

## Product Contents

### SP6 RNA Polymerase:

Part No.	Size (units)
P108B	1,000
P108G	5,000
P408A	(High Conc.) 2,500

#### Description

SP6, T3 and T7 RNA Polymerases are DNA-dependent RNA polymerases that exhibit extremely high specificity for their cognate promoter sequences. For example, only SP6 DNA or DNA cloned downstream from an SP6 promoter can serve as a template for SP6 RNA Polymerase-directed RNA synthesis (1,2); SP6 RNA Polymerase does not recognize T3 or T7 RNA Polymerase promoters as a start site for transcription. SP6, T3 and T7 RNA Polymerases will incorporate  $^{32}\text{P}$ ,  $^{35}\text{S}$  and  $^3\text{H}$  nucleotide phosphates. SP6 RNA Polymerase is available in the RiboMAX™(a,b,c,d) and Riboprobe®(b,c) Systems.

#### Applications of phage RNA polymerases include:

- Synthesis of RNA transcripts for hybridization probes (3)
- Synthesis of large amounts of nonlabeled RNA (3)
- In vitro synthesis of capped RNA transcripts (3)
- RNase protection assays

**Transcription Optimized 5X Buffer (Cat.# P1181):** When the Transcription Optimized 5X Buffer supplied with this enzyme is diluted 1:5 to 1X, it has a composition of 40mM Tris (pH 7.9), 6mM  $\text{MgCl}_2$ , 2mM spermidine and 10mM NaCl.

**100mM DTT (Cat.# P1171):** Add to a final concentration of 10mM in a standard transcription reaction.

**Enzyme Storage Buffer:** SP6 RNA Polymerase is supplied in 20mM potassium phosphate buffer (pH 7.7), 1mM EDTA, 10mM DTT, 0.1M NaCl, 0.1% Triton® X-100 and 50% (v/v) glycerol.

**Source:** *E. coli* strain expressing a recombinant clone.

**Unit Definition:** One unit is defined as the amount of enzyme required to catalyze the incorporation of 5nmol of rCTP into acid-insoluble product in 1 hour at 37°C in a total volume of 100 $\mu\text{l}$  (4). The reaction conditions are: 40mM Tris-HCl (pH 7.9), 10mM NaCl, 6mM  $\text{MgCl}_2$ , 10mM DTT, 2mM spermidine, 0.05% Tween®-20, 0.5mM each of rATP, rGTP, rCTP and rUTP, 0.5 $\mu\text{Ci}$  [ $^3\text{H}$ ]rCTP and 2 $\mu\text{g}$  of supercoiled pGEM®-5Zl(+) Vector(®) DNA (Cat.# P2241). See the unit concentration on the Product Information Label.

**Usage Note:** Reference 2 contains additional information and applications for SP6 RNA Polymerase.

**Storage Temperature:** Store at -20°C. Avoid exposure to frequent temperature changes. See the expiration date on the Product Information Label.

## Quality Control Assays

### Activity Assays

**RNA Synthesis Assay:** SP6 RNA Polymerase is tested for RNA synthesis using the same conditions as for Unit Definition (above) except that unlabeled rCTP is limited to 12 $\mu\text{M}$ , the Tween®-20 is excluded and pGEM® Express Positive Control DNA(®) (Cat.# P2561) is used as the template. Separate reactions are performed using 1, 2, 5, 10 and 20 units of enzyme for 1 hour at 37°C. Minimum passing specification is  $\geq 65\%$  incorporation of [ $^3\text{H}$ ]rCTP using 20 units of enzyme.

**Transcription Assay:** SP6 RNA Polymerase is tested in a transcription assay using pGEM® Express Positive Control DNA(®) incubated for 1 hour at 37°C in Transcription Optimized 1X Buffer with 5 or 10 units of enzyme. Transcripts are denatured by heating at 65°C for 10 minutes in formamide/formaldehyde buffer and resolved in a 1% agarose gel in TAE buffer. Specification is to obtain intact transcripts of the correct size with minimal smearing.

### Contaminant Activity

**DNase and RNase Assay:** To test for nuclease activity, 50ng of radiolabeled DNA or RNA is incubated with 100 units of SP6 RNA Polymerase in Transcription Optimized 1X Buffer for 1 hour at 37°C. The release of radiolabeled nucleotides is monitored by scintillation counting of TCA-soluble material. Minimum passing specification is  $\leq 1\%$  release for DNase and RNase activity.

**Physical Purity:** Purity is  $>90\%$  as judged by SDS-polyacrylamide gels with Coomassie® blue staining.

## References

1. Butler, E.T. and Chamberlain, M.J. (1982) Bacteriophage SP6-specific RNA polymerase I. Isolation and characterization of the enzyme. *J. Biol. Chem.* **257**, 5772-8.
2. Melton, D.A. *et al.* (1984) Efficient in vitro synthesis of biologically active RNA and RNA hybridization probes from plasmids containing a bacteriophage SP6 promoter. *Nucl. Acids Res.* **12**, 7035-56.
3. *Riboprobe® in vitro Transcription Systems Technical Manual #TM016*, Promega Corporation.
4. Knoche, K., Stevens, J. and Bandziulis, R. (1997) A comparative study of T7 RNA polymerase quality. *Promega Notes* **61**, 2-5.

(a)The method of recombinant expression of *Coleoptera* luciferase is covered by U.S. Pat. Nos. 5,583,024, 5,674,713 and 5,700,673. A license (from Promega for research reagent products and from The Regents of the University of California for all other fields) is needed for any commercial sale of nucleic acid contained within or derived from this product.

(b)U.S. Pat. Nos. 4,966,964, 5,019,556 and 5,266,687, Australian Pat. Nos. 616881 and 641261 and other pending and issued patents, which claim vectors encoding a portion of human placental ribonuclease inhibitor, are exclusively licensed to Promega Corporation.

(c)U.S. Pat. No. 5,552,302, Australian Pat. No. 646803 and other patents.

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(e)U.S. Pat. No. 4,766,072.

(f)U.S. Pat. Nos. 5,324,637 and 5,492,817, Australian Pat. No. 660329 and other patents.

(g)U.S. Pat. Nos. 5,283,179, 5,641,641, 5,650,289 and 5,814,471, Australian Pat. No. 649289 and other patents and patents pending.

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## I. Standard Applications

Protocols for three standard applications of phage RNA polymerases are given. Reference 3 contains additional information and applications for the phage RNA polymerases. Please read the pertinent section(s) and prepare any reagents as appropriate. Gloves should be worn when working with transcription reagents or RNA transcripts to prevent RNase contamination.

### Materials to Be Supplied by the User

All materials except  $\alpha$ -<sup>32</sup>P and the DNA template, linearized, can be found in Sections II and III.

(Solution compositions are provided in Section II.)

- DNA template, linearized
- Nuclease-Free Water
- Recombinant RNasin® Ribonuclease Inhibitor<sup>(b,c)</sup>
- rNTP mix or rNTP capping mix
- [ $\alpha$ -<sup>32</sup>P]rCTP (400Ci/mmol, 10Ci/ml)
- Ribo m<sup>7</sup>G Cap Analog, 5mM (Cat.# P1711)

### A. Synthesis of High Specific Activity RNA Probes

- In a microcentrifuge tube, add the following reagents at room temperature in the order listed:

Transcription Optimized 5X Buffer	4 $\mu$ l
DTT, 100mM	2 $\mu$ l
Recombinant RNasin® Ribonuclease Inhibitor <sup>(b,c)</sup>	20 units
rATP, rGTP and rUTP mix, 2.5mM each	4 $\mu$ l
rCTP, 100 $\mu$ M	2.4 $\mu$ l
DNA template, linearized (in water or TE buffer at 0.2–1.0 $\mu$ g/ $\mu$ l)	1 $\mu$ l
[ $\alpha$ - <sup>32</sup> P]rCTP (50 $\mu$ Ci at 10mCi/ml)	5 $\mu$ l
phage RNA polymerase	20 units
Nuclease-Free Water to final volume of	20 $\mu$ l
- Incubate for 1 hour at 37°C.

### B. Synthesis of Nonlabeled RNA

- In a microcentrifuge tube, add the following reagents at room temperature in the order listed:

Transcription Optimized 5X Buffer	20 $\mu$ l
DTT, 100mM	10 $\mu$ l
Recombinant RNasin® Ribonuclease Inhibitor <sup>(b,c)</sup>	100 units
rNTP mix (see Section II)	20 $\mu$ l
DNA template, linearized (in water or TE buffer at 2–5 $\mu$ g)	5 $\mu$ l
phage RNA polymerase	40 units
Nuclease-Free Water to final volume of	100 $\mu$ l
- Incubate for 2 hours at 37°C.

### C. In Vitro Synthesis of Capped RNA Transcripts

- In a microcentrifuge tube, add the following reagents at room temperature in the order listed:

Transcription Optimized 5X Buffer	10 $\mu$ l
DTT, 100mM	5 $\mu$ l
Recombinant RNasin® Ribonuclease Inhibitor <sup>(b,c)</sup>	50 units
rNTP capping mix (see Section II)	5 $\mu$ l
Ribo m <sup>7</sup> G Cap Analog	5 $\mu$ l
DNA template, linearized (in water or TE buffer at 1 $\mu$ g/ $\mu$ l)	5 $\mu$ l
phage RNA polymerase	40 units
Nuclease-Free Water to final volume of	50 $\mu$ l
- Incubate for 1 hour at 37°C. To increase the yield of RNA, add an additional 40 units of phage RNA polymerase and incubate for 1 hour.

## II. Composition of Buffers and Solutions

### rNTP mix

2.5mM	rATP
2.5mM	rGTP
2.5mM	rUTP
2.5mM	rCTP

in Nuclease-Free Water

### rNTP capping mix

5mM	rATP
5mM	rUTP
5mM	rCTP
0.5mM	rGTP

in Nuclease-Free Water

### Transcription Optimized 5X Buffer (provided)

200mM	Tris-HCl (pH 7.9 at 25°C)
50mM	NaCl
30mM	MgCl <sub>2</sub>
10mM	spermidine

## III. Related Products

### A. Related Systems

Product	Cat.#
Riboprobe® System—SP6 <sup>(b,c)</sup>	P1420
Riboprobe® System—T3 <sup>(b,c)</sup>	P1430
Riboprobe® System—T7 <sup>(b,c)</sup>	P1440
Riboprobe® System Buffers	P1121
RiboMAX™ Large Scale RNA Production System—SP6 <sup>(a,b,c)</sup>	P1280
RiboMAX™ Large Scale RNA Production System—T7 <sup>(a,b,c,d)</sup>	P1300
TNT® T7 Quick Coupled Transcription/Translation System <sup>(a,b,c,f,g)</sup>	L1170
TNT® T7 Quick Coupled Transcription/Translation System, Trial Size <sup>(a,b,c,f,g)</sup>	L1171
TNT® SP6 Quick Coupled Transcription/Translation System <sup>(a,b,c,f,g)</sup>	L2080
TNT® SP6 Quick Coupled Transcription/Translation System, Trial size <sup>(a,b,c,f,g)</sup>	L2081
TNT® SP6 Coupled Reticulocyte Translation System <sup>(a,b,f,g)</sup>	L4600
TNT® T3 Coupled Reticulocyte Translation System <sup>(a,b,f,g)</sup>	L4950
TNT® T7 Coupled Reticulocyte Translation System <sup>(a,b,f,g)</sup>	L4610
TNT® T7/SP6 Coupled Reticulocyte Translation System <sup>(a,b,f,g)</sup>	L5020
TNT® T7/T3 Coupled Reticulocyte Translation System <sup>(a,b,f,g)</sup>	L5010
TNT® SP6 Coupled Reticulocyte Translation System, Trial Size <sup>(a,b,f,g)</sup>	L4601
TNT® T7 Coupled Reticulocyte Translation System, Trial Size <sup>(a,b,f,g)</sup>	L4611

For Laboratory Use.

### B. Related Products

Product	Size	Cat.#
SP6 Promoter Primer	2 $\mu$ g	Q5011
T3 Promoter Primer	2 $\mu$ g	Q5741
T7 Promoter Primer	2 $\mu$ g	Q5021
pGEM® Express Positive Control Template <sup>(e)</sup>	10 $\mu$ g (2 x 5 $\mu$ g)	P2561
rATP, 100mM*	400 $\mu$ l	E6011
rUTP, 100mM*	400 $\mu$ l	E6021
rGTP, 100mM*	400 $\mu$ l	E6031
rCTP, 100mM*	400 $\mu$ l	E6041
rATP, rCTP, rGTP and rUTP, each at 100mM*	400 $\mu$ l each	E6000
Nuclease-Free Water*	50ml (2 x 25ml)	P1193
Ribo m <sup>7</sup> G Cap Analog	10 A <sub>254</sub> units	P1711
	25 A <sub>254</sub> units	P1712

For Laboratory Use.

Product	Concentration	Size	Cat.#
Recombinant RNasin®	20–40u/ $\mu$ l	2,500u	N2511
Ribonuclease Inhibitor <sup>(b,c)</sup>	20–40u/ $\mu$ l	10,000u	N2515

For Laboratory Use.