Drug	Definition	Properties	Systemic Effects	Side Effects	Contraindications	Drug interactions
Halothane	Halogen substituted ethane Oxidised by hepatic cyt P-450	Volatile liquid easily vaporized stable nonflammable Most potent inhalational anesthetic (MAC of 0.75%) Very soluble in blood and adipose (slow onset and offset)	**Cardiovascular:** 🤍 • Direct myocardial depression • Coronary artery vasodilator • Blunt the reflex tachycardia to hypotension • Sensitizes the heart to the arrhythmogenic effects of epinephrine **Respiratory:** 🫁 • Rapid, shallow breathing • Resting PaCO2: ↑ • Alveolar ventilation: ↓ • potent bronchodilator **Cerebral and neuromuscular:**🧠 • CBF↑ • Blunt autoregulation of constant CBF • ICP: ↑ • Metabolic oxygen requirement: ↓ • Relaxes skeletal muscle • A triggering agent of malignant hyperthermia **Renal and Hepatic:** • ↓Renal BF thus ↓GFR, U/O • ↓Hepatic BF	• **Malignant Hyperthermia:** <u>Defined as: hypermetabolic state by inhibition of calcium reuptake in sarcoplasmic reticulum</u> LEADS TO: rapid rise in body temperature, muscle rigidity, tachycardia, rhabdomyolysis, acidosis, hyperkalemia, DIC, rise in CPK levels, myoglobinuria Trx by: hyperventilation, HCO3-, IV DANTROLENE, diuretics, cooling blankets • **Halothane Hepatitis:** metabolised by cyt P-450, fever, jaundice, hepatic necrosis, death	- Unexplained liver dysfunction following previous exposure - Elevation of ICP - Hypovolaemia - Severe cardiac disease - MALIGNANT HYPERTHERMIA	B-blockers CCBs Aminophylline: serios ventricular arrhythmia

Enuflurane	Halogenated methyl ethyl ether	Stable Nonflammable Liquid MAC 1.68% NOT USED ANYMORE DUE TO SEs	**Cardiovascular:** 🤍 • Potent inotropic and chronotropic depressant • decreases systemic vascular resistance so it lowers blood pressure and conduction dramatically • Sensitizes the heart to the arrhythmogenic effects of epinephrine • Blunts sympathetic baroreflex response **Respiratory:** 🫁 • increases dead space • widens A-a gradient • drive is greatly depressed • produces hypercarbia in spontaneously breathing patient • bronchodilator	• Renal toxicity: metabolism releases F- ion • Hepatotoxicity: less than that of halothane • Brain: epileptiform EEG patterns • MALIGNANT HYPERTHERMIA		
Isoflurane	Halogenated methyl ethyl ether, a chemical isomer of enflurane	Nonflammable pungent MAC of 1.20 %	**Cardiovascular:** 🤍 • Minimal cardiac depression • Produces most significant reduction in systemic vascular resistance) → BP: ↓ • Sensitizes myocardium to catecholamines -- less than halothane or enflurane	MALIGNANT HYPERTHERMIA		

			Respiratory: 🫁 • Respiratory depression • Blunt the normal ventilatory response to hypoxia and hypercapnia • Irritate upper airway reflex • good bronchodilator **Cerebral and neuromuscular:**🧠 • CBF↑ • ICP: ↑ • Metabolic oxygen requirement: ↓ • Relaxes skeletal muscle • A triggering agent of malignant hyperthermia **Renal and Hepatic:** • ↓Renal BF thus ↓GFR, U/O • ↓Hepatic BF			
Desflurane	Haloginated methyl ethyl ether, a chemical isomer of enflurane	High vapor pressure thus requires SPECIAL VAPORISER Low solubility → ultrashort duration of action MAC 6% (moderate potency)	**Cardiovascular:** 🤍 • Systemic vascular resistance: ↓So BP: ↓ • CO: unchanged or slightly depressed • Rapid increases in concentration lead to transient elevation in HR, BP, catecholamine levels **Respiratory:** 🫁 • Tidal volume: ↓, RR: ↑ • Alveolar ventilation: ↓ • Resting PaCO2: ↑ • Depress the ventilatory response to ↑PaCO2	• Degraded by desiccated CO2 absorbent into carbon monoxide • MALIGNANT HYPERTHERMIA	- Elevation of ICP - Hypovolaemia - MALIGNANT HYPERTHERMIA	

			• Pungency and airway irritation **Cerebral and neuromuscular:** 🧠 • CBF↑ • ICP: ↑ • Metabolic oxygen requirement: ↓ • A triggering agent of malignant hyperthermia **Renal:** • ↓U/O			
Sevoflurane		Non pungent Smooth and rapid inhalation inductions in pediatric and adult patients Rapid increase in alveolar anesthetic concentration MAC 2%	**Cardiovascular:** 🤍 • Mildly depress myocardial contractility • Systemic vascular resistance, arterial BP: ↓ • CO: not maintained well due to little rise in HR **Respiratory:** 🫁 • Rapid shallow breathing • Depress respiration • Reverse bronchospasm **Cerebral and neuromuscular:**🧠 ◦ CBF, ICP: slight ↑ ◦ Cerebral metabolic oxygen requirement: ↓ ◦ Adequate muscle relaxation for intubation of children **Renal and Hepatic:** Impaired renal tubule function Portal vein blood flow: ↓	Renal toxicity: Degraded by alkali (barium hydroxide lime, soda lime), producing nephrotoxic end products (compound A) MALIGNANT HYPERTHERMIA	- Elevation of ICP - Severe Hypovolaemia - MALIGNANT HYPERTHERMIA	

Nitrous Oxide		The only inorganic anesthetic gas in clinical use • Characterized by inert nature with minimal metabolism • Colorless, odorless, tasteless, and does not burn • Weak anaesthetic, good analgesic • Major difference is low potency with MAC value being 104% • Needs other agents for surgical anesthesia • Low blood solubility	**Cardiovascular:** 🤍 • Depress myocardial contractility • Arterial BP, CO, HR: unchanged or slightly ↑ due to stimulation of catecholamines • Constriction of pulmonary vascular smooth muscle → increase pulmonary vascular resistance • Peripheral vascular resistance: not altered **Respiratory:** 🫁 • Respiratory rate: ↑ • Tidal volume: ↓ • Minute ventilation, resting arterial CO2: minimal change • Hypoxic drive (ventilatory response to A. hypoxia): ↓ **Cerebral and neuromuscular:** 🧠 • CBF, cerebral blood volume, ICP: ↑ • Cerebral oxygen consumption (CMRO2): ↑ • DOES NOT provide significant muscle relaxation • DOES NOT trigger malignant hyperthermia **Renal and Hepatic:** • Increase renal vascular resistance • Renal blood flow, GFR, U/O:↓		• Pneumothorax • Air embolism • Acute intestinal obstruction • Intracranial air • Pulmonary air cysts • Intraocular air bubbles • Tympanic membrane grafting • Pulmonary HTN	

			• Hepatic blood flow: ↓ **GI:** 👄 • Postoperative nausea and vomiting (PONV) **Effects:** • Beginning of case: second gas effect • Inhibits vitamin B-12 metabolism • Diffusion into closed spaces thus the contraindications			
Xenon	Very close to the 'ideal agent '	Nonexplosive, non-pungent, odorless and chemically inert No metabolism Low toxicity High cost MAC 71% Has some analgesic effects	• Reduces anesthesia-emergent nausea and vomiting • Minimal hemodynamic effects • DOES NOT trigger malignant hyperthermia			

In addition, there are some OBSTETRIC EFFECTS that make neuroaxial (regional) anaesthesia preferred over GA, these inhalational agents:

• Produce dose dependent decrease in uterine contractility and blood flow
• May cause uterine atony and PPH
• Rapidly cross the placenta and reach the foetus

There's also higher risk of aspiration during surgery (as pregnant ladies have increased intraabdominal pressure)