

REFERENCE MATERIALS

A) BOOKS

- A.1 TANK CAR INSPECTION: RHYTHM INDIVIDUALIZED TRAINING
BOOKS 1 AND 2

E.I. DUPONT DE NEMOURS & CO., WILMINGTON, DELAWARE, 19898.

- A.2 EMERGENCY RESPONSE GUIDE FOR DANGEROUS GOODS,
COPP CLARK PITMAN
517 WELLINGTON ST. WEST,
TORONTO, ONTARIO, M5V 161

- A.3 FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS,
FIFTH EDITION, NATIONAL FIRE PROTECTION ASSOCIATION
470 ATLANTIC AVE.,
BOSTON, MASS., 02210

- A.4 GATX HANDBOOK
GENERAL AMERICAN TRANSPORTATION CORP.
120 SOUTH RIVERSIDE PLAZA
CHICAGO ILLINOIS
60606

- B) CHLORINE CELL PUTTY: (ROWE CELL PUTTY)
ROWE CELL
HOUSTON, TEXAS
(713)-233-3514

C) FIELD ANALYSIS EQUIPMENT

C.1 FLAMMABLE LIMITS DETECTOR (GAS TECH #3)
ANALYGAS, 215 NANTUCKET BLVD.,
SCARBOROUGH, ONTARIO

- FLAMMABLE GAS & O₂ EFFICIENCY

C.2 PHOTOIONIZATION DETECTOR (HNU)
TECHNICAL MARKETING ASSOCIATES LTD.
6620 KITIMAT ROAD, UNIT #6,
MISSISSAUGA, ONTARIO L5N 2B8

C.3 CENTURY ORGANIC VAPOUR ANALYZER
ASW CONTROLS AND INSTRUMENTS
3877 CHESSWOOD DRIVE
DOWNSVIEW, ONTARIO M3J 2R8

C.4 DRAGER GAS DETECTION TUBES
SAFETY SUPPLY COMPANY
214 KING ST. EAST,
TORONTO, ONTARIO M5A 15B

D) CAPPING KITS

D.1 MIDLAND MANUFACTURING CORP.
7733 GROS POINT ROAD
P.O. BOX 226
SKOKIE, ILL. 60077

- FOR 1",2" AND SOME 3" FITTINGS

D.2 INDIAN SPRING MANUFACTURING INC.
P.O. BOX 112
BALDWINVILLE, N.Y. 13027

- CHLORINE INSTITUTE SPECIFICATION

E) FOAM KITS

E.1 SEMCO
MISSISSAUGA, ONTARIO

F) LEAD WOOL

F.1 WESTBURNE HOFFMAN
SARNIA, ONTARIO
(519) 336-0014

G) PERSONAL EMERGENCY RESPONSE KIT

2	NOMEX COVERALLS
2	REGULAR COVERALL
1	BIT RESPIRATOR
2	COMFO RESPIRATOR
1	BOX CARTRIDGES (COMFO)
6	PAIR OF SOCKS
1	PAIR OF RUBBER GLOVES
1	DOZ. LEATHER GLOVES
1	DOZ. LEATHER FACED GLOVES
3	UNDER PANTS
1	RUBBER BOOTS
3	SHIRTS
3	WORK PANTS
1	HARD HAT
1	EAR BAND
2	MONOGOGGLES
1	FLASHLIGHT
1	BINOCULARS
5	ACID SUIT GLOVES
1	BELT & LANYARD

TOXICOLOGY — The study of substances that may alter normal living organisms when introduced either accidentally or deliberately at levels beyond which that organism can function normally

TOXICITY THRESHOLD — Level of exposure at which no apparently adverse effect can be demonstrated

NO • OBSERVABLE • EFFECT LEVEL — Highest dose of exposure that causes no apparent ill effects

EMBRYOTOXICITY — Toxic effect of an agent on an embryo during pregnancy —early stage of pregnancy.

FETOTOXICITY — Toxic or degenerative effect on already formed fetal tissue and organs —later stage of pregnancy

PARTS PER MILLION — Equivalent to one penny in a stack of \$10,000 worth of pennies; or 1 brick in a stack 166,666 feet (or 31 6 miles) high

PART PER BILLION — One square foot of an area of 36 square miles.

PARTS PER TRILLION — Equivalent to one square inch in area of 250 square miles

1 mg per kilogram or per liter of water is 1 part per million.

1 microgram per kilogram is 1 part per billion

1 nanogram per kilogram is 1 part per trillion

1 microgram per gram is 1 part per million

1 nanogram per gram is 1 part per billion

1 picogram per gram is 1 part per trillion

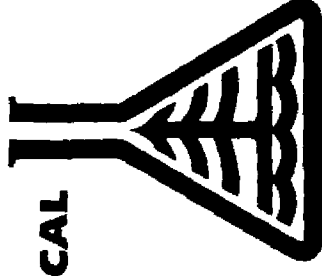


The Dow Chemical Company

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SOME TERMINOLOGY USED IN TOXICOLOGY AND BIOMEDICAL STUDIES



There are numerous terms being used today explaining the in-depth research being conducted in research laboratories such as those of The Dow Chemical Company. Here are some of the most common terms used in toxicology and biomedical studies.

ABSORPTION — How a material is taken up by the body, whether by inhalation, ingestion, through the skin or some other route.

BEHAVIORAL — A term used to describe actions and reactions, stability and emotions, in research, this generally means performance testing, e.g., reaction time, standing stability, etc

MEDICAL BIOMONITORING — The use of blood, urine or other body constituents for measurement of chemical concentration to allow evaluation of exposure

BIOTRANSFORMATION — The study of what happens to chemicals in the body, including absorption, metabolism, distribution and excretion

CARCINOGEN — Any substance which causes cancer at any concentration in a test animal or in man at a frequency

greater than is seen spontaneously. Frequently, materials are found to be carcinogens when given to animals at high doses, while human response to the particular substances under conditions of use providing only small fractions of the doses used in animals is uncommon. E.g., saccharin.

DISTRIBUTION — How a material is distributed within the body, as in blood, fat and other tissues.

ELIMINATION — Of a chemical (or drug) from the body by whatever route, e.g., exhaled or excreted in urine or feces

EXTRAPOLATION — To predict from experiments in animals or experience in man, the response likely to occur in a larger population.

PHARMACOKINETICS — The mathematical description of absorption, distribu-

tion, metabolism and elimination of foreign compounds in an organism.

METABOLISM — Chemical alteration of a drug or chemical within the body.

MOLECULAR TOXICOLOGY — Quantitative and qualitative effects of chemicals on molecules found in living organisms

MUTAGEN — An agent which has potential to affect the genetic material which determines inherited characteristics.

PATHOLOGY — Study of structural or functional deviations from normal which characterize disease or insult.

TERATOGEN — A substance that may cause abnormality of an embryo or fetus during pregnancy at a frequency greater than the spontaneous rate

TOXICITY — The innate ability of a material to act as a poison

*Some more interesting
comparisons are*

PART PER TRILLION

- 1 square inch/250 square miles
- 1 bad apple/2,000,000 000 barrels
- 1 pinch of salt/10,000 tons of potato chips
- 1 bogey/3,500,000,000 tourneys
- 1 lob/1,200,000,000 tennis matches
- 1 hairsbreadth/1 trip around the world
- 1 postage stamp/an area the size of Dallas, Texas
- 1 flea/360,000,000 elephants



We hope this will be useful in helping you keep discussions of parts per billion and parts per trillion in their proper perspective.

By the way, if there are any typographical errors in this brochure the equivalent of one part per trillion would be one error among all the words of all the front page stories in all the issues of more than 2000 daily newspapers in the United States if their publication had started with the invention of moveable type for the printing press!



The Dow Chemical Company

Form No. 162-807-82

*Parts per
billion...*

*Parts per
trillion...*

the true, explicit
& unedited story
of

TRACE CONTAMINANTS

We often find reference to “parts per billion” or “parts per trillion” in our everyday reading or conversations about trace contaminants in chemicals. What is a part per billion? How big is a part per trillion? Are they a lot, a little bit, or simply “bigger than a breadbasket”?

Well, if you’re 32 years old, the equivalent of a part per billion would be 1 second out of your 32 years. A part per trillion is 1 second out of 320 centuries!

For you big spenders, the equivalent would be one penny out of

\$10 million, and a part per trillion would be one penny for every \$10 billion. Even with interest compounded daily that doesn’t add up to a great deal!

If you’re going on a 16,000 mile trip — roughly the distance for a round trip flight from Washington, D.C. to Bombay, India and back — the equivalent distance to one part per billion would be one inch out of that entire trip. A part per trillion is equivalent to a six’ inch leap on a journey to the sun!

Some interesting comparisons are . . .

PART PER BILLION

1 square foot/36 square miles

1 bad apple/2,000,000 barrels



1 pinch of salt/10 tons of potato chips



1 bogey/3,500,000 golf tournaments

1 lob/1,200,000 tennis matches

