A Selection of carcinogens with GHS/CLP classification, Hazard Statements, Workplace Exposure Limits and, where these have been assigned, a ranking of potency

The information in this table is linked to *Topic 12, Assessing Carcinogenic Hazards* in *Topics in Safety Revised* and should used in conjunction with it. This is the APPENDIX referred to in that Chapter

Notes on the abbreviations used in the table below

1) CAS – where available, the CAS number has been given to allow searching by this route as many of these compounds have more than one name.

Identification of organic compounds can be very difficult by name alone as there are often dozens of different names. The CAS number, therefore is vital in ensuring you are looking up the right compound.

2) Name – The prefix is placed in a different cell in the table to allow for ordering in alphabetical order by name.

3) **B** = Banned. This only lists national bans. Education Authorities or boards of governors may in their safety policies place a ban on other chemicals. Those banned in law are picked out in red.

4) Classification[1] (Cat)

1A - known human carcinogen

1B - well recognised animal carcinogen and probable human carcinogen

2 - animal carcinogen and possible human carcinogen. Some in this Category will be of low potency but that cannot be guaranteed.

NC – means not classified by ECHA as carcinogenic

Blank – not listed

The Hazard statements for each are also listed. An 'i' afterwards indicates the substance is carcinogenic by inhalation only. Eg H350i).

5) Pot

[1] The designations of Category are taken from the database of the European Chemicals Agency (ECHA) http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database

The **asterisk ranking notation** is based on a combination of that used by Searle in the Universities Safety Association's Handbook, *Chemical Carcinogens* and the extended version produced by Hong Kong University[2]. These gradings were stated to be to some extent subjective, but with allowance made for factors such as volatility or persistence in the body as well as the potency. Such a ranking cannot allow for the scale and frequency of use.

*** High carcinogenic hazard

** Significant carcinogenic hazard

*Carcinogenicity established, but little risk with reasonable care

The absence of an asterisk denotes nothing about the potency of the substance on that line. It may be weak or it may simply be that there is insufficient evidence as yet to assign it to a group.

H Known to have caused cancer in humans

H? Very likely to have caused cancer in humans

6) TD_{50} These values obtained from the Carcinogenic Potency Project[3] give the concentration at which 50% of test animals develop tumours. (Analogous to LD_{50} for toxicity)

The letters after the numbers signify

R – rat

M – mouse

Rh – rhesus monkey

'-' signifies that the substance is listed but either has not been tested or the test has produced no positive results.

A blank cell signifies the substance is not listed

7) Sk The **Sk** notation means a substance is well absorbed through the skin and has been so designated by (i) the HSE and published in EH40[4] or (ii) in the German MAK and BAT values[5].

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[2] http://www.safety.hku.hk/homepage/pdf/CarInf.pdf
[3] http://toxnet.nlm.nih.gov/cpdb/index.html

8) Exposure limits

The WEL are the values referenced for 8 hours, taken from EH40/2011 in ppm unless otherwise stated.
Where values are not given in EH40 if possible they have been taken from other sources, eg, MAK and BAT Values, they are italicised as before.
In the cases of dusts or aerosols two limits are sometimes given. That for the finer dust particles which can reach the gas exchange region of the lungs is coded “R” (respirable) and the limit for the total dust entering the nose and mouth is coded “I” (inhalable).

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[4] http://www.hse.gov.uk/pubns/priced/eh40.pdf

[5] The MAK and BAT Values are broadly similar to UK classification. Where there is no WEL or SK classification in EH40, there is sometimes one here. Where the value quoted is a MAK/BAT one, italics are used.

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
304-28-9	2-	acetamidofluorene					***		
107-02-8		acrolein (prop-2-enal, propenal) can be formed by dehydration of some polyols .eg propane-123-triol		NC		-			
79-06-1		acrylamide (propenamide)		1B	H350	3.75r	*	Sk	0.3 mg m-3
107-13-1		acrylonitrile		1B	H350	16.9r	H?*	Sk	2 ppm
1162-65-8		aflatoxin B from Aspergillus spp.		1B	H350	0.0032r	H?**		
		alkyl methanesulphonates		2	H351		**		
107-18-6		allyl alcohol (2-propen-1-ol)		NC		-		Sk	2ppm
119-34-6	4-	amino-2-nitrophenol (2-nitro-4-aminophenol)		NC		309r			
132-32-1	3-	amino-9-ethylcarbazole		1B	H350		**		
60-09-3	4-	aminoazobenzene		1B	H350			*Sk*	
97-56-3	4-	aminoazotoluene (o- aminoazotoluene , 4-amino 2,3'-dimethylazobenzene, Solvent Yellow 3, 4-o-tolylazo-o-toluidine, fast garnet GBC base, 3-(4-Methylphenyl)-1-triazen)		1B	H350	4.04r	*	*Sk*	
153-78-6	2-	aminofluorene (fluoren-2-ylamine		NC			***		
61-82-5		amitrole, 3-amino-1,2,4-triazole (in some photographic developers)		NC					*0.21 mg m-3*
1309-64-4		antimony(III) oxide		2	H351				0.5 mg m-3
24938-64-5	p-	aramid fibre as fibrous dust eg kevlar							0.5 fibres/ml
		arsenic compounds		1A	H350	-	H*		0.1 mg m-3

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
		asbestiform and other certain minerals		1A	H350		H***		0.2 fibres/ cm3 air referenced over 4 hours
2465-27-2		auramine		2	H351	11r	H?		
334-88-3		azoalkanes (R-N-N-R') eg diazomethane and precursors		1B	H350		**		
		azoxyalkanes		2	H351		**		
12041-95-1		benzacridines and similar heterocyclic compounds		NC			***		
56-55-3	1,2-	benzanthracene		1B	H350		***		5 ppm
71-43-2		benzene		1A	H350	169r	H**	Sk	1
95-54-5		benzene 1,2-diamine (o-phenylenediamine)		2	H351	248r			
108-45-2		benzene 1,3-diamine (m-phenylenediamine)		NC		-			
106-50-3		benzene 1,4- diamine (p-phenylenediamine)		NC		-		Sk	0.1mg m-3
123-31-9		Benzene-1,4-diol (hydroquinone, quinol)		2	H351	82.8r			
92-87-5		benzidine and salts	B	1A	H350		H***		
50-32-8.		benzopyrene		1B	H350	0.596	***		
		beryllium and compounds(except Al Be silicates)		1B	H350i	- (SO_4)	H*		0.002 mg m3
92-67-1		biphenyl-4-ylamine (4-aminobiphenyl)	B	1A	H350	0.98r	H***		
505-60-2		bis(2-chloroethyl) sulfide (mustard gas)		NC			H***		
1675-54-3		bisphenol A diglycidyl ether (bis-[4-(2,3-epoxipropoxi)phenyl]propane, BADGE, DGEBA)		NC				*Sk*	
		bracken spores		1B	H350		*		
74-96-4		bromoethane (ethyl bromide)		2	H351	149r	*		

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
593-60-2		bromoethene (vinyl bromide)		1B	H350	18.5r	*		
74-83-9		bromomethane (methyl bromide)		NC		-	-	Sk	5 ppm
106-99-0	1,3-	butadiene		1A	H350	261r	*		
1633-83-6	1,(4)-	butane sultone		2	H351			Sk	
		cadmium and compounds		1B	H350	0.0136r (Cl)	H?		0.025 mg m3
23209-59-8		calcium sodium metaphosphate fibres							
142844-00-6		ceramic fibres & mineral wools except Superwool 607		1B	H350i				
88-73-3	1-	chloro-2-nitrobenzene		1B	H350	157m			
121-73-3	1-	chloro-3-nitrobenzene		2	H351				
100-00-5	1-	chloro-4-nitrobenzene		2	H351	473m			
107-20-0		chloroethanal (chloroacetaldehyde)		2	H351				1ppm (15 min)
75-00-3		chloroethane (ethyl chloride)		2	H351	1810m		Sk	1000 ppm
75-01-4		chloroethene (vinyl chloride)		1A	H350		H*		
74-87-3		chloromethane (methyl chloride)		2	H351		*		50 ppm
100-44-7	α-	chloromethylbenzene (α-chlorotoluene)		1B	H350	61.5m			0.5
106-47-8	4-	chlorophenylamine (p-chloroaniline)		1B	H350	-		Sk	
126-99-8		chloroprene		1B	H350	12.6r	*	Sk	
107-05-1	3-	chloropropene (allyl chloride)		2	H351	-		Sk	
7789-00-6		chromate(VI), potassium		1B	H350i		H*		0.05 mg m-3
03/11/7775		chromate(VI), sodium		1B	H350		H*		0.05 mg m-3
13530-65-9		chromate(VI), zinc		1A	H350		H*		0.05 mg m-3

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
58591-12-1		chromium(III) chromate(VI)		1B	H350		H*		0.05 mg m-3
1333-82-0		chromium(VI) oxide		1A	H350i		H*		0.05 mg m-3
		chromium(VI), others		1B	H350i		H*		0.05 mg m-3
14977-61-8		chromyl chloride [chromium(III)oxychloride] chromium dichloride dioxide		1B	H350i		H*		0.05 mg m-3
218-01-9		chrysene		1B	H350				
		cobalt metal, oxide and sulfide		NC					0.1 mg m-3
513-79-1		cobalt(II) carbonate		1B	H350i				0.1 mg m-3
71-48-7		cobalt(II) ethanoate		1B	H350i				0.1 mg m-3
10141-05-6		cobalt(II) nitrate		1B	H350i				0.1 mg m-3
7646-79-9		cobalt(II) chloride		1B	H350i				0.1 mg m-3
10124-43-3		cobalt(II) sulphate		1B	H350i	0.137r			0.1 mg m-3
14901-08-7		cycasin (methylazoxymethanol glucoside; from Cycads)					*		
108-94-1		cyclohexanone		NC		-		Sk	10ppm
50-18-0		cyclophosphamide		1B	H350		H**		
95-80-7	2,4-	diamino methylbenzene(2,4-toluenediamine)		1B	H350				
495-54-5	2,4-	diaminoazobenzenes (chrysoidines)		NC			*		
101-77-9	4,4'-	diaminodiphenylmethane(4,4'-methylenedianiline)		1B	H350	20r	*	Sk	0.01 ppm
	4'-	diarylazobiphenyl dyes in general excepting those specified elsewhere			H350				
53-70-3		dibenz(a,h)anthracene		1B	H350	5.88m	***		

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
96-12-8	2,3-	dibromo-1-chloropropane (has caused sterility in males)		1B	H350	0.259r	**		
106-93-4.	1,2-	dibromoethane		1B	H350	1.52r	**	Sk	0.5 ppm
96-13-9	2,3-	dibromopropan-1-ol		1B	H350		**		
91-94-1	3,3'-	dichlorobenzidine & salts		1B	H350	28.1r	**		
111-44-4	2,2-	dichlorodiethyl ether – bis(2-chloroethyl) ether		2	H351	11.7m			*10 ppm*
542-88-1	2,2-	dichlorodimethyl ether (or bis-CME)		1A	H350	0.00357r	H***		
107-06-2	1,2-	dichloroethane		1B	H350	14.6r	-	Sk	5 ppm
75-09-2		dichloromethane (methylene dichloride)		2	H351	724r	-		100 ppm
98-87-3	α, α-	dichloromethylbenzene (α,α-dichlorotoluene)		2	H351				
96-23-1	1,3-	dichloropropan-2-ol		1B	H350				
7789-09-5		dichromate(VI), ammonium		1B	H350		H*		0.05 mg m-3
7778-50-9		dichromate(VI), potassium		1B	H350		H*		0.05 mg m-3
10588-01-9		dichromate(VI), sodium		1B	H350	4.64r	H*		0.05 mg m-3
64-67-5		diethyl sulfate		1B	H350		**	Sk	0.05 ppm
91-22-5	1,4-	dihydroxybenzene (quinol, hydroquinone)		1B	H350		*	*Sk*	
119-90-4	3,3'-	dimethoxybenzidine (o-dianisidine)		1B	H350		*		
		dimethyl sulfate		1B	H350		**	Sk	0.05 ppm
121-69-7.	N,N-	dimethylaniline (but not N,N-diethyl-)		1B	H350	125r	-	Sk	5 ppm

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
57-97-6	7,12-	dimethylbenz(a)anthracene		1B	H350	0.084m	***		
95-53-4	3,3'-	dimethylbenzidines (o-tolidine) & salts		1B	H350	43.6r	**		
79-44-7		dimethylcarbam(o)yl chloride		1B	H351	5.37m	**		
57-14-7	1,1-	dimethylhydrazine (N,N-)		1B	H350	3.16m	***	*Sk*	
540-73-8	1,2-	dimethylhydrazine (N,N'-)		1B	H350	0.114m		*Sk*	
		dinitro derivatives of polyaromatics							
		dinitrobenzenes all isomers		NC				Sk	0.15
1528-74-1	4,4'-	dinitrobiphenyl		NC			***		
25321-14-6	2,4-	dinitromethylbenzene (2,4-dinitrotoluene)		1B	H350	-			
606-20-2	2,6-	dinitromethylbenzene (2,6-dinitrotoluene)		1B	H350	0.292r			
25321-14-6		dinitromethylbenzenes (dinitrotoluenes) all isomers		1B	H350				
27478-34-8		dinitronaphthalenes all isomers		NC					
123-91-1	1,4-	dioxane		2	H351	267r	-	Sk	20 ppm
122-39-4		diphenylamine (if contaminated with 4-aminobiphenyl))		NC			*		10 ppm
122-66-7	1,2-	diphenylhydrazine (hydrazobenzene)		1B	H350	5.59r			
1937-37-7		Direct Black 38		1B	H350				
2602-46-2		Direct Blue 6		1B	H350				
16071-86-6		Direct Brown 95		1B	H350				
573-58-0		Direct Red 28		1B	H350				
106-89-8		epichlorohydrin (1-chloro-2, 3-epoxypropane)		1B	H350	2.96r		Sk	

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
75-56-9		epoxypropane (propylene oxide)		1B	H350	74.4r	*	*Sk*	*2 ppm*
66733-21-9		erionite		1A	H350				
75-07-0		ethanal (acetaldehyde)		2	H351	153r			20 ppm
60-35-5		ethanamide (acetamide)		2	H351	180r			
64-17-5		ethanol		NC					1000ppm
74-85-1		ethene (ethylene)		NC		9110r			
75-21-8		ethylene oxide (oxirane)		1B	H350	21.3r	H?*		5 ppm
151-56-4		ethyleneimine (aziridine)		1B	H350				
		glass fibres		NC					
126-07-8		griseofulvin from a Penicillium sp		2	H351	13.8m	*		
438-67-5		hormones eg oestrogens		1B	H350				
302-01-2		hydrazine		1B	H350	0.613r		Sk	0.02 ppm
	1,2-dialkyl	hydrazines		1B	H350		**	*Sk*	
74-88-4		iodomethane (methyl iodide)		2	H351		*	Sk	2 ppm
		ionising radiations							
		lead compounds, other		NC					
1335-32-6		lead(II) ethanoate, basic (ethanoate-hydroxide double sat)		2	H351	46.6r			
		many glycidyl ethers glycol ethers		2	H351				

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
		metal working fluids which contain nitrite or compounds which form nitrite and substances which react with nitrite to form nitrosamines					**		
50-00-0		methanal (formaldehyde)		1B	H350	1.35r	-	*Sk*	2 ppm
90-04-0	2-	methoxyaniline (o-anisidine) (not 3 or 4-isomers)		1B	H350	29.7r			
421-20-5		methyl fluorosulfonate (so toxic that carcinogenicity is a minor issue)					***		
108-44-1	3-	methylaniline (m-toluidine)				1440m			
95-53-4	2-	methylaniline (o-toluidine) (Not 3 isomer)		1B	H350	43.6r		Sk	0.2 ppm
106-49-0	4-	methylaniline (p-toluidine)		2	H351	83.5m		Sk	
590-96-5		methylazoxymethanol					*		
592-62-1		methylazoxymethanol acetate		1B	H350	62.7Rh	*		
56-49-5	3-	methylcholanthrene		2	H351	0.491r	***		
101-14-4	4,4'-	methylenebis (2-chloroaniline)		1B	H350		*		
95-80-7	4-	methyl-m-phenylenediamine (not the 2 isomer) (2,4-diaminotoluene, 2,4-toluenediamine)		1B	H350	4.42r			
91-20-3		naphthalene		2	H351	22.1r			
134-32-7	1-	naphthylamine (though often contaminated with the 2-isomer)		NC		67.3m	H		
91-59-8	2-	naphthylamine & salts	B	1A	H350	61.6r	H***	Sk	
2243-62-1	1,5-	naphthylene-diamine (1,5-diaminonaphthalene)		2	H351	69.6r		*Sk*	
		nickel compounds (other)		1A	H350i	-	H*		0.1 mg m-3
		nickel metal and carbonyl		2	H351		H*		0.1 mg m-3
		nitro derivatives of polyaromatic hydrocarbons					*		

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
119-34-6	2-	nitro-4-aminophenol (see 4-amino-2-nitrophenol)		NC		309r			
98-95-3		nitrobenzene		2	H351	25.5r		Sk	0.2 ppm
92-93-3	4-	nitrobiphenyl	B	1B	H350		***		
607-57-8	2-	nitrofluorene		2	H351	0.285r	**		
	2-	nitrofurans (substituted) many of them					**		
		nitrogen mustard derivatives (various)					H***	*Sk*	
91-23-6	2-	nitromethoxybenzene (2-nitroanisole)		1B	H350	15.6r			
86-57-7	1-	nitronaphthalene		2	H351	-	*		
581-89-5	2-	nitronaphthalene		1B	H350		**		
79-46-9	2-	nitropropane		1B	H350	-			5 ppm
56-57-5	4-	nitroquinoline-1-oxide (and related compounds)		1B	H350		**		
	N-	nitrosamines (most including those of secondary amines RR'N.NO and ureas)		1B	H350		**		
1116-54-7	N-	nitrosodiethanolamine		1B	H350	3.17r	*		
55-18-5	N-	nitrosodiethylamine (diethylnitrosoamine)		1B	H350	0.0265r	***		
62-75-9	N-	nitrosodimethylamine (dimethylnitrosamine)		1B	H350	0.0959r	***		
621-64-7		nitrosodipropylamine		1B	H350	0.186r	**		
	N-alkyl-N'-nitro-N-	nitrosoguanidines (e.g. MNNG)		1B	H350		***		
59-89-2	N-	nitrosomorpholine		2	H351	0.109r	**		
5632-47-3	N-	nitrosopiperazine		2	H351	8.78r	**		
100-75-4	N-	nitrosopiperidine		2	H351	1.43r	**		
	N-alkyl-N-	nitrosoureas		1B	H350		*		
	N-alkyl-N-	nitrosourethanes (powerful local carcinogens)		2	H351		***		

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
		non-ionising radiations eg UV							
112-80-1		oleic acid		NC		-			
10028-15-6		ozone		NC		1.88m			0.2ppm 15'
149-29-1		patulin (carcinogenic on injection but not orally)		2	H351	-	*		
79-21-0		peracetic acid (peroxyacetic, PAA, ethaneperoxic acid)		NC					
108-95-2		phenol		NC		-		Sk	2ppm
7227-91-0	1-	phenyl-3,3-dimethyltriazene and analogues				2.31r	*		
100-63-0		phenylhydrazine		1B	H350	71.3m		*Sk*	
7758-01-2		potassium bromate(V)		1B	H350	9.82r			
1120-71-4	1,3-	propane sultone		1B	H350		*		
1120-71-4	1,3-	propanesultone		1B	H350	3.84r			
107-02-8		Propenal (prop-2-enal, acrolein) can be formed by dehydration of some polyols .eg propane-123-triol		NC		-			
57-57-8	β-	propiolactone		1B	H350		*		
57-57-8	1,3-	propiolactone		1B	H350	1.46r	**		
91-22-5		Quinoline (hydroquinone, 1,4-dihydroxybenzene)		1B	H350		*		
94-59-7		safrole (4-allyl-1,2-(methylenedioxy)benzene, 5-allyl-1,3-benzodioxole, 3-allyl-1,2-(methylenedioxy)benzene)		1B	H350	441r			

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
		side chain chloro methylbenzenes					**		
409-21-2		silicon carbide(as fibrous dust)		1B	H350i				10 mg m-3
7789-38-0		sodium bromate(V)		1B	H350				
10048-13-2		sterigmatocystin (from Aspergillus)		2	H351	0.152r	*		
18883-66-4		streptozotocin (methylnitrosourea glucoside; from a Streptomyces)		1B	H350	0.963r	*		
96-09-3		styrene oxide (epoxyethylbenzene)		1B	H350	55.4r	**		
7664-93-9		sulfuric acid		NC					0.05 mg m-3
101794-75-6		tarry messes from pyrolysis of organic compounds and substances		1B	H350		H*		
		tars cutting oils used engine oils		1B	H350		H*		
584-84-9		TDI (toluene diisocyanate)		2	H351	33.7r			
127-18-4		tetrachloroethylene (tetrachloroethene)		2	H351	145r	-	Sk	50 ppm
56-23-5		tetrachloromethane (carbon tetrachloride)		2	H351	27.8	H?*		*0.5 ppm*
62-56-6		thiocarbamide (thiourea)		2	H351	98.5r		*Sk*	
62-55-5		thioethanamide (thioacetamide)		1B	H350	11.5r			
79-01-6		trichloroethene (trichloroethylene)		1B	H350	668	-	Sk	100 ppm
67-66-3		trichloromethane (chloroform)		2	H351	262r	-	Sk	2 ppm
98-07-7	α,α α-	trichloromethylbenzene (α,α,α-trichlorotoluene, benzotrichloride)		1B	H350	0.396m			
545-55-1		triethylene phosphoramide (TEPA)		NC			*		

CAS	Prefix	Name	B	Cat	H No	TD50	Pot	Sk	WEL
52-24-4		triethylene thiophosphoramide (thio TEPA)					*		
512-56-1		trimethyl phosphate		1B	H350	335m		Sk	
126-72-7		tris(2,3-dibromopropyl) phosphate (former clothing flameproofer)		1B	H350	3.83r	**		
		unrefined oils naphthas crude oils cracked oils in general		1B	H350		H*		
51-79-6		urethane (ethyl carbamate)		1B	H350	41.3r	*		
108-05-4		vinyl ethanoate (vinyl acetate)		2	H351	341r			5 ppm
		wood dusts beech oak					*		5 mg m-3
		wood dusts other (softwoods)					**		5 mg m-3