	Mechanism	Uses	Adverse effects	Notes
Cell-Cycle-Nonspecific Drugs (CCNS)				
Polyfunctional Alkylating Agents • Cyclophosphamide. • Mechlorethamine. • Chlorambucil. • Melphalan. • Thiotepa. • Busulphan. • Nitrosureas	• Work by transferring alkyl groups to various cellular constituents, mainly to DNA, leading to cell death. • They also interact with sulfhydryl, amino, hydroxyl, carboxyl and phosphate groups of other cellular nucleophiles. • DNA interactions can occur on a single strand or on both strands through crosslinking, i.e. bifunctional with two reactive groups.		• Direct vesicant effects. • Nausea and vomiting.	**Resistance:** Can cause acquired resistance and cross resistance , but not with nitrosureas.
Nitrosureas • Carmustine (BCNU). • Lomustine (CCNU_. • Semustine(methyl-CCNU). •Streptozocin		Streptozocin; for insulin-secreting islet cell carcinoma, also to induce diabetes in experimental animals.		Highly lipid soluble. **Resistance:** Not cross-resistant with other alkylating agents.
Platinum analogs				
Cisplatin	• Kills cells in all stages. • Binds DNA and inhibits synthesis and function.	Solid tumors	Nephrotoxic, hydration is necessary	
Cell-Cycle-Specific Drugs (CCS)				
Antimetabolites	Utilize quantitative differences in metabolism of cancer cells from normal cells, that render them susceptible to a number of structural analogs.			The most vulnerable pathways are those of nucleotide and nucleic acid synthesis.
Methotrexate (MTX)	• Folic acid analog which binds to the active site of dihydrofolate reductase (DHFR), interfering with the synthesis of the reduced form that accepts one-carbon units. • This will interrupt the de novo synthesis of thymidylate, purine nucleotides and the amino acids serine and methionine. • This will interfere with the formation of DNA, RNA and key cellular proteins.			• Leukovorine Rescue: - The administration of the reduced folate leukovorine (5-formyltetrahydrofolate) to reverse the effects and toxicity of MTX. - This will compete with methotrexate for DHFR - Usually indicated in high dose methotrexate therapy to rescue normal cells.

					Resistance by: • Decreased drug transport. • Decreased formation of cytotoxic MTX polyglutamate. • Synthesis of increased levels of DHFR through gene amplification. • Altered DHFR with reduced affinity for MTX. • Decreased accumulation of drug through activation of MDRP170 glycoprotein transporter.
	Purine Antagonists 6-Thiopurines: • 6-Mercaptopurine (6-MP). • 6-Thioguanine 6-TG).	Inhibit several enzymes		6-MP metabolized by xanthine oxidase, so toxicity is enhanced by Allopurinol	
	Pyrimidine Antagonists: • 5-Fluorouracil		Most widely used agent in colorectal carcinoma, also stomach, breast, esophagus, liver, head and neck, and pancreas		
Plant Alkaloids					
	Vinblastine	• Inhibits tubulin polymerization, disrupting assembly of microtubules, which are important part of the cytoskeleton and the mitotic spindle. • This effect results in mitotic arrest and death of the cell.		• Neurotoxicity • Milder myelosuppression. • SIADH	• Periwinkle plant Vinca rosea.
	Vincristine	Similar actions but different clinical activities and toxicity.	Pediatric tumors		
Antitumor Antibiotics		Bind to DNA through intercalation between specific bases and block the synthesis of RNA, DNA or both, cause DNA strand scission and interference with cell replication.			Products of various strains of the soil microbe Streptomyces.
	Anthracyclines: • Daunorubicin. • Doxorubicin " Adriamycin" • Idarubicin. • Epirubicin	• Inhibit topoisomerase II. • Intercalate with DNA. • Bind to membranes to alter fluidity and ion transport.	Cancers of breast, endometrium, ovary, testicles, thyroid, stomach, bladder, liver, lung, soft tissue sarcomas, in childhood cancers and in hematologic malignancies.	• Generate semiquinone and oxygen free radicals leading to cardiotoxicity. • Myelosuppression. • Mucositis, sometimes is dose-limiting. • "Radiation Recall Reaction": a severe skin reaction that occurs when certain chemotherapy drugs are administered during or soon after radiation treatment.	• Important anticancer drugs. • Very widely used. **- Administration:** • IV. • Metabolized and excreted through the liver. • Given on every 3-week schedule, Or, as low-dose weekly, Or, 72-96 hour continuous infusion

Cardiotoxicity:

-Acute: first 2-3 days.

• Arrhythmias and ECG changes, pericarditis and myocarditis.

-Chronic: dose dependent.

• Cardiomyopathy and heart failure. • Results from increased production of free radicals. • Reduced by weekly or continuous treatment. • Iron chelation treatment may reduce it.

Hormonal Agents				
Estrogen Inhibitor • Tamoxifen (discussed)	Competitive partial agonist-inhibitor of estrogen and binds to estrogen receptor of estrogen-sensitive tumors.	• Extremely useful for both early and metastatic breast carcinoma. • Also as chemopreventive agent in women at high risk. • Endometrial cancer.		**- Administration:** • Oral and very safe.
Androgen Inhibitors • Flutamide. • Bicalutamide.	Are nonsteroidal antiandrogen agents.	• Used in combination with radiation therapy for early-stage prostate cancer and metastatic cancer.		**- Administration:** • Oral.
Gonadotrpin-releasing Hormone Agonists: • Leuprolide. • Goserelin.	Are synthetic peptide analogs.	Indicated for advanced prostate cancer.	hot flushes, impotence and gynecomastia	**- Administration:** • Given as depot preparations leading to transient release of FSH and LH followed by marked inhibition.
Aromatase Inhibitors: • Aminoglutethimide	• Nonsteroidal inhibitor of corticosteroid synthesis at the first step(cholesterol ---- pregnenolone). • Also inhibits extra-adrenal synthesis of estrone and estradiol. • Also; in body fat; inhibits aromatase enzyme that converts the adrenal androgen androstenedione to estrone.	• Primarily used in metastatic breast carcinoma with significant estrogen or progesterone receptor expression. • Also effective in advanced prostate cancer.		Normally given with hydrocortisone