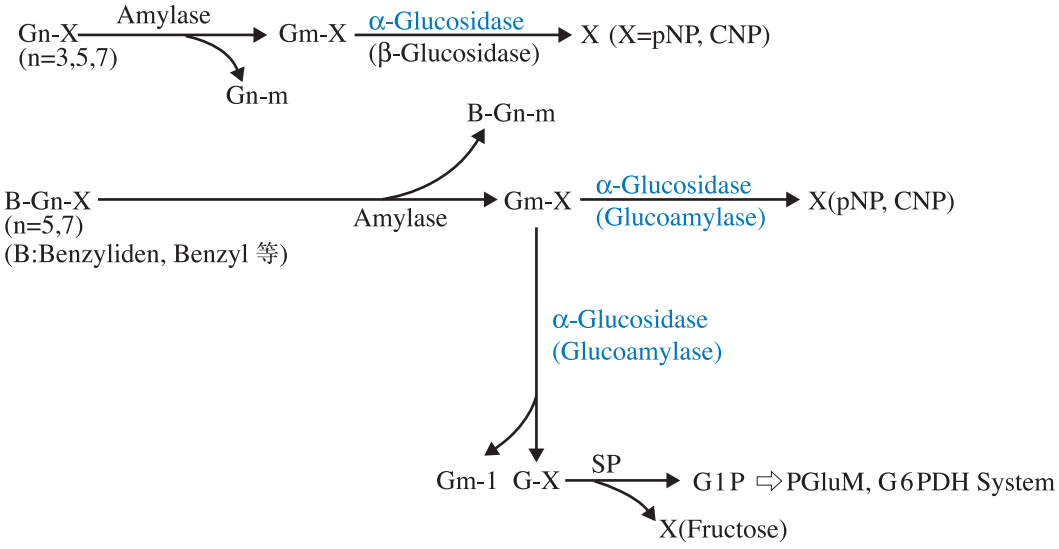
ALT/AST



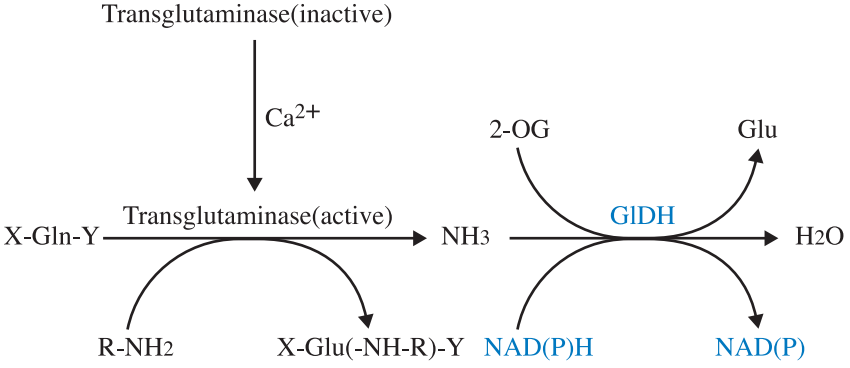
Amylase-1



Amylase-2,3

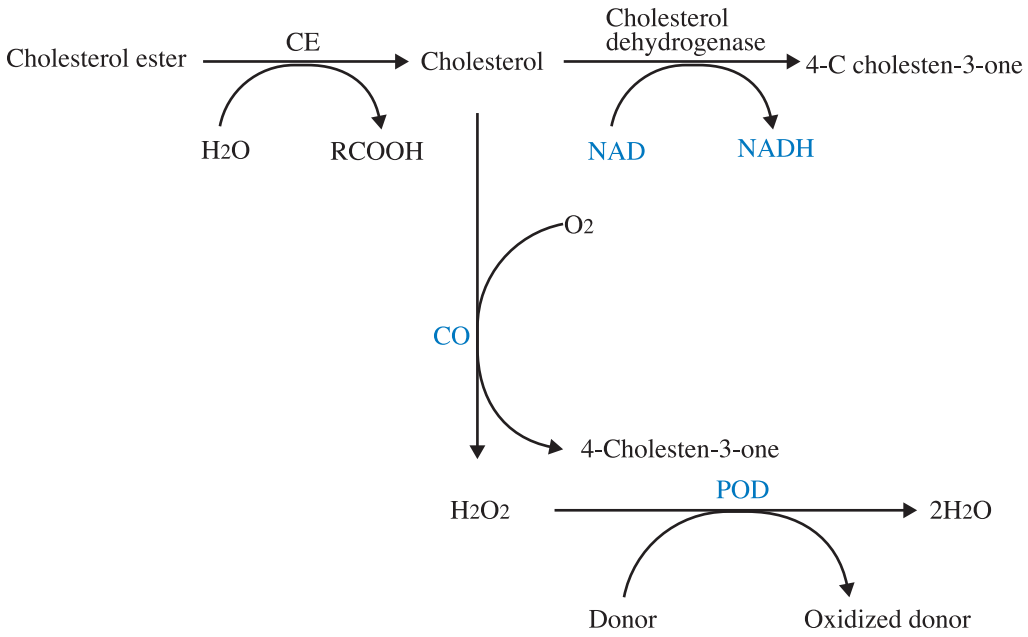


Ca

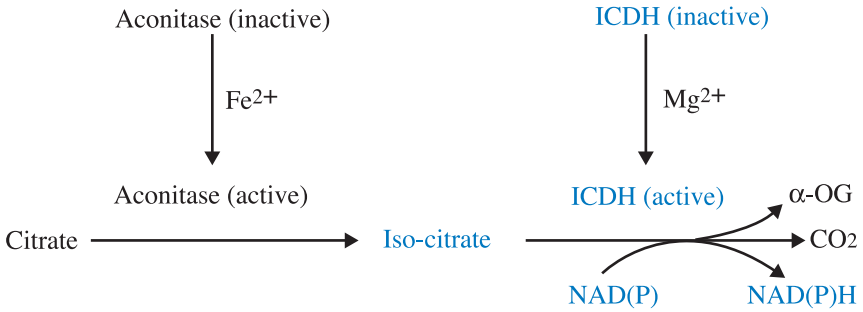


Our product is indicated in blue.

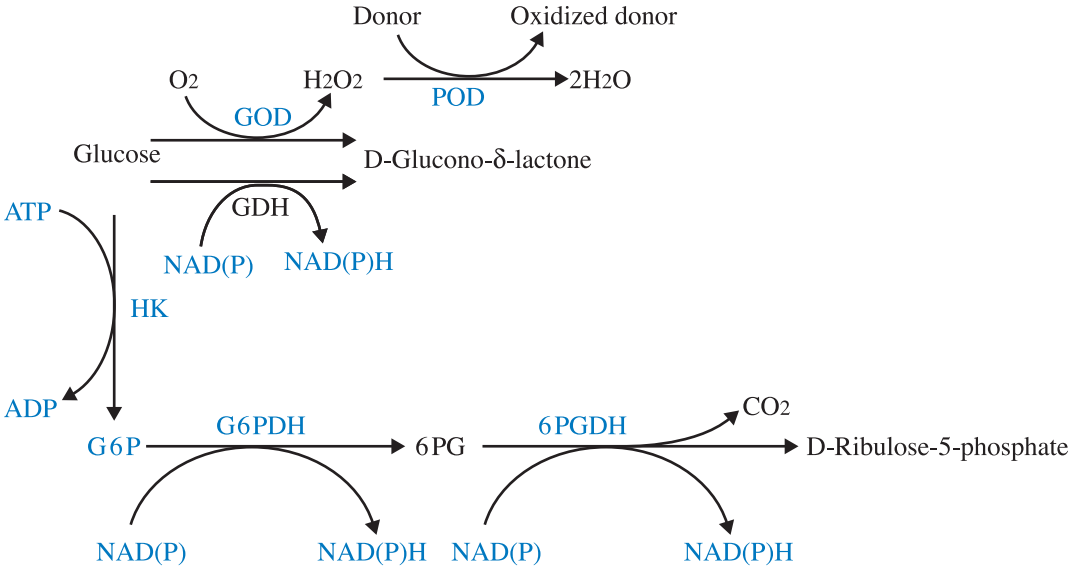
Cholesterol



Fe, Mg



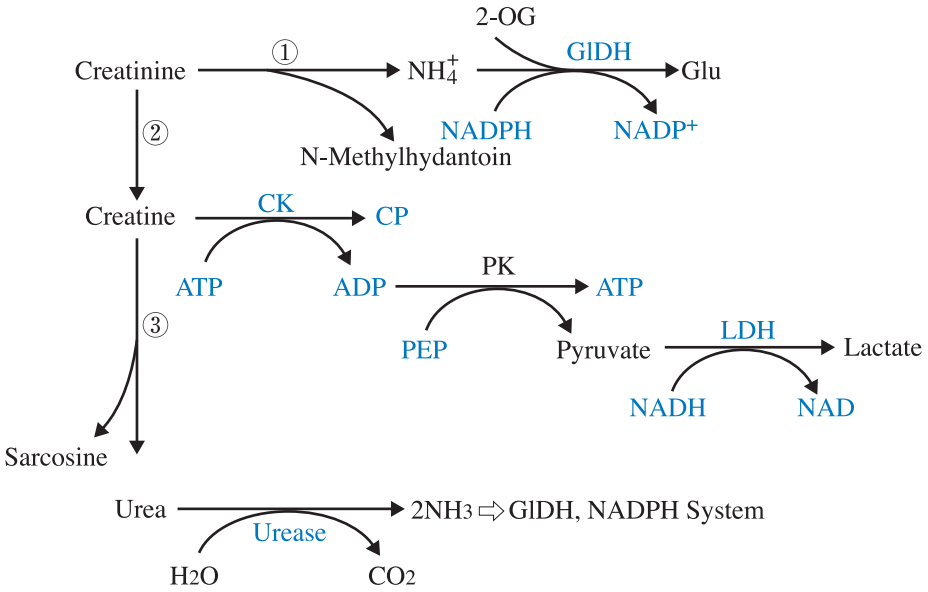
Glucose



Metabolic response series

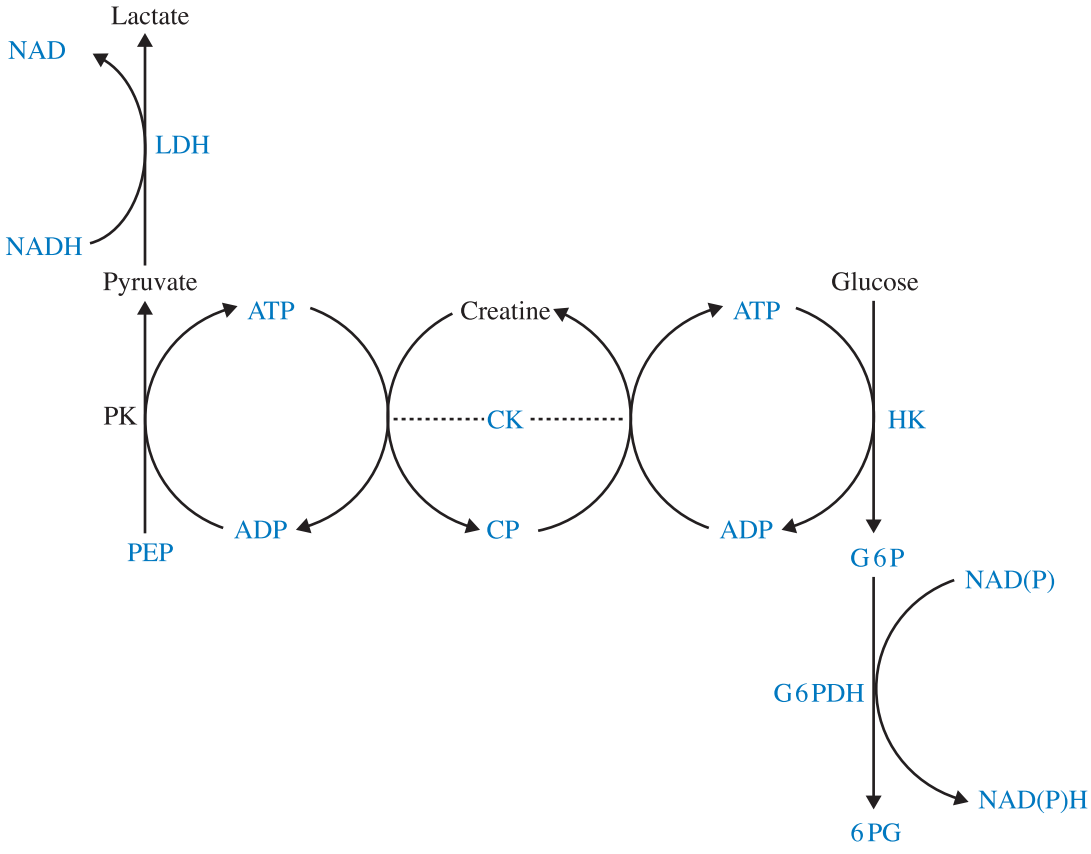
Our product is indicated in blue.

Creatinine, Urea



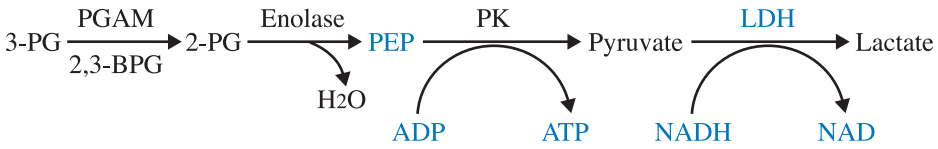
① Creatinine deiminase
② Creatinine amidohydrolase
③ Creatine amidinohydrolase

CK

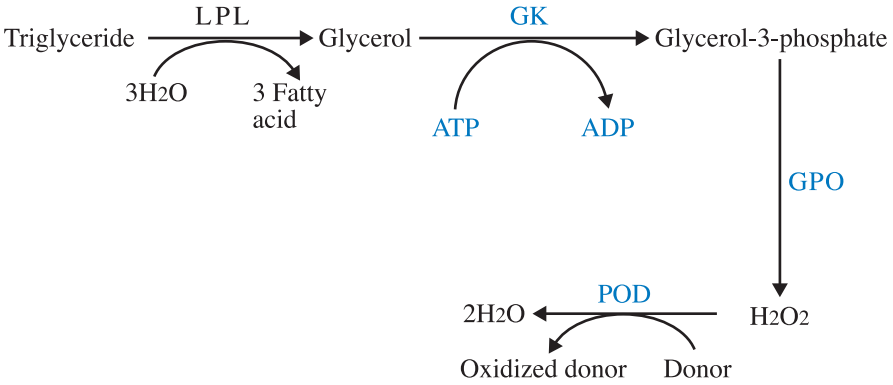


Our product is indicated in blue.

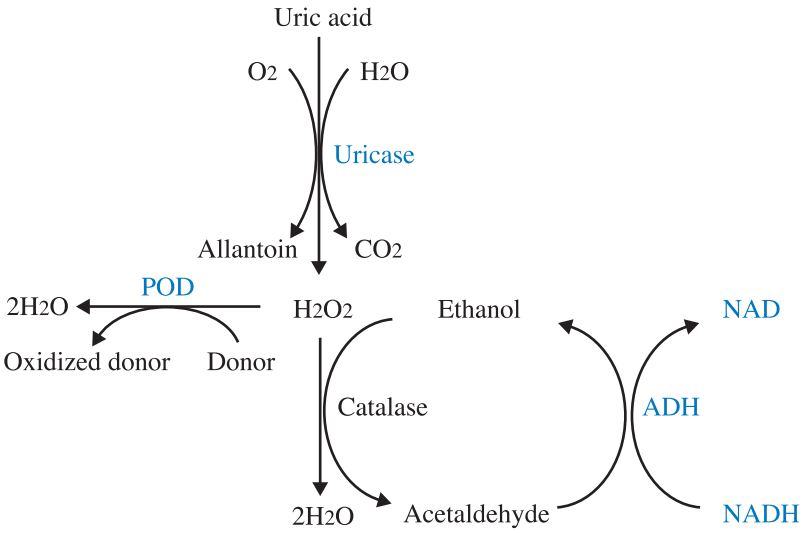
PGAM



TRIGLYCERIDE



UA



Product Index

Product Name	Cat. No.	Package	Page
APADH	44048900	Bulk	37
rhAST	46887903	100 U/Vial	63-64
ATP	45142000	10 g	56
	45140902	100 g	56
	45140903	500 g	56
	45140900	Bulk	56
ATP-II	45147900	Bulk	57
B			
rβ_2M	47183000	1 mg	66
	47184000	5 mg	66
	47183900	Bulk	66
β_2M-IGG	47295900	Bulk	72
BSA FAF	47408903	Bulk	82
BSA ST-G1	47400903	Bulk	82
C			
rhChE	46909903	100 U/Vial	63-64
rhCK-MB(Lyophilized powder)	46905903	100 U/Vial	63-64
rhCK-MB(Glycerol Solution)	47014905	Bulk	63-64
rhCK-MM(Lyophilized powder)	46906903	100 U/Vial	63-64
rhCK-MM(Glycerol Solution)	47013905	Bulk	63-64
CK-MM MCAmL(MX1)-12	47099900	Bulk	73
rCO	46703003	100 units	5
	46438003	1,000 units	5
	46438903	Bulk	5
CoA	45150000	100 mg	38
	45152000	1 g	38
	45152900	Bulk	38
CoA-Li	45160000	100 mg	39
	45162000	1 g	39
	45162900	Bulk	39
CP	45180000	1 g	58
	45180900	Bulk	58
rCRP	47191000	5 mg	67
	47190900	Bulk	67
CRP-FREE-SERUM	47936900	Bulk	83
CRP-IgG / O-RB-CRP-IGG-BT35	47872900	Bulk	74
CRP-MCA / O-CRP-MCA(12D-2C)	47858000	1 mg	75
	47155000	5 mg	75
	47858900	Bulk	75
rCystatin C	47516900	Bulk	68
Cystatin C-IgG / O-RB-rCystatin C IgG	47880900	Bulk	76

Product Name	Cat. No.	Package	Page
G			
Glucoamylase	46817903	Bulk	6
GOD(AN)	46524003	3,000 units	7
	46526003	10,000 units	7
	46527003	50,000 units	7
G6P	45195000	1 g	59
	45197000	10 g	59
	45195900	Bulk	59
rG6PDH(L)	46857003	200 units	8
	46854003	1,000 units	8
	46854903	Bulk	8
rG6PDH(Y)	46859053	1,000 units	9
	46864053	5,000 units	9
	46859903	Bulk	9
rα -Glucosidase	46772900	Bulk	10
rGlDH(NAD)	46874903	Bulk	11
rGlDH(NADP)	46754904	Bulk	12
rGlDH(Y)	46868003	600 units	13
	46870003	3,000 units	13
	46747903	Bulk	13
rGK	46898903	Bulk	14
rGPO	46899903	Bulk	15
rhγGT	46893903	100 U/Vial	63-64
H			
H-IgG	47364000	10 mg	84
rHK(Y)	46763900	Bulk	16
I			
rICDH(NADP)	46476015	3,000 units	17
	46720905	Bulk	17
rICDH(Taq)	46746903	Bulk	18
D-Isocitrate-K	45205900	Bulk	60
L			
rhLDH	46886903	100 U/Vial	63-64
rLDH(CH)	46757903	Bulk	19
rLDH(PH)	46775003	10,000 units	20
	46862903	Bulk	20
rLDH(RM)	46776003	10,000 units	21
	46781003	50,000 units	21
	46782003	100,000 units	21
	46764900	Bulk	21
rD-LDH(Bacteria)	46762903	Bulk	22
rD-LDH(L)	46773003	10,000 units	23
	46867903	Bulk	23
rhLIP	46883903	100 U/Vial	63-64
M			
rMb	47196000	1 mg	69
	47197000	5 mg	69
	47196900	Bulk	69
rMDH	46756903	Bulk	24
rMutarotase	46858902	Bulk	25

Product Name	Cat. No.	Package	Page
N			
β-NAD^+	44065908	10 g	40
	44065903	500 g	40
	44065900	Bulk	40
β-NAD^+-Li	44097900	Bulk	41
β-NADH	44326000	5 g	42
	44327000	10 g	42
	44320900	Bulk	42
β-$NADP^+$	44290000	100 mg	43
	44292000	1 g	43
	44297000	5 g	43
	44298000	10 g	43
	44292900	Bulk	43
β-$NADP^+$-Na_2	44300900	Bulk	44
β-$NADP^+$-K	44310900	Bulk	45
β-NADPH	44330000	100 mg	46
	44335000	5 g	46
	44332900	Bulk	46
P			
rhP-AMY	46891903	100 U/Vial	63-64
PEP	45170900	Bulk	61
r6PGDH(Y)	46861903	Bulk	26
r6PGL(L)	46765900	Bulk	27
rPCO	46852904	Bulk	28
rpHBH	46853903	Bulk	29
POD	46261003	10,000 units	30
	46262003	50,000 units	30
	46260903	Bulk	30
Pyridoxamine phosphate	44600900	Bulk	47
S			
rhS-AMY	46892903	100 U/Vial	63-64
Scavenger ALP	47814900	Bulk	80
T			
Thio-NAD^+	44104001	1 g	48
	44104900	Bulk	48
Thio-NADH	44317900	Bulk	49
U			
rUrease	46753000	1,000 units	31
	46753900	Bulk	31
rUricase(Y)	46769003	100 units	32
	46767900	Bulk	32
rUricase-03	46785903	Bulk	33
rUricase-73	46786903	Bulk	34

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Published in 2024

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