



Further azo dyes that may release carcinogenic amines: Human health tier II assessment

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Chemicals in this assessment

Chemical Name in the Inventory	CAS Number
1H-Benz[de]isoquinoline-1,3(2H)-dione, 5-[(4-chlorophenyl)azo]-6-hydroxy-2-(3-methoxypropyl)-	42358-39-4
Benzamide, 3-[[[2,4-bis(1,1-dimethylpropyl)phenoxy]acetyl]amino]-N-[4,5-dihydro-4-[(methoxyphenyl)azo]-5-oxo-1-(2,4,6-trichlorophenyl)-1H-pyrazol-3-yl]-	55664-78-3
Benzenesulfonic acid, 4,4'-[methylenebis[4,1-phenyleneazo(4,5-dihydro-3-methyl-5-oxo-1H-pyrazole-4,1-diyl)]]bis[3-methyl-, disodium salt	75949-73-4
1H-Pyrazole-1-carboximidamide, 4,5-dihydro-4-[(2-methoxy-5-methylphenyl)azo]-3-methyl-5-oxo-, monohydrochloride	68936-08-3
3-Pyridinecarbonitrile, 1-butyl-5-[(4-chlorophenyl)azo]-1,2-dihydro-6-hydroxy-4-methyl-2-oxo-	69808-32-8

Chemical Name in the Inventory	CAS Number
Chromate(3-), [2-hydroxy-3-[(2-hydroxy-1-naphthalenyl)azo]-5-nitrobenzenesulfonato(3-)] [4-hydroxy-3-[[[2-hydroxy-5-[[4-(phenylazo)phenyl]azo]phenyl]methylene]amino]benzenesulfonato(3-)]-, trisodium	72479-31-3
Ferrate(5-), bis[4-[[2,4-dihydroxy-5-[(2-methoxyphenyl)azo]-3-[[4-(phenylamino)-3-sulfophenyl]azo]phenyl]azo]-3-hydroxy-7-nitro-1-naphthalenesulfonato(4-)]-, pentahydrogen	72779-11-4
1H-Pyrazole-3-carboxamide, 4,5-dihydro-5-oxo-1-phenyl-4-[[4-(phenylazo)phenyl]azo]-	84753-01-5
Chromate(2-), [4-[4,5-dihydro-4-[(2-hydroxy-5-nitrophenyl)azo]-3-methyl-5-oxo-1H-pyrazol-1-yl]benzenesulfonato(3-)][1-[[2-hydroxy-5-[(2-methoxyphenyl)azo]phenyl]azo]-2-naphthalenolato(2-)]-, lithium sodium	85828-74-6
2,7-Naphthalenedisulfonic acid, 3-hydroxy-4-[[4'-[[1-hydroxy-7-(phenylamino)-3-sulfo-2-naphthalenyl]azo]-3,3'-dimethoxy[1,1'-biphenyl]-4-yl]azo]-, trisodium	86437-47-0
1,3-Benzenediamine, 4-methyl-, coupled with diazotized aniline, diazotized o(or p)-toluidine and m-phenylenediamine, acetates hydrochlorides	90193-72-9
1,7-Naphthalenedisulfonic acid, 5-hydroxy-4-[[[6-hydroxy-2-naphthalenyl)sulfonyl]amino]-, coupled with diazotized aniline, o- and p-toluidine, ammonium sodium salts	90431-96-2
2,7-Naphthalenedisulfonic acid, 4-amino-5-hydroxy-, diazotized, coupled with diazotized 2-[(4-aminophenyl)amino]-5-nitrobenzenesulfonic acid, diazotized 4-nitrobenzenamine, 4-methyl-1,3-benzenediamine and resorcinol, potassium sodium salts	90432-01-2
Amines, C10-14-branched and linear alkyl-1-[[2-methyl-4-[(2-methylphenyl)azo]phenyl]azo]-2-naphthalenyl	91745-48-1
Chromate(3-), [3-hydroxy-4-[(2-hydroxy-1-naphthalenyl)azo]-7-nitro-1-naphthalenesulfonato(3-)][2-hydroxy-3-[[[2-hydroxy-5-[[4-(phenylazo)phenyl]azo]phenyl]methylene]amino]-5-nitrobenzenesulfonato(3-)]-, trisodium	93783-72-3

Chemical Name in the Inventory	CAS Number
1,3-Benzenediamine, 4-methyl-, coupled with diazotized 4-methyl-1,3-benzenediamine, diazotized m-phenylenediamine, diazotized m-toluidine, m-phenylenediamine and m-toluidine, propoxylated, acetates	104376-63-8
1,3-Benzenediamine, 4-methoxy, coupled with diazotized 4-methoxy-1,3-benzenediamine, diazotized 2(or 4)-methyl-1,3-benzenediamine and 2(or 4)-methyl-1,3-benzenediamine	108594-54-3
1,3-Benzenediamine, 4-methoxy-, coupled with diazotized 4-methoxy-1,3-benzenediamine, diazotized 2(or 4)-methyl-1,3-benzenediamine and 2(or 4)-methyl-1,3-benzenediamine, hydrochlorides	108594-55-4
Benzenesulfonic acid, 3,3'-[[[3,3'-dichloro(1,1'-biphenyl)-4,4'-diyl]bis[azo(4,5-dihydro-3-methyl-5-oxo-1H-pyrazole-4,1-diyl)]]bis-, calcium salt (1:1)	111636-31-8

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

For more detail on this program please visit: www.nicnas.gov.au

Disclaimer

NICNAS has made every effort to assure the quality of information available in this report. However, before relying on it for a specific purpose, users should obtain advice relevant to their particular circumstances. This report has been prepared by NICNAS using a range of sources, including information from databases maintained by third parties, which include data supplied by industry. NICNAS has not verified and cannot guarantee the correctness of all information obtained from those databases. Reproduction or further distribution of this information may be subject to copyright protection. Use of this information without obtaining the permission from the owner(s) of the respective information might violate the rights of the owner. NICNAS does not take any responsibility whatsoever for any copyright or other infringements that may be caused by using this information.

ACRONYMS & ABBREVIATIONS

Grouping Rationale

The critical health concern for the chemicals in this group is the potential for carcinogenic or genotoxic effects following exposure to certain aromatic amines present as both impurities and breakdown products.

All chemicals in this group are azo compounds that share a similar molecular structure (R—N=N—R). The chemicals in this group could contain one or more azo linkages, in which the attached functional groups differ for each chemical.

The significance of azo-reduction in the mutagenicity and carcinogenicity of azo dyes is well established. The chemicals in this group have the potential to undergo reductive cleavage to form one or more of the following carcinogenic and/or genotoxic aromatic amines:

- o-anisidine (CAS No. 90-04-0)
- o-toluidine (CAS No. 95-53-4)
- p-aminoazobenzene (CAS No. 60-09-3)
- 2,4-toluenediamine (CAS No. 95-80-7)
- p-chloroaniline (CAS No. 106-47-8)
- 6-methoxy-m-toluidine (p-cresidine) (CAS No. 120-71-8)
- 3,3'-dimethoxybenzidine (3,3'-DMOB—CAS No. 119-90-4)
- 3,3'-dichlorobenzidine (3,3'-DCB—CAS No. 91-94-1)
- 4,4-methylenedianiline (CAS No. 101-77-9)
- 2,4-diaminoanisole (CAS No. 615-05-4)

These amines with the exception of p-cresidine (which is not listed in the Australian Inventory of Chemical Substances (AICS)) have been previously assessed by NICNAS (NICNASa; NICNASb; NICNASc; NICNASd; NICNASE; NICNASf; NICNASg; NICNASH). These reports should be read in conjunction with this Tier II assessment.

In the European Union (EU), these aromatic amines are classified as carcinogens and are included in Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) list of 22 aromatic amines in Annex XVII Appendix 8 (European Commission, 2006) (see International restrictions section).

Import, Manufacture and Use

Australian

No specific Australian use, import, or manufacturing information has been identified.

International

Limited use data are available for the chemicals in this group.

The chemicals are expected to be used as colouring agents or dyes. CAS No. 42358-39-4 has been reported as a dye for polyesters, polyacrylonitrile, polyamides and wool, and cellulose (Ullmanns, 2012). CAS No. 85828-74-6 has been detected in a variety of textiles (KEMI, 2008). CAS No. 75949-73-4 has been identified as an acid dye (Government of Canada, 2016) and CAS No. 86437-47-0 as a direct dye. CAS No.

CAS No. 55664-78-3 has identified site-limited use as a dye intermediate (coupler).

Several chemicals were sold in small quantities for research and development purposes.

The chemicals are not listed in the US Personal Care Product Council INCI dictionary or available product ingredient databases.

Restrictions

Australian

The chemicals CAS Nos 86437-47-0, 111636-31-8 are covered by the following entry in the *Poisons Standard—the Standard for the Uniform Scheduling of Medicines and Poisons* (SUSMP) in Schedule 7 (SUSMP, 2019).

BENZIDINE-CONGENER (3,3'-disubstituted) AZO DYES.

The remaining chemicals except CAS No. 75949-73-4 are covered by the following entry in the *Poisons Standard—the Standard for the Uniform Scheduling of Medicines and Poisons* (SUSMP) in Schedule 7 (SUSMP, 2019).

AZO DYES that are derivatives by diazotisation of any of the following substances:

- p-aminoazobenzene (CAS No. 60-09-3)
- o-aminoazotoluene (CAS No. 97-56-3)
- o-anisidine (CAS No. 90-04-0)
- p-chloroaniline (CAS No. 106-47-8)
- 4-chloro-o-toluidine (CAS No. 95-69-2)
- 6-methoxy-m-toluidine (p-cresidine) (CAS No. 120-71-8)
- 2-naphthylamine (CAS No. 91-59-8)
- 5-nitro-o-toluidine (CAS No. 99-55-8)
- 2,4-toluenediamine (CAS No. 95-80-7)
- o-toluidine (CAS No. 95-53-4)
- 2,4,5-trimethylaniline (CAS No. 137-17-7)

except for BASIC RED 76 (CAS No. 68391-30-0) when included in Schedule 6.

Schedule 7 chemicals are described as 'Dangerous Poison – Substances with a high potential for causing harm at low exposure and which require special precautions during manufacture, handling or use. These poisons should be available only to specialised or authorised users who have the skills necessary to handle them safely. Special regulations restricting their availability, possession, storage or use may apply' (SUSMP, 2019).

Although azo dyes that are derivatives of 2,4-diaminoanisole (CAS No. 615-05-4) are not included in the Poison Standard, the chemicals (CAS Nos 108594-54-3 and 108594-55-4) that are derivatives of 2,4-diaminoanisole are also derivatives of 2,4-toluenediamine (CAS No. 95-80-7) and are, therefore, covered by the schedule entry.

The Australian Competition and Consumer Commission (ACCC) has published safety guidance on concentrations of particular aromatic amines, in clothing, textiles and leather articles in direct and prolonged contact with the human skin or oral cavity (ACCC, 2014). The guidance includes limits for aromatic amines, including those released by the chemicals in this assessment, in textile and leather articles that align with those in the European Union (refer **International restrictions**). The limit does not have a legislative basis and is provided for the information of suppliers who may be supplying products that contain aromatic amines.

International

The chemicals are restricted by the EU Annex XVII to EU Regulation as follows:

1. Azodyes which, by reductive cleavage of one or more azo groups, may release one or more of the aromatic amines listed in Appendix 8, in detectable concentrations,

i.e. above 30 ppm in the finished articles or in the dyed parts thereof, according to the testing methods listed in Appendix 10, shall not be used in textile and leather articles which may come into direct and prolonged contact with the human skin or oral cavity, such as:

clothing, bedding, towels, hairpieces, wigs, hats, nappies and other sanitary items, sleeping bags;

footwear, gloves, wristwatch straps, handbags, purses/wallets, briefcases, chair covers, purses worn round the neck;

textile or leather toys and toys which include textile or leather garments; and

yarn and fabrics intended for use by the final consumer.

2. Furthermore, the textile and leather articles referred to in paragraph 1 above shall not be placed on the market unless they conform to the requirements set out in that paragraph' (Galleria Chemica).

Existing Worker Health and Safety Controls

Hazard Classification

The chemicals are not listed on the Hazardous Chemical Information System (HCIS) (Safe Work Australia).

Exposure Standards

Australian

No specific exposure standards are available (Safe Work Australia).

International

No specific exposure standards are available (Galleria Chemica).

Health Hazard Information

The critical concern for this group of chemicals and focus of this assessment relates to the potential carcinogenic effects following exposure. The azo linkage is usually the most easily released (labile) portion of an azo-based substance. Azo bond reduction and cleavage to release aromatic amines occurs by an enzyme-mediated metabolism in the liver, skin and intestines. The released aromatic amines are much more readily absorbed across biological membranes compared with the azo-based substance. Local effects are considered a secondary concern for this group of chemicals and, as such, have not been considered as part of this assessment.

No toxicological data are available for the chemicals in this assessment. NICNAS has previously assessed azo dyes that may release the same aromatic amines (NICNASi; NICNASj; NICNASK). These reports should be read in conjunction with this Tier II assessment.

The chemicals CAS Nos 86437-47-0 and 111636-31-8 are expected to be metabolised to 3,3'-DCB and 3,3'-DMOB. Dyes metabolised to 3,3'-DMOB are listed in the National Toxicology Program (NTP) Report on Carcinogens as 'reasonably anticipated to be human carcinogens' (NTP, 2011). Sufficient data were available for other dyes that are metabolised to 3,3'-DCB and 3,3'-DMOB to recommend classification for carcinogenicity (May cause cancer—Category 1B (H350)) and mutagenicity (Suspected of causing genetic defects—Category 2 (H341)) for non-metallised dyes (NICNASi).

The remaining chemicals may release other known carcinogenic aromatic amines. Although there are limited data for other dyes that release the same aromatic amines (NICNASj; NICNASK), based on the potential for the chemicals to be metabolised to form classified carcinogens, classification (Suspected of causing cancer—Cat. 2 (H351)) was considered appropriate. Although available data were neither sufficient nor adequately comprehensive for classification, a genotoxic mode of action cannot be ruled out (NICNASj; NICNASK).

Risk Characterisation

Critical Health Effects

The chemicals are all considered to have the potential to be metabolised to classified carcinogens through reductive cleavage of the azo linkage. In addition, azo dyes are generally known to be contaminated with their respective starting amine material (SCCNFP, 2002).

It is not possible to draw a definite conclusion regarding the genotoxicity of the majority of chemicals in this group. However, while available data are insufficient or inadequately comprehensive for classification, genotoxicity as a mode of action cannot be ruled out.

Local effects are considered a secondary concern for this group of chemicals and, as such, have not been considered as part of this assessment.

Public Risk Characterisation

The public could be exposed to classified carcinogenic aromatic amines as impurities, or through the release of these aromatic amines derived from the chemicals in this group through:

- prolonged exposure to articles of clothing and leather goods containing the dyes;
- young children exposed by sucking the materials containing the dye; and
- exposure by dermal contact or incidental ingestion of printed cardboards, papers or foils.

An international assessment of the risk of cancer caused by textiles and leather goods coloured with certain azo dyes concluded that, while consumer exposure is likely to be 'very low', the associated cancer risks give cause for concern. Although this

assessment was not publicly available, the European Scientific Committee on Toxicity, Ecotoxicity and Environment (CSTEE) considers that the report adequately reviews the situation regarding the risk of cancer for consumers from fabrics dyed with azo compounds, and that its conclusions are, in general, acceptable (CSTEE, 1999). The CSTEE also supported the recommendation that using azo dyes with the potential to give rise to the 22 aromatic amines classified as Category 1 or 2 carcinogens according to Directive 76/769/EEC, should be restricted to the lowest possible levels or completely eliminated.

In considering the NICNAS recommendation for previously assessed azo dyes, the ACCC conducted a market survey to determine if any dyes of concern had been used in manufacturing consumer goods supplied in Australia. The ACCC has negotiated several recalls of products based on the results of the surveys. The ACCC tested for the concentration of aromatic amines that could be released from the chemicals in this group. This testing is considered appropriate for the chemicals in this group.

The Australian Competition and Consumer Commission (ACCC) has published safety guidance on concentrations of particular aromatic amines in clothing, textiles and leather articles in direct and prolonged contact with the human skin or oral cavity (ACCC, 2014). The guidance includes limits for aromatic amines, including those released by the chemicals in this assessment, in textile and leather articles (see **Restrictions** section).

Limited data are available to assess exposure to azo dyes through use in the manufacture of paper. Overall exposure is not expected to be prolonged and is limited by the fastness requirements of colourants in paper. Widespread use of dyes based on carcinogenic amines in paper is not indicated (personal communication, European Commission, 2000).

The chemicals except CAS No. 75949-73-4 are currently listed on Schedule 7 of the *Standard for the Uniform Scheduling of Medicines and Poisons* (SUSMP, 2019).

This precludes the introduction of these dyes for home use. An amendment to the schedule entry to include 4,4-methylenedianiline (CAS No. 101-77-9) would provide a similar restriction for CAS 75949-73-4. Although the azo dyes that are derivatives of 2,4-diaminoanisole (CAS No. 615-05-4) are already scheduled due to presence of other aromatic amines, the inclusion CAS No. 614-05-4 in the azo dye schedule entry would provide greater clarity for these chemicals.

Occupational Risk Characterisation

During product formulation, oral, dermal, ocular and inhalation exposure of workers to the chemical may occur, particularly where manual or open processes are used. These may include transfer and blending activities, quality control analysis, and cleaning and maintaining equipment. Worker exposure to the chemical at lower concentrations may also occur while using formulated products containing the chemical. The level and route of exposure will vary depending on the method of application and work practices employed.

Given the critical systemic long-term health effects, the chemicals could pose an unreasonable risk to workers unless adequate control measures to minimise dermal and inhalation exposure are implemented. The chemicals should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU) at a workplace (such as an employer) has adequate information to determine the appropriate controls.

The *Guidance on the interpretation of workplace exposure standards for airborne contaminants* advises that 'exposure to carcinogens should be eliminated or minimised so far as is reasonably practicable' (Safe Work Australia, 2013).

The data available support an amendment to the hazard classification on the HCIS (Safe Work Australia) (refer to **Recommendation** section).

NICNAS Recommendation

Further risk management is required. Sufficient information is available to recommend that risks for workplace health and safety be managed through changes to classification and labelling for all chemicals.

In addition, risk management controls through changes to the Poisons Standard should be considered for CAS Nos 75949-73-4, 108594-54-3 and 108594-55-4.

Regulatory Control

Public Health

The majority of chemicals in this assessment covered by the azo dye entry in Schedule 7.

4,4-Methylenedianiline (CAS No. 101-77-9) is both genotoxic and carcinogenic in animals (NICNASf). 2,4-Diaminoanisole (CAS No. 615-05-4) is carcinogenic in animals. A genotoxic mode of action cannot be excluded (NICNASg). Azo dyes which, by reductive cleavage of one or more azo groups, and may release this aromatic amines are restricted internationally (see **Restrictions:International** section).

To be consistent with previous decisions made on azo-based dyes, it is recommended that the azo dye entry in Schedule 7 be amended to include 4,4-methylenedianiline (CAS No. 101-77-9). Consideration should be given to also include 2,4-diaminoanisole (CAS No. 615-05-4).

Work Health and Safety

The chemicals are recommended for classification and labelling aligned with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) as below. This does not consider classification of physical hazards and environmental hazards.

The Carcinogenicity Category 2 classification applies to all chemicals except CAS Nos 86437-47-0 and 111636-31-8. These chemicals should be classified as May cause cancer - Category 1B (H350).

The mutagenicity classification only applies to CAS Nos 86437-47-0 and 111636-31-8.

From 1 January 2017, under the model Work Health and Safety Regulations, chemicals are no longer to be classified under the Approved Criteria for Classifying Hazardous Substances system.

Hazard	Approved Criteria (HSIS) ^a	GHS Classification (HCIS) ^b
Genotoxicity	Not Applicable	Suspected of causing genetic defects - Cat. 2 (H341)
Carcinogenicity	Not Applicable	Suspected of causing cancer - Cat. 2 (H351)

^a Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

^b Globally Harmonized System of Classification and Labelling of Chemicals (GHS) United Nations, 2009. Third Edition.

* Existing Hazard Classification. No change recommended to this classification

Advice for consumers

Products containing the chemicals should be used according to the instructions on the label.

Advice for industry

Control measures

Control measures to minimise the risk from dermal and inhalation exposure to the chemicals should be implemented in accordance with the hierarchy of controls.

Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate, or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemicals is used. Examples of control measures that could minimise the risk include, but are not limited to:

- using closed systems or isolating operations;
- health monitoring for any worker who is at risk of exposure to the chemicals, if valid techniques are available to monitor the effect on the worker's health;
- minimising manual processes and work tasks through automating processes;
- work procedures that minimise splashes and spills;
- regularly cleaning equipment and work areas; and
- using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemicals.

Guidance on managing risks from hazardous chemicals are provided in the *Managing risks of hazardous chemicals in the workplace—Code of practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

Obligations under workplace health and safety legislation

Information in this report should be taken into account to help meet obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((M)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemicals are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (M)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of safety data sheets for hazardous chemicals—Code of practice* and *Labelling of workplace hazardous chemicals—Code of practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the physical hazards of these chemicals has not been undertaken as part of this assessment.

References

Australian Competition and Consumer Commission (ACCC), 2014. Safety guidance on concentrations of particular chemicals in certain consumer goods, Oct 2014. Accessed October 2019 at <https://www.productsafety.gov.au/publication/safety-guidance-on-concentrations-of-particular-chemicals-in-certain-consumer-goods>

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National Industrial Chemicals Notification and Assessment Scheme (NICNASc). Inventory Multi-tiered Assessment and Prioritisation (IMAP) Human Health Tier II Assessment for Benzenamine, 4-(phenylazo)- Cas no: 60-09-3. Accessed October 2019 at <http://www.nicnas.gov.au>

National Industrial Chemicals Notification and Assessment Scheme (NICNASd). Inventory Multi-tiered Assessment and Prioritisation (IMAP) Human Health Tier II Assessment for 1,3-Benzenediamine, 4-methyl- (CAS No. 95-80-7). Accessed October 2019 at <http://www.nicnas.gov.au>

National Industrial Chemicals Notification and Assessment Scheme (NICNASE). Inventory Multi-tiered Assessment and Prioritisation (IMAP) Human Health Tier II Assessment for Benzenamine, 4-chloro- (CAS No. 106-47-8). Accessed October 2019 at <http://www.nicnas.gov.au>

National Industrial Chemicals Notification and Assessment Scheme (NICNASf). Inventory Multi-tiered Assessment and Prioritisation (IMAP) Human Health Tier II Assessment for Benzenamine, 4,4'-methylenebis- (CAS No. 101-77-9). Accessed October 2019 at <http://www.nicnas.gov.au>

National Industrial Chemicals Notification and Assessment Scheme (NICNASg). Inventory Multi-tiered Assessment and Prioritisation (IMAP) Human Health Tier II Assessment for 1,3-Benzenediamine, 4-methoxy- (CAS No. 615-05-4). Accessed October 2019 at <http://www.nicnas.gov.au>

National Industrial Chemicals Notification and Assessment Scheme (NICNASh). Inventory Multi-tiered Assessment and Prioritisation (IMAP) Human Health Tier II Assessment for Benzidine congeners. Accessed October 2019 at <http://www.nicnas.gov.au>

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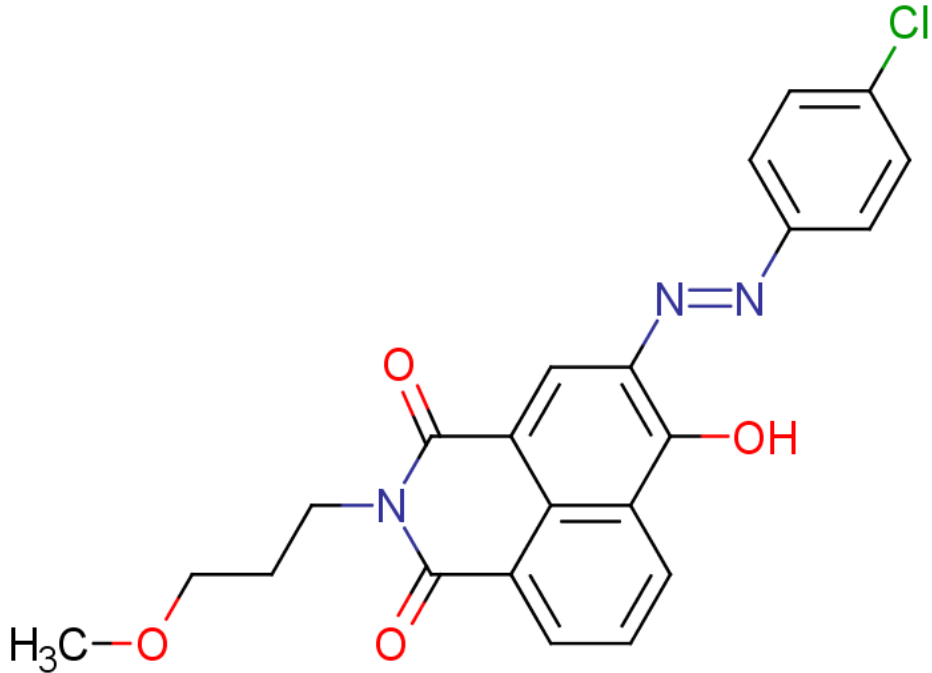
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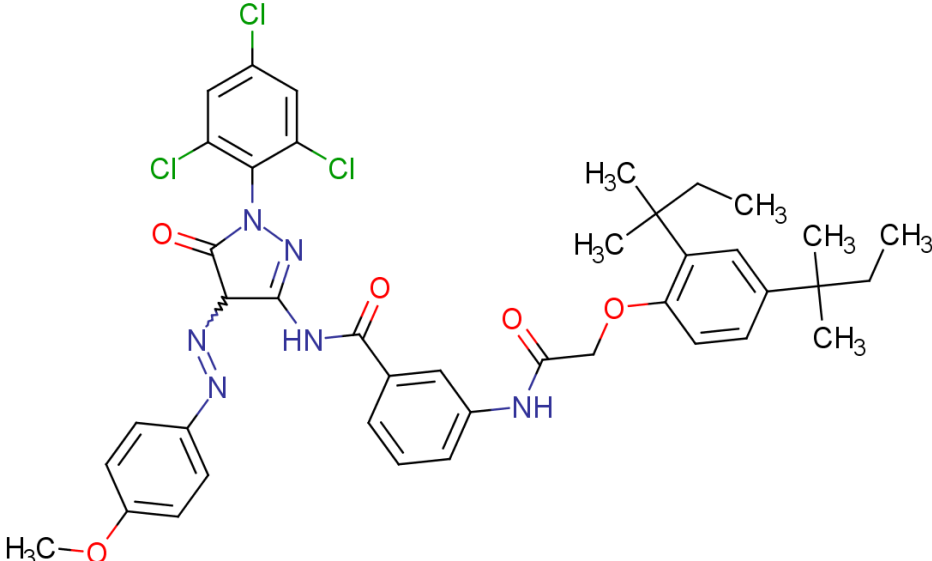
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Last Update 12 December 2019

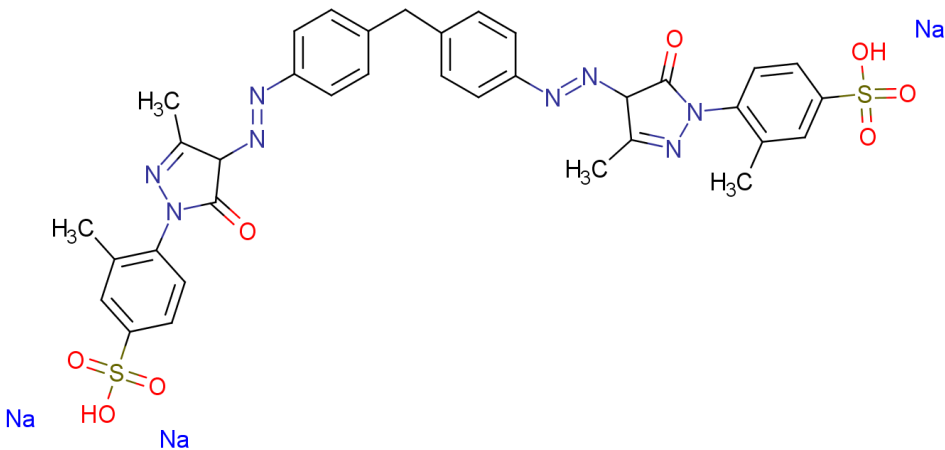
Chemical Identities

Chemical Name in the Inventory and Synonyms	<p>1H-Benz[de]isoquinoline-1,3(2H)-dione, 5-[(4-chlorophenyl)azo]-6-hydroxy-2-(3-methoxypropyl)- 3-(4-chlorophenylazo)-4-hydroxy-N-(3-methoxypropyl)-1,8-naphthalenedicarboximide 1H-benz[de]isoquinoline-1,3(2H)-dione, 5-[(4-chlorophenyl)azo]-6-hydroxy-2-(3-methoxypropyl)- 5-[(4-chlorophenyl)diazenyl]-6-hydroxy-2-(3-methoxypropyl)-1H-benzo[de]isoquinoline-1,3(2H)-dione 1H-benz[de]isoquinoline-1,3(2H)-dione, 5-[2-(4-chlorophenyl)diazenyl]-6-hydroxy-2-(3-methoxypropyl)</p>
CAS Number	42358-39-4
Structural Formula	

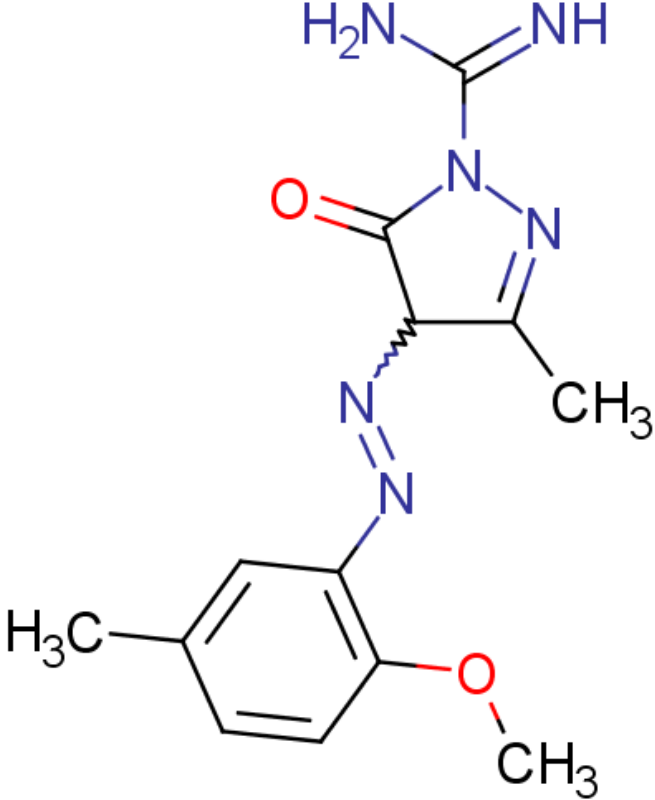
	
Molecular Formula	C ₂₂ H ₁₈ ClN ₃ O ₄
Molecular Weight	423.85

Chemical Name in the Inventory and Synonyms	<p>Benzamide, 3-[[[2,4-bis(1,1-dimethylpropyl)phenoxy]acetyl]amino]-N-[4,5-dihydro-4-[(methoxyphenyl)azo]-5-oxo-1-(2,4,6-trichlorophenyl)-1H-pyrazol-3-yl]- benzamide, 3-[[[2,4-bis(1,1-dimethylpropyl)phenoxy]acetyl]amino]-N-[4,5-dihydro-4-((methoxyphenyl)azo)-5-oxo-1-(2,4,6-trichlorophenyl)-1H-pyrazol-3-yl]benzamide</p>
CAS Number	55664-78-3
Structural Formula	

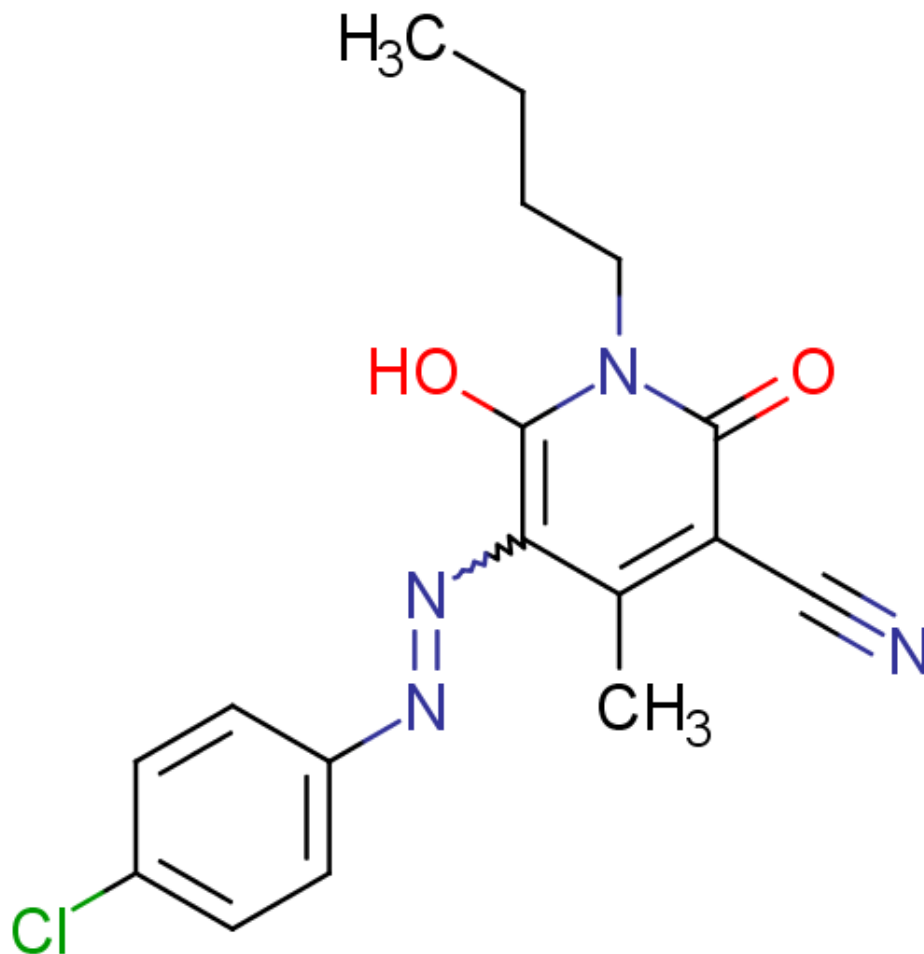
Molecular Formula	C41H43Cl3N6O5
Molecular Weight	806.19

Chemical Name in the Inventory and Synonyms	Benzenesulfonic acid, 4,4'-[methylenebis[4,1-phenyleneazo(4,5-dihydro-3-methyl-5-oxo-1H-pyrazole-4,1-diyl)]]bis[3-methyl-, disodium salt disodium 3-methyl-4-(3-methyl-4-[[4-(4-[[3-methyl-1-(2-methyl-4-sulfonatophenyl)-5-oxo-4,5-dihydro-1H-pyrazol-4-yl]diazanyl]benzyl)phenyl]diazanyl)-5-oxo-4,5-dihydro-1H-pyrazol-1-yl]benzenesulfonate
CAS Number	75949-73-4
Structural Formula	
Molecular Formula	C35H32N8O8S2.2Na
Molecular Weight	800.78

Chemical Name in the Inventory and Synonyms	1H-Pyrazole-1-carboximidamide, 4,5-dihydro-4-[(2-methoxy-5-methylphenyl)azo]-3-methyl-5-oxo-, monohydrochloride 1H-pyrazole-1-carboximidamide, 4,5-dihydro-4-((2-methoxy-5-methylphenyl)azo)-3-methyl-5-oxo-, monohydrochloride 4,5-dihydro-4-((2-methoxy-5-methylphenyl)azo)-3-methyl-5-oxo-1H-pyrazole-1-carboximidine monohydrochloride
CAS Number	68936-08-3
Structural Formula	

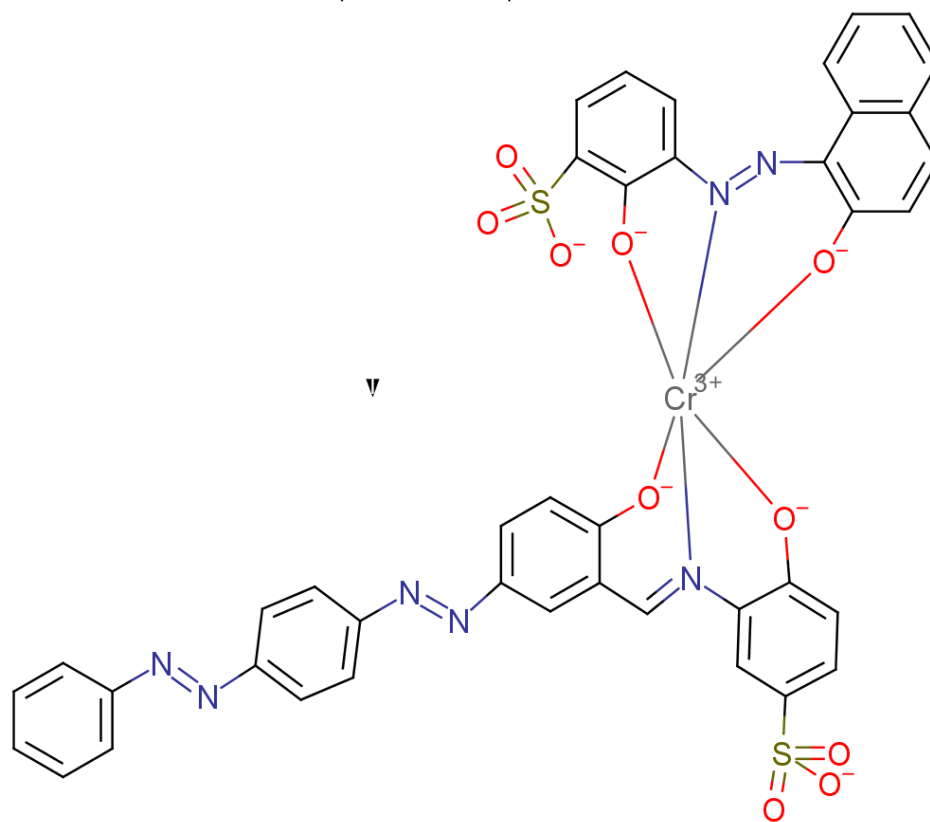
	 <p style="text-align: center; color: green; font-weight: bold;">HCl</p>
Molecular Formula	C ₁₃ H ₁₆ N ₆ O ₂ .ClH
Molecular Weight	324.77

Chemical Name in the Inventory and Synonyms	<p>3-Pyridinecarbonitrile, 1-butyl-5-[(4-chlorophenyl)azo]-1,2-dihydro-6-hydroxy-4-methyl-2-oxo- 1-butyl-5-((4-chlorophenyl)azo)-1,2-dihydro-6-hydroxy-4-methyl-2-oxo-3-pyridinecarbonitrile 1-butyl-5-((4-chlorophenyl)azo)-1,2-dihydro-6-hydroxy-4-methyl-2-oxonicotinonitrile</p>
CAS Number	69808-32-8
Structural Formula	



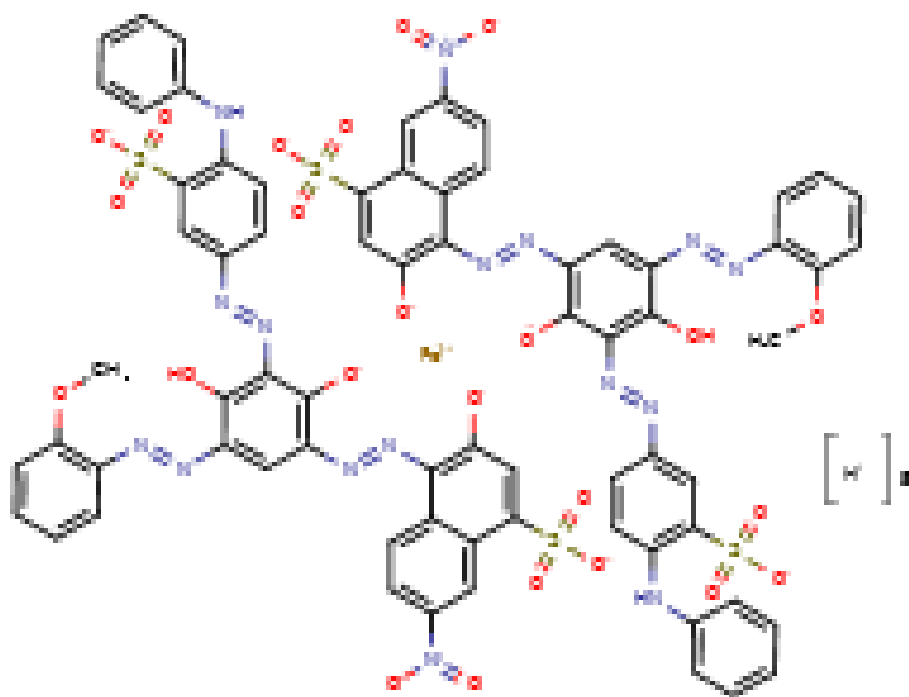
Molecular Formula	C ₁₇ H ₁₇ ClN ₄ O ₂
Molecular Weight	344.8

Chemical Name in the Inventory and Synonyms	<p>Chromate(3-), [2-hydroxy-3-[(2-hydroxy-1-naphthalenyl)azo]-5-nitrobenzenesulfonato(3-)][4-hydroxy-3-[[[2-hydroxy-5-[[4-(phenylazo)phenyl]azo]phenyl]methylene]amino]benzenesulfonato(3-)]-, trisodium</p> <p>trisodium (2-hydroxy-3-((2-hydroxy-1-naphthyl)azo)-5-nitrobenzene-1-sulphonato(3-))(4-hydroxy-3-(((2-hydroxy-5-((4-(phenylazo)phenyl)azo)phenyl)methylene)amino)benzene-1-sulphonato(3-))chromate(3-)</p> <p>chromate(3-), (2-(hydroxy-kappaO)-3-((2-(hydroxy-kappaO)-1-naphthalenyl)azo-kappaN1)-5-nitrobenzenesulfonato(3-))(4-(hydroxy-kappaO)-3-(((2-(hydroxy-kappaN)-5-((4-(phenylazo)phenyl)azo)phenyl)methylene)amino-kappaN)benzenesulfonato(3-))-, trisodium</p>
CAS Number	72479-31-3
Structural Formula	



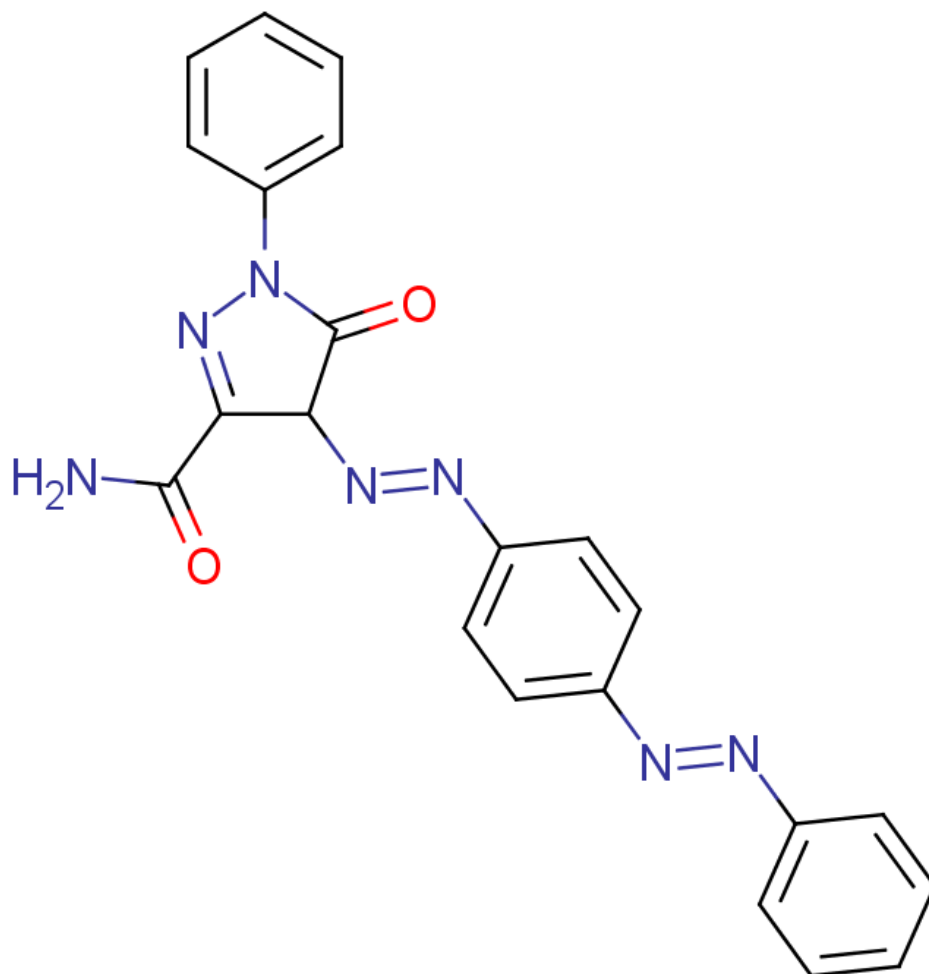
Molecular Formula	C ₄₁ H ₂₄ CrN ₈ O ₁₂ S ₂ .3Na
Molecular Weight	1005.78

Chemical Name in the Inventory and Synonyms	Ferrate(5-), bis[4-[[2,4-dihydroxy-5-[(2-methoxyphenyl)azo]-3-[[4-(phenylamino)-3-sulfophenyl]azo]phenyl]azo]-3-hydroxy-7-nitro-1-naphthalenesulfonato(4-)]-, pentahydrogen
CAS Number	72779-11-4
Structural Formula	



Molecular Formula	C70H44FeN16O24S4.5H
Molecular Weight	

Chemical Name in the Inventory and Synonyms	1H-Pyrazole-3-carboxamide, 4,5-dihydro-5-oxo-1-phenyl-4-[[4-(phenylazo)phenyl]azo]- 2-pyrazoline-3-carboxamide, oxo-1-phenyl-4-[[p-(phenylazo)phenyl
CAS Number	84753-01-5
Structural Formula	

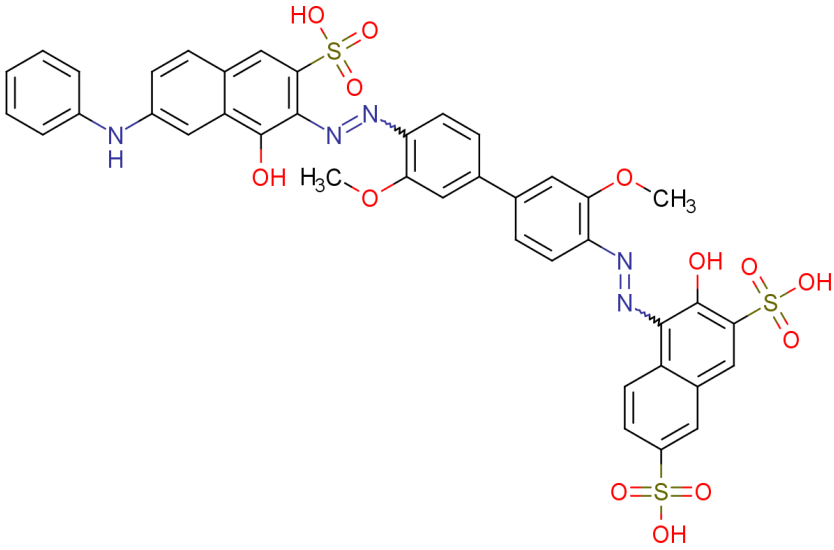


Molecular Formula	C22H17N7O2
Molecular Weight	411.42

Chemical Name in the Inventory and Synonyms	<p>Chromate(2-), [4-[4,5-dihydro-4-[(2-hydroxy-5-nitrophenyl)azo]-3-methyl-5-oxo-1H-pyrazol-1-yl]benzenesulfonato(3-)][1-[[2-hydroxy-5-[(2-methoxyphenyl)azo]phenyl]azo]phenyl]azo]-2-naphthalenolato(2-)-, lithium sodium</p> <p>chromate(2-), (4-(4,5-dihydro-4-((2-hydroxy-5-nitrophenyl)azo)-3-methyl-5-oxo-1H-pyrazol-1-yl)benzenesulfonato(3-))(1-((2-hydroxy-5-((2-methoxyphenyl)azo)phenyl)azo)-2-naphthalenolato(2-)-, lithiumsodium</p> <p>C.I. Acid Brown 415</p>
CAS Number	85828-74-6
Structural Formula	

No Structural Diagram Available

Molecular Formula	Unspecified
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	2,7-Naphthalenedisulfonic acid, 3-hydroxy-4-[[4'-[[1-hydroxy-7-(phenylamino)-3-sulfo-2-naphthalenyl]azo]-3,3'-dimethoxy[1,1'-biphenyl]-4-yl]azo]-, trisodium Direct Blue 201
CAS Number	86437-47-0
Structural Formula	<p>Na⁺ Na⁺</p>  <p>Na⁺</p>
Molecular Formula	C ₄₀ H ₃₁ N ₅ O ₁₃ S ₃ .3Na
Molecular Weight	954.86

Chemical Name in the Inventory and Synonyms	1,3-Benzenediamine, 4-methyl-, coupled with diazotized aniline, diazotized o(or p)-toluidine and m-phenylenediamine, acetates hydrochlorides
CAS Number	90193-72-9
Structural Formula	No Structural Diagram Available
Molecular Formula	Unspecified
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	1,7-Naphthalenedisulfonic acid, 5-hydroxy-4-[[6-hydroxy-2-naphthalenyl)sulfonyl]amino]-, coupled with diazotized aniline, o- and p-toluidine, ammonium sodium salts
CAS Number	90431-96-2
Structural Formula	No Structural Diagram Available

Molecular Formula	C20H15NO10S3.C7H9N.C7H9N.C6H7N.H3N.Na
Molecular Weight	

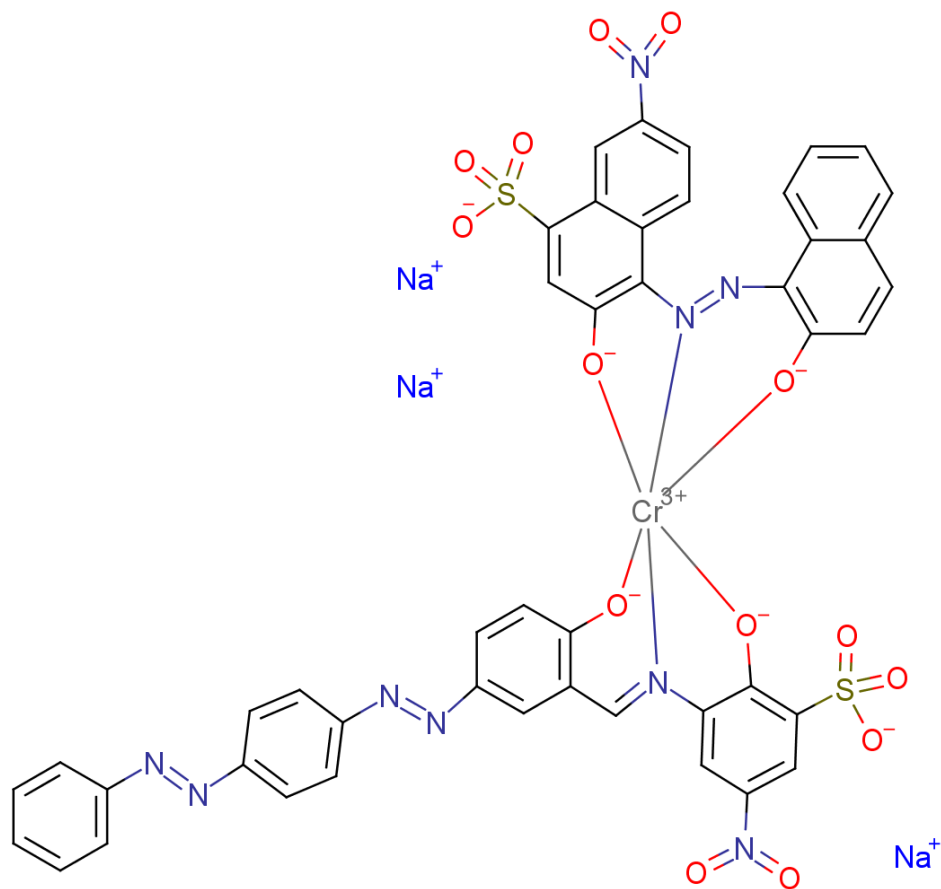
Chemical Name in the Inventory and Synonyms	2,7-Naphthalenedisulfonic acid, 4-amino-5-hydroxy-, diazotized, coupled with diazotized 2-[(4-aminophenyl)amino]-5-nitrobenzenesulfonic acid, diazotized 4-nitrobenzenamine, 4-methyl-1,3-benzenediamine and resorcinol, potassium sodium salts
CAS Number	90432-01-2
Structural Formula	No Structural Diagram Available
Molecular Formula	C12H11N3O5S.C10H9NO7S2.C7H10N2.C6H6N2O2.C6H6O2.K.Na
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	Amines, C10-14-branched and linear alkyl-1-[[2-methyl-4-[(2-methylphenyl)azo]phenyl]azo]-2-naphthalenyl
CAS Number	91745-48-1
Structural Formula	

No Structural Diagram Available

Molecular Formula	Unspecified
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	Chromate(3-), [3-hydroxy-4-[(2-hydroxy-1-naphthalenyl)azo]-7-nitro-1-naphthalenesulfonato(3-)] [2-hydroxy-3-[[[2-hydroxy-5-[[4-(phenylazo)phenyl]azo]phenyl]methylene]amino]-5-nitrobenzenesulfonato(3-)]-, trisodium
CAS Number	93783-72-3
Structural Formula	



Molecular Formula	C ₄₅ H ₂₅ CrN ₉ O ₁₄ S ₂ .3Na
Molecular Weight	1100.84

Chemical Name in the Inventory and Synonyms	1,3-Benzenediamine, 4-methyl-, coupled with diazotized 4-methyl-1,3-benzenediamine, diazotized m-phenylenediamine, diazotized m-toluidine, m-phenylenediamine and m-toluidine, propoxylated, acetates oxirane, methyl-, polymer with 1,3-benzenediamine, 4-methyl-, coupled with diazotized 4-methyl-1,3-phenylenediamine, diazotized m-phenylenediamine, diazotized m-toluidine, m-phenylenediamine and m-toluidine, acetates
CAS Number	104376-63-8
Structural Formula	

	No Structural Diagram Available
Molecular Formula	Unspecified
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	1,3-Benzenediamine, 4-methoxy, coupled with diazotized 4-methoxy-1,3-benzenediamine, diazotized 2(or 4)-methyl-1,3-benzenediamine and 2(or 4)-methyl-1,3-benzenediamine
CAS Number	108594-54-3
Structural Formula	No Structural Diagram Available
Molecular Formula	C7H10N2O.C7H10N2
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	1,3-Benzenediamine, 4-methoxy-, coupled with diazotized 4-methoxy-1,3-benzenediamine, diazotized 2(or 4)-methyl-1,3-benzenediamine and 2(or 4)-methyl-1,3-benzenediamine, hydrochlorides
---------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

CAS Number	108594-55-4
Structural Formula	No Structural Diagram Available
Molecular Formula	C7H10N2O.C7H10N2.ClH
Molecular Weight	Unspecified

Chemical Name in the Inventory and Synonyms	Benzenesulfonic acid, 3,3'-[[3,3'-dichloro(1,1'-biphenyl)-4,4'-diyl]bis[azo(4,5-dihydro-3-methyl-5-oxo-1H-pyrazole-4,1-diyl)]]bis-, calcium salt (1:1)
CAS Number	111636-31-8
Structural Formula	

Molecular Formula	C ₃₂ H ₂₄ Cl ₂ N ₈ O ₈ S ₂ .Ca
Molecular Weight	821.69

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