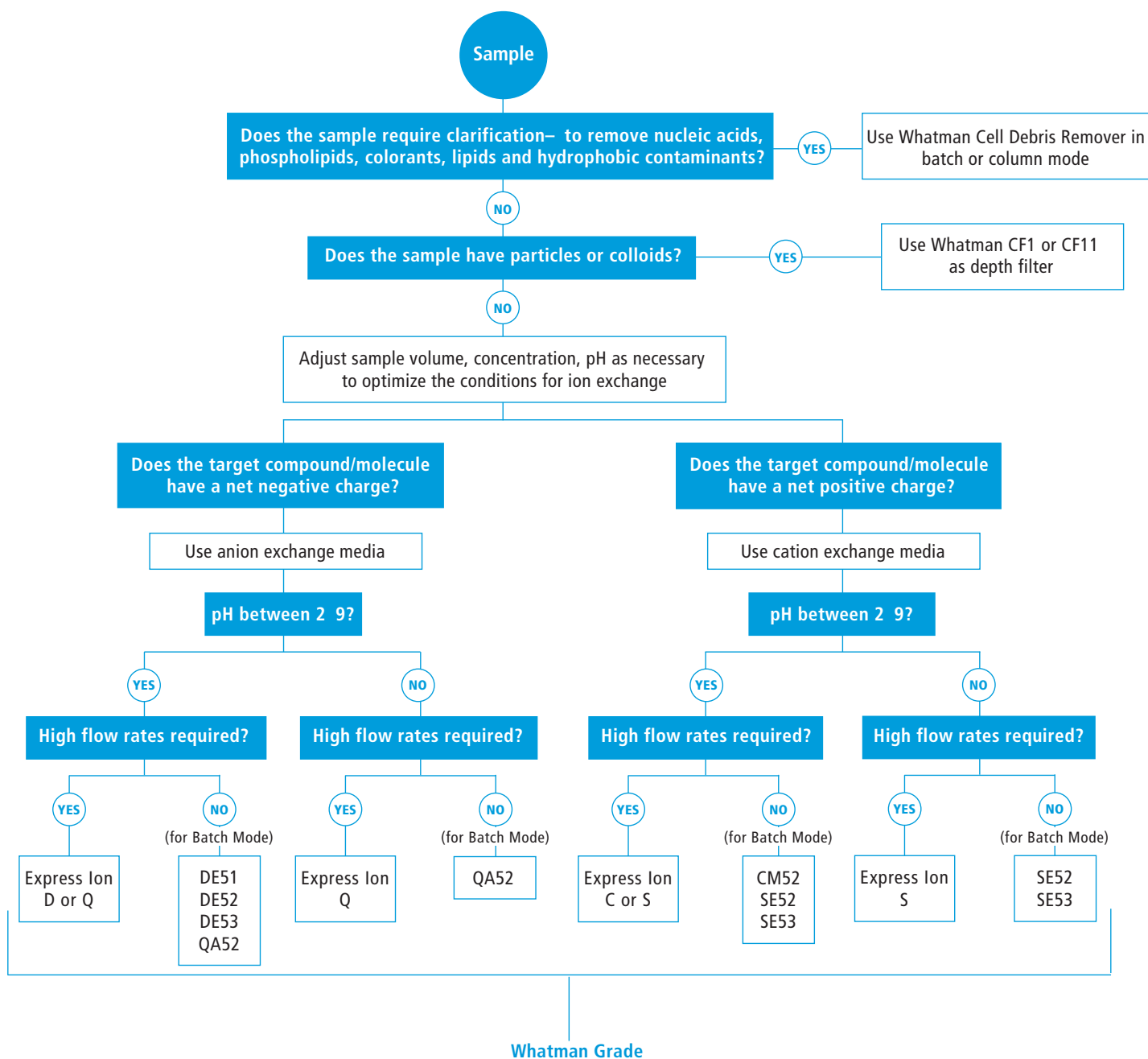


## Chromatography Media Quick Pick Reference Chart



## Advanced Ion Exchange Cellulose

Whatman Advanced Ion Exchange Cellulose (AIEC) and Column Chromatography (CC) products, ideal for separation of biopolymers, are also suitable for a wide variety of applications. Available as:

- Preswollen microgranular AIEC for high load capacity fast kinetics and resolution; saves time by eliminating need for precycling prior to buffer equilibration
- Dry microgranular AIEC for similar performance characteristics as preswollen media after precycling; reduces possibility of bacterial growth
- Fibrous AIEC for maximum throughput at high flow rates

- Commonly used anion and cation exchange functional groups: DEAE (diethylaminoethyl tertiary amine) and CM (ether-linked carboxymethyl)
- Orthophosphate bifunctional cation exchanger for sharp separation of medium molecular weight molecules



## Cellulose Powders

For Column and Thin Layer Chromatography (TLC).

Four high-purity cellulose powders are available using the partition mode.

### CC31

Pure, microgranular cellulose powder for column separations.

### CC41

Pure, binder-free microgranular cellulose powder for TLC.

### CF1

Fibrous, long cellulose for batch separations.

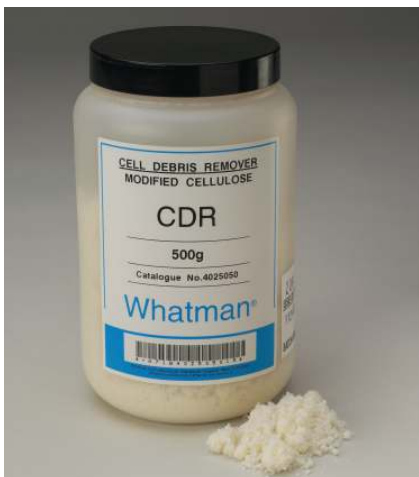
### CF11

Fibrous, medium cellulose powder for general column chromatography.

## Ordering Information

Catalog Number	Product	Description	Size
4020-050	CF1	Fibrous cellulose for batch separations	500 g
4021-050	CF11	Fibrous cellulose powder for column work	500 g
4021-500	CF11	Fibrous cellulose powder for column work	5 kg
4014-050	CC31	Microgranular cellulose powder for column work	500 g
4014-200	CC31	Microgranular cellulose powder for column work	2 kg
4061-050	CC41	Microgranular cellulose for TLC	500 g

## Specialty Products for Protein Separations



### CDR (Cell Debris Remover)

Aids in protein purification through initial clean-up of cell lysates; removes unwanted suspended, colloidal and soluble matter, leaving target proteins in solutions.

## Ordering Information

Catalog Number	Product	Description	Size
4025-050	CDR	Cell Debris Remover	500 g
4025-200	CDR	Cell Debris Remover	2 kg

## Anion Exchangers

### Anion Exchange Chromatography

The weak anion exchangers are based on the diethylaminoethyl (DEAE) tertiary amine functional group. QA52 is a strongly basic anion exchange medium, containing quaternary amine groups.

#### DE23 (fibrous)

Allows fast flow rates especially after fines removal; suitable for negative charged biopolymers.

#### DE32 (dry microgranular)

Similar performance characteristics as DE52 after precycling.

#### DE51 (preswollen, microgranular)

Low overall net charge. For use with proteins bearing a high negative charge and for nucleic acids. Suitable for isocratic elution systems.

#### DE52 (preswollen, microgranular)

Probably the most widely used DEAE cellulose in the world; used for biopolymers with low to high negative charges; exhibits excellent resolution with good flow rates.

#### DE53 (preswollen, microgranular)

Partially quaternized DEAE anion exchanger, highly substituted and with higher capacity than DE52; can be used in series with DE51 and DE52 media.

#### QA52 (preswollen, microgranular)

A strongly basic, quaternary amine-bearing anion exchange medium, moderately substituted, with high protein capacity. Fully ionized, bears constant charge under all pH conditions; excellent for high pH applications.

### Typical Data

Anion Exchange Media					
Physical Form	Functional Group	Normal pH Range	Small Ion Capacity	Protein Capacity <sup>1</sup>	
			meq/dg	mg/dg	mg/mL Bed Volume
<b>Dry Fibrous</b>					
DE23	Diethylaminoethyl	2–9.5	0.88–1.08	425 <sup>b</sup>	60
<b>Dry Microgranular</b>					
DE32	Diethylaminoethyl	2–9.5	0.88–1.08	700 <sup>b</sup>	140
<b>Preswollen Microgranular</b>					
DE51	Diethylaminoethyl	2.9	0.20–0.25	175 <sup>a</sup>	30
DE52	Diethylaminoethyl	2–9.5	0.88–1.08	700 <sup>b</sup>	130
DE53	Diethylaminoethyl	2–12	1.8–2.2	750 <sup>b</sup>	150
QA52	Quaternary Ammonium	2–12	1.10	750 <sup>b</sup>	150

dg=dry gram

<sup>1</sup> Protein capacity quoted:

<sup>a</sup> 0.005 M pH 8.5 phosphate buffer–Bovine Serum Albumin

<sup>b</sup> 0.01M pH 8.5 phosphate buffer–Bovine Serum Albumin

### Ordering Information

Anion Exchangers DEAE and QA Celluloses			
Catalog Number	Product	Description	Size
4053-010	DE23	Fibrous DEAE cellulose	100 g
4053-025	DE23	Fibrous DEAE cellulose	250 g
4055-010	DE32	Dry microgranular DEAE cellulose	100 g
4057-050	DE52	Preswollen microgranular DEAE cellulose	500 g
4057-200	DE52	Preswollen microgranular DEAE cellulose	2 kg
4058-050	DE53	Preswollen microgranular DEAE cellulose	500 g
4058-200	DE53	Preswollen microgranular DEAE cellulose	2 kg
4065-050	QA52	Quaternary amine substituted	500 g

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## Cation Exchangers

### CM32 (dry microgranular)

High capacity medium for proteins, hormones, polypeptides and other biopolymers bearing low to high positive charges; excellent resolution with good column flow rates. Requires precycling to restore swelling. Equivalent to CM52 when swollen.

### CM52 (preswollen, microgranular)

High capacity medium for proteins, hormones, polypeptides and other biopolymers bearing low to high positive charges; excellent resolution with good column flow rates.

### P1 Cellulose Phosphate

Dry fiber. Recommended for batch separations.

### P11 Cellulose Phosphate

Dry fiber. Recommended for column separations.

## Typical Data

Cation Exchange Media						
	Physical Form	Functional Group	Normal pH Range	Small Ion Capacity meq/dg	Protein Capacity <sup>1</sup>	
					mg/dg	mg/mL Bed Volume
<b>Preswollen Microgranular</b>						
	CM52	Carboxymethyl	3–10	0.90–1.15	1180 <sup>a</sup>	210
<b>Dry Microgranular</b>						
	CM32	Carboxymethyl	3–10	2.1–2.8	1180 <sup>b</sup>	200
<b>Dry Fibrous</b>						
	P1	Orthophosphate	2–10	7.4	—	—
	P11	Orthophosphate	2–10	3.2–5.3	—	—

dg=dry gram

<sup>1</sup> Protein capacity quoted:

<sup>a</sup> 0.01M pH 5.0 acetate buffer–Lysozyme

<sup>b</sup> 0.01M pH 4.4 acetate buffer–Lysozyme

## Ordering Information

Cation Exchangers CM Celluloses and P Phosphates			
Catalog Number	Product	Description	Size
4035-010	CM32	Dry microgranular carboxymethyl	100 g
4035-050	CM32	Dry microgranular carboxymethyl	500 g
4037-050	CM52	Preswollen microgranular CM cellulose	500 g
4037-200	CM52	Preswollen microgranular CM cellulose	2 kg
4070-050	P1	Dry bifunctional cation exchange cellulose	500 g
4071-010	P11	Dry bifunctional cation exchange cellulose	100 g
4071-050	P11	Dry bifunctional cation exchange cellulose	500 g
4071-200	P11	Dry bifunctional cation exchange cellulose	2 kg

## Ion Exchangers EXPRESS-ION® High Flow Rate Media

EXPRESS-ION media are matrices whose flow characteristics have been greatly improved. The manufacturing process has been optimized so that the matrix retains its inherent property of fast kinetics of adsorption and desorption.

### EXPRESS-ION D

A weak anion exchange cellulose substituted with diethylaminoethyl (DEAE) groups and recommended for separations between pH 2 and pH 9.

### EXPRESS-ION Q

A strong anion exchange cellulose having general applicability in separations requiring an anion exchange step, with the benefit of wide pH versatility. The N,N,N-trimethyl hydroxypropyl amine (quaternary amine) group is fully ionized throughout pH range 2–12.

### EXPRESS-ION C

A moderately acidic cation exchange cellulose. A weak ion exchanger recommended for separations between pH 4.5 and pH 10 to ensure the carboxymethyl functional group remains ionized.

### EXPRESS-ION S

A strongly acidic cation exchange cellulose having general applicability in separations requiring a cation exchange step, with the benefit of wide pH versatility. The sulfoxyethyl functional group is fully ionized throughout the pH range 2–12.

## Properties

Type	EXPRESS-ION D Weak Anion	EXPRESS-ION Q Strong Anion	EXPRESS-ION C Weak Cation	EXPRESS-ION S Strong Cation
Working pH range	2–9	2–12	4.5–10	2–12
Typical Protein	—	—	—	—
Capacity mg/mL: BSA	60	55	—	—
Lysozyme	—	—	162	153
Small Ion Capacity	—	1 meq/dg	—	—
Fiber Length	—	60–130 µm	—	—
Base Matrix	—	Microgranular cellulose	—	—
Typical Flow Rate	—	150 cm/hr	—	—
Physical Stability	—	Negligible volume changes due to ionic strength or pH	—	—



## Typical Data

Flow Rate (cm/h)	Pressure (psi)		
	5.0	7.5	10.0
EXPRESS-ION D	171.6	213.6	238.5
EXPRESS-ION Q	134.7	173.6	212.4
EXPRESS-ION C	94.0	127.2	165.3
EXPRESS-ION S	94.0	127.2	160.8

Column dimensions 45 cm ID x 15 cm.

## Ordering Information

EXPRESS-ION High Flow Rate Media		
Catalog Number	Description	Size
4079-0025	EXPRESS-ION D	250 g
4079-3025	EXPRESS-ION Q	250 g
4079-1025	EXPRESS-ION C	250 g
4079-2025	EXPRESS-ION S	250 g

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