Thorax pins · front

Superior: thoracic inlet 15

Superior thoracic aperture and supraplevural membrane
Superior thoracic aperture sup *Boundaries: T1 vertebra, first ribs and their cartilages, superior border of the manubrium; the suprapleural membrane (Sibson fascia) runs from the C7 transverse process to the internal border of the first rib and roofs the cervical pleura*

First rib: head, neck and tubercle
B First rib sup ★
V Subclavian vein ant M Suprapleural membrane sup deep B Head of the first rib med B Neck of the first rib post B Tubercle of the first rib post
First rib: shortest, broadest, most curved; single facet on its head (T1 only); its superior surface carries the scalene tubercle between the two subclavian grooves

Scalene tubercle and subclavian grooves
B Groove for the subclavian vein sup ★ N Accessory phrenic nerve ant B Scalene tubercle sup ★ B Groove for the subclavian artery sup ★ *Vein, tubercle, artery from anterior to posterior: subclavian vein anterior to the scalene tubercle (scalenus anterior), subclavian artery and inferior trunk posterior to it*

Venous angle and lymph trunks
Venous angle sup
Vertebral vein post *Right lymphatic duct drains the right upper quadrant (right head, neck, upper limb, thorax); the thoracic duct drains everything else into the left venous angle*
↳ Right lymphatic duct lat
↳ Right lymphatic duct: Bronchomediastinal trunk inf

Superior: superior mediastinum 43

Mediastinum and its divisions
Or Mediastinum Or Superior mediastinum sup A Aortic arch sup ★
V Superior vena cava lat ★ V Thoracic duct post ★ Or Inferior mediastinum inf *PVT Left BATTLE (superior mediastinum: phrenic nerves, vagus nerves, thoracic duct, left recurrent laryngeal nerve, brachiocephalic veins, aortic arch, thymus, trachea, lymph nodes, oesophagus); a plane through the sternal angle and T4/T5 separates superior from inferior mediastinum*
↳ Aortic isthmus post
↳ Right brachiocephalic vein lat ★
↳ Left brachiocephalic vein ant ★
↳ Left brachiocephalic: Inferior thyroid veins ant
Left superior intercostal vein lat ★

Thymus and thymic vessels
Or Thymus ant ★ A Thymic branches lat V Thymic veins post Or Right lobe of the thymus lat Or Left lobe of the thymus lat *Thymus comes from the 3rd pharyngeal pouch with the inferior parathyroids; large in children, it involutes after puberty into the thymic fat body*

Brachiocephalic veins and superior vena cava
Brachiocephalic lymph nodes ant deep *Left brachiocephalic vein is the long one, crossing anterior to the arch branches; SVC forms at the right 1st costal cartilage and enters the right atrium at the right 3rd costal cartilage*

Aortic arch and ligamentum arteriosum
Ligamentum arteriosum inf ★ *Arch begins and ends at the sternal angle (T4/T5); the left recurrent laryngeal nerve hooks around the arch, posterior to the ligamentum arteriosum (right one hooks the right subclavian)*

Trachea and cervical oesophagus
Or Trachea ant ★ A Brachiocephalic trunk ant ★ N Right vagus nerve post ★ V Paratracheal lymph nodes lat deep Or Cervical part of the trachea sup N Left recurrent laryngeal nerve med ★ Or Thoracic part of the trachea inf A Left common carotid artery med ★ Or Tracheal cartilages ant ★ Or Anular ligaments of the trachea ant Or Membranous wall of the trachea post Or Trachealis post Or Cervical part of the oesophagus post *C6 rule: at the cricoid (C6) the larynx becomes the trachea and the pharynx becomes the oesophagus*
↳ Right common carotid artery med Right subclavian artery lat Thyroid ima artery ant
↳ Right recurrent laryngeal nerve med

Tracheal bifurcation and paratracheal nodes
Or Bifurcation of the trachea inf V Inferior tracheobronchial lymph nodes inf deep N Cardiac plexus sup A Pulmonary trunk ant ★ Or Carina of the trachea inf ★ *Trachea bifurcates at the sternal angle (T4/T5); the carina is the cough-sensitive ridge between the main bronchi*
↳ Superficial cardiac plexus ant superf. Deep cardiac plexus post deep
↳ Bifurcation of the pulmonary trunk sup

Anterior: anterior thoracic wall (sternum, costal cartilages, internal thoracic vessels) 33

Manubrium and sternal angle
B Sternum M Transversus thoracis post deep A Internal thoracic artery ant deep ★ B Manubrium of the sternum sup ★ B Jugular notch sup ★ B Clavicular notch lat B Lateral border of the manubrium lat B Synchondrosis of the first rib lat B Sternal angle ant ★ B Manubriosternal joint inf *RATPLANT at the sternal angle (T4/T5): Rib 2 articulates, Aortic arch begins and ends, Trachea bifurcates, Pulmonary trunk bifurcates, Ligamentum arteriosum, Azygos enters the SVC, Nerve (left recurrent laryngeal) hooks the arch, Thoracic duct crosses right to left; count ribs from the 2nd costal cartilage here*
↳ Sternal branches med Perforating branches ant

Body of the sternum and sternocostal joints
Body of the sternum Costal notches lat Sternocostal joint lat Radiate sternocostal ligament ant Intra-articular sternocostal ligament lat Anterior surface of the sternum ant Sternal membrane ant *1st sternocostal joint is a synchondrosis (primary cartilaginous); 2nd to 7th are synovial*

Costal cartilages and costal arch
B Costal cartilage ant ★ B Costochondral joint lat B Interchondral joint inf B Costal arch inf A Musculophrenic artery lat V Musculophrenic vein lat B Infrasternal angle inf *Costal arch = cartilages 7 to 10; true ribs 1 to 7 reach the sternum by their own cartilage*

Xiphoid process
Xiphoid process inf ★
Xiphisternal joint sup Costoxiphoid ligament ant *Xiphisternal joint at T9*

Posterior surface of the sternum: internal thoracic vessels
B Posterior surface of the sternum post V Internal thoracic vein med deep ★ *Internal thoracic artery (first part of the subclavian) branches in order: pericardiacophrenic, mediastinal, thymic, sternal, perforating, anterior intercostal, then musculophrenic and superior epigastric*

Terminal branches of the internal thoracic vessels
A Superior epigastric artery med V Superior epigastric vein med *Internal thoracic artery runs about 1 cm lateral to the sternal border and divides in the 6th intercostal space: musculophrenic (lateral) and superior epigastric (medial, into the rectus sheath)*

Anterior: pectoral region and breast 31

Mammary gland and its vessels
Or Mammary gland ant superf. A Medial mammary branches med M Pectoral fascia ant superf. V Parasternal lymph nodes lat deep Or Suspensory ligaments of the breast ant Or Lobes of the mammary gland Or Axillary process of the breast lat M Pectoralis major ant superf. ★ A Lateral thoracic artery lat superf. V Lateral thoracic vein lat superf. *Breast extends from rib 2 to rib 6, sternal border to midaxillary line, with the axillary tail (of Spence); about 75% of lymph drains to axillary nodes*
↳ Lateral mammary branches lat
↳ Thoracoepigastric vein lat superf.

Nipple, areola and lactiferous ducts
Nipple ant superf. Areola ant superf. Areolar glands ant superf. Lactiferous sinus post deep Lactiferous ducts deep *Male nipple at the 4th intercostal space in the midclavicular line (T4 dermatome); 15 to 20 lobes, each with its own lactiferous duct and sinus opening on the nipple*

Retromammary space and pectoralis major
Or Retromammary space post deep M Clavicular head of pectoralis major sup superf. M Sternocostal head of pectoralis major med superf. M Abdominal part of pectoralis major inf superf. N Supraclavicular nerves sup superf. *Breast lies two-thirds on pectoralis major and one-third on serratus anterior, separated by the retromammary space*

Pectoralis minor
M Pectoralis minor post deep ★ N Medial pectoral nerve lat deep *Medial pectoral nerve is lateral, lateral pectoral nerve is medial (named for their cords); the medial pectoral nerve pierces pectoralis minor*

Subclavius
M Subclavius sup deep N Nerve to subclavius post A Superior thoracic artery sup *Nerve to subclavius (C5, C6) from the superior trunk; it often gives the accessory phrenic nerve*

Clavipectoral fascia and its piercing structures
M Clavipectoral fascia sup deep A Thoracoacromial artery sup N Lateral pectoral nerve med *Two in, two out: cephalic vein and lymphatics pass in; thoracoacromial artery and lateral pectoral nerve come out*
↳ Pectoral branch of the thoracoacromial artery inf

Medial: anterior and middle mediastinum (outside the heart) 12

Between sternum and pericardium
Or Anterior mediastinum V Anterior mediastinal lymph nodes ant deep A Mediastinal branches of the internal thoracic artery lat Or Thymic fat body sup Or Sternopericardial ligaments ant *4 Ts of anterior mediastinal masses: thymoma, teratoma, thyroid (retrosternal), 'terrible' lymphoma*

Ascending aorta and pulmonary trunk
Or Middle mediastinum A Ascending aorta med ★ N Phrenic nerve ant ★ A Pericardiacophrenic artery ant ★ *Pulmonary trunk bifurcates at the sternal angle (T4/T5), in the concavity of the aortic arch*
↳ Aortic bulb inf
↳ Left phrenic nerve lat ★

Cardiac plexus
Thoracic cardiac branches of the vagus nerve sup *Superficial cardiac plexus in the concavity of the aortic arch, deep cardiac plexus anterior to the tracheal bifurcation; sympathetic nerves speed the heart, the vagus slows it*

Lateral: ribs (typical and atypical) and serratus anterior 27

Thoracic cage, classes of ribs and twelfth rib
B Thoracic cage B True ribs sup B False ribs inf B Floating ribs inf B Tenth rib inf B Eleventh rib inf B Twelfth rib inf N Subcostal nerve inf deep *7 true, 3 false, 2 floating; atypical ribs 1, 2, 10, 11, 12*

Rib: head and neck
Rib Head of the rib med ★ Articular facet of the head of the rib med Crest of the head of the rib med Neck of the rib post ★ Crest of the neck of the rib sup *A typical rib head articulates with its own vertebra and the one superior to it (two demifacets)*

Rib: tubercle and angle
Tubercle of the rib post ★ Articular facet of the tubercle of the rib post Angle of the rib post ★ *Tubercle of rib N articulates with the transverse process of vertebra N; ribs 11 and 12 have no costotransverse joint*

Rib: body, surfaces and borders
B Body of the rib M Serratus anterior lat superf. ★ B External surface of the rib lat B Internal surface of the rib med B Superior border of the rib sup B Inferior border of the rib inf B Sternal end of the rib ant *Costal groove on the internal surface at the inferior border holds the intercostal bundle: VAN (vein, artery, nerve, superior to inferior) in the costal groove; pass a needle along the superior border of the rib inferior to the space*

Second rib and serratus anterior
B Second rib sup B Tuberosity for serratus anterior lat N Long thoracic nerve lat superf. ★ *C5, 6, 7 - wings of heaven (long thoracic nerve; injury gives a winged scapula); the 2nd rib is found at the sternal angle*

Lateral: intercostal spaces 19

External and internal intercostal layers
B Intercostal space lat N Anterior ramus of a thoracic spinal nerve post deep M External intercostal muscle lat superf. ★ M Internal intercostal muscle med deep ★ M Innermost intercostal muscle med deep ★ M External intercostal membrane ant superf. M Internal intercostal membrane post deep *Hands in pockets: external intercostal fibres run inferomedially (anteroinferiorly), internal intercostals at right angles to them; external membrane anteriorly, internal membrane posteriorly*
↳ Intercostal nerve inf deep ★
↳ Intercostal: Collateral branch of the intercostal nerve inf deep Muscular branches of the intercostal nerve inf deep

Intercostal space (from superior to inferior: VAN)
B Costal groove inf ★ V Anterior intercostal veins ant deep A Anterior intercostal branches ant deep *VAN (vein, artery, nerve, superior to inferior) in the costal groove; pass a needle along the superior border of the rib inferior to the space*

Cutaneous branches of the intercostal nerves
Lateral cutaneous branch of the intercostal nerve lat superf. Anterior cutaneous branch of the intercostal nerve ant superf. Thoracoabdominal nerves inf deep *Dermatome landmarks: T4 at the nipple, T10 at the umbilicus*

First and second intercostal nerves
First intercostal nerve sup Second intercostal nerve sup *Intercostobrachial nerve (T2) supplies the medial arm: why cardiac pain refers to the medial left arm*
↳ Intercostobrachial nerve lat superf.

Lateral: pleura and pleural recesses 27

Cervical and costal pleura with recesses
Or Parietal pleura M Endothoracic fascia med deep Or Cervical pleura sup ★ A Left subclavian artery lat ★ A Costocervical trunk sup N Sympathetic trunk lat ★ Or Costal pleura lat Or Costodiaphragmatic recess inf ★ M Costal part of the diaphragm lat Or Costomediastinal recess ant Or Vertebromediastinal recess post *2-4-6-8-10-12 rule for the parietal pleura: meets in the midline at rib 2, left diverges at 4 (cardiac notch), right continues to 6, 8 in the midclavicular line, 10 in the midaxillary line, 12 paravertebrally; the lung stops two ribs short (6-8-10)*
↳ Supreme intercostal artery ant
↳ Cervicothoracic ganglion sup ★
↳ Thoracic ganglia lat
↳ Thoracic ganglia: Grey rami communicantes med

Diaphragmatic and mediastinal pleura
Or Diaphragmatic pleura inf M Diaphragm A Superior phrenic arteries post Or Phrenicomediastinal recess inf Or Mediastinal pleura med V Pericardiacophrenic vein ant Or Pulmonary ligament inf ★ V Right inferior pulmonary vein inf V Left inferior pulmonary vein inf ★ *Parietal pleura, four parts: cervical, costal, diaphragmatic, mediastinal; it is pain-sensitive (intercostal and phrenic nerves)*

Visceral pleura and pleural cavity
Or Visceral pleura N Pulmonary plexus post Or Pleural cavity *Visceral pleura has autonomic supply only and is insensitive to pain; parietal pleura is somatic and painful*

Thorax pins · back

Lateral: right lung 52

Apex of the right lung Or Right lung A Right pulmonary artery ant ⭐ V Right superior pulmonary vein ant ⭐ V Azygos vein lat ⭐ Or Apex of the lung sup ⭐ Or Groove for the right subclavian artery sup Or Groove for the right brachiocephalic vein med *Apex and cervical pleura rise 2 to 3 cm superior to the medial third of the clavicle: a Pancoast tumour at the apex can involve the inferior trunk of the brachial plexus and the sympathetic trunk (Horner syndrome)*

↳ Arch of the azygos vein sup ⭐ Right superior intercostal vein sup ⭐

Costal surface and borders of the right lung Or Costal surface of the lung lat Or Diaphragmatic surface of the lung inf M Right dome of the diaphragm sup M Left dome of the diaphragm inf Or Vertebral part of the mediastinal surface post A Posterior intercostal arteries post deep ⭐ V Posterior intercostal veins post deep N Greater splanchnic nerve med ⭐ Or Anterior border of the lung ant Or Posterior border of the lung post Or Inferior border of the lung inf *Lung borders two ribs short of the pleura: 6 midclavicular, 8 midaxillary, 10 paravertebral*

↳ Right posterior intercostal arteries post deep Dorsal branch of the posterior intercostal artery post Collateral branch of the posterior intercostal artery inf deep Lateral cutaneous branch of the posterior intercostal artery lat superf.

Mediastinal surface of the right lung Or Mediastinal surface of the lung med Or Cardiac impression of the right lung med N Right phrenic nerve lat ⭐ Or Groove for the superior vena cava med Or Groove for the inferior vena cava med V Inferior vena cava inf Or Groove for the azygos vein med ⭐ Or Azygos lobe sup Or Tracheal impression med Or Groove for the oesophagus med *Right lung is the venous side: grooves for the SVC, IVC, azygos arch and right brachiocephalic vein (left lung is the arterial side)*

Fissures and lobes of the right lung Interlobar surface of the lung Oblique fissure of the right lung post ⭐ Horizontal fissure of the right lung ant ⭐ Superior lobe of the right lung sup ⭐ Middle lobe of the right lung ant ⭐ Inferior lobe of the right lung inf *Right: 3 lobes, 2 fissures; left: 2 lobes, 1 fissure. Oblique fissure from the T2/T3 spine to the 6th costochondral junction; horizontal fissure along the 4th costal cartilage*

Segments of the right superior and middle lobes Or Apical segment of the right lung sup A Lobar arteries post Or Posterior segment of the right lung post Or Anterior segment of the right lung ant Or Lateral segment of the right lung lat Or Medial segment of the right lung med *A PALM Seed Makes Another Little Palm (right lung: apical, posterior, anterior; lateral, medial; superior, medial basal, anterior basal, lateral basal, posterior basal)*

↳ Segmental arteries

Segments of the right inferior lobe Superior segment of the right lung sup Medial basal segment of the right lung med Anterior basal segment of the right lung ant Lateral basal segment of the right lung lat Posterior basal segment of the right lung post *A PALM Seed Makes Another Little Palm: the last five (superior, medial basal, anterior basal, lateral basal, posterior basal) are the right inferior lobe*

Lateral: left lung 28

Apex of the left lung Or Left lung A Left pulmonary artery sup ⭐ V Left superior pulmonary vein ant ⭐ A Thoracic aorta lat ⭐ Or Groove for the first rib sup Or Groove for the left subclavian artery sup Or Groove for the left common carotid artery med Or Groove for the left brachiocephalic vein med *Apex and cervical pleura rise 2 to 3 cm superior to the medial third of the clavicle: a Pancoast tumour at the apex can involve the inferior trunk of the brachial plexus and the sympathetic trunk (Horner syndrome)*

↳ Pericardial branches of the thoracic aorta ant

Mediastinal branches of the thoracic aorta ant

Mediastinal surface of the left lung Or Cardiac impression of the left lung med ⭐ Or Groove for the aortic arch med ⭐ N Left vagus nerve post ⭐ Or Groove for the descending aorta med ⭐ Or Oesophageal impression of the left lung med *Left lung is the arterial side: grooves for the aortic arch, descending aorta, left subclavian and left common carotid (right lung is the venous side)*

Fissure and lobes of the left lung Oblique fissure of the left lung post ⭐ Superior lobe of the left lung sup ⭐ Inferior lobe of the left lung inf *Left: 2 lobes, 1 fissure (oblique); no horizontal fissure*

Cardiac notch and lingula Cardiac notch of the left lung ant ⭐ Lingula of the left lung ant ⭐ *Lingula is the left counterpart of the right middle lobe; the cardiac notch lies at the 4th to 6th left costal cartilages (pleura diverges at 4)*

Segments of the left superior lobe Apicoposterior segment of the left lung sup Anterior segment of the left lung ant Superior lingular segment sup Inferior lingular segment inf *Left lung has 8 segments: apical + posterior fuse (apicoposterior); the lingula takes superior and inferior lingular segments in place of a middle lobe*

Segments of the left inferior lobe Superior segment of the left lung sup Anteromedial basal segment of the left lung ant Lateral basal segment of the left lung lat Posterior basal segment of the left lung post *Left inferior lobe: anterior and medial basal fuse (anteromedial basal), so 4 segments: superior, anteromedial basal, lateral basal, posterior basal*

Medial: lung roots, hila and bronchi 22

Root and hilum of the lung Or Root of the lung med A Bronchial arteries post V Bronchial veins post Or Hilum of the lung med ⭐ V Pulmonary veins inf V Bronchopulmonary lymph nodes lat deep N Bronchial branches of the vagus nerve post *Anterior to posterior: vein, artery, bronchus (VAB) on both sides; pulmonary veins are the most anterior and most inferior; phrenic nerve anterior to the root, vagus posterior*

Right hilum Or Right main bronchus post ⭐ A Right bronchial artery post V Superior tracheobronchial lymph nodes sup deep Or Right superior lobar bronchus sup ⭐ *RALS (Right Anterior, Left Superior: the pulmonary artery is anterior to the main bronchus on the right, superior to it on the left); the eparterial bronchus (right superior lobar) arises superior to the artery. Right main bronchus is wider, shorter, more vertical: inhaled bodies go right*

Right intermediate and lobar bronchi Intermediate bronchus inf Right middle lobar bronchus ant Right inferior lobar bronchus inf *Right main bronchus gives the superior lobar (eparterial) bronchus, then continues as the intermediate bronchus, which splits into middle and inferior lobar bronchi*

Left hilum Or Left main bronchus post ⭐ A Left superior bronchial artery sup A Left inferior bronchial artery inf Or Left superior lobar bronchus inf ⭐ *RALS (Right Anterior, Left Superior: the pulmonary artery is anterior to the main bronchus on the right, superior to it on the left); the left pulmonary artery arches over the superior aspect of the left main bronchus (no eparterial bronchus on the left)*

Left lingular and inferior lobar bronchi Lingular bronchus ant Left inferior lobar bronchus inf *Left main bronchus is longer, narrower and more horizontal than the right (inhaled objects go right); the lingular bronchus comes from the left superior lobar bronchus*

Lobar and segmental branching Or Segmental bronchi V Intrapulmonary lymph nodes lat deep *Bronchopulmonary segment: segmental bronchus and artery central, veins intersegmental (at the periphery)*

Posterior: posterior thoracic wall (vertebrae, costovertebral joints, posterior intercostal vessels) 42

Vertebral body and joint of the head of the rib Thoracic vertebra Vertebral body ant Superior costal facet lat ⭐ Inferior costal facet lat ⭐ Joint of the head of the rib lat Radiate ligament of the head of the rib ant Intra-articular ligament of the head of the rib med *Ribs 2 to 9 meet two demifacets (own vertebra + the one superior); ribs 1, 10, 11, 12 have a single full facet*

Pedicles and intervertebral foramen B Vertebral foramen med B Pedicle of the vertebral arch lat B Superior vertebral notch sup B Inferior vertebral notch inf B Intervertebral foramen lat A Spinal branch of the posterior intercostal artery med *Thoracic spinal nerve T(n) leaves through the intervertebral foramen inferior to the pedicle of vertebra T(n); C1 to C7 exit superior to their pedicles, C8 inferior to C7*

Laminae, articular and spinous processes B Lamina of the vertebral arch post B Ligamentum flavum post B Superior articular process sup B Inferior articular process inf B Zygapophysial joint lat B Spinous process post M Serratus posterior superior sup deep M Serratus posterior inferior inf deep *Rule of threes (thoracic spines): T1 to T3 spines are level with their own transverse processes, T4 to T6 half a vertebra inferior, T7 to T9 a whole vertebra inferior, T10 to T12 return towards level*

Transverse process and costotransverse joint B Transverse process lat M Levatores costarum post deep B Transverse costal facet lat ⭐ B Costotransverse joint lat B Costotransverse ligament med B Superior costotransverse ligament sup B Lateral costotransverse ligament lat *Tubercle of rib N to transverse process of vertebra N; no costotransverse joints for ribs 11 and 12*

Intervertebral disc and longitudinal ligaments Intervertebral disc med Anterior longitudinal ligament ant Posterior longitudinal ligament post *Anterior longitudinal ligament is broad and limits extension; the posterior longitudinal ligament is narrow and limits flexion, so discs herniate posterolaterally*

Levatores costarum Levatores costarum breves post deep Levatores costarum longi post deep

First thoracic vertebra and costocervical trunk B First thoracic vertebra sup V Supreme intercostal vein ant *Costocervical trunk gives the deep cervical artery and the supreme intercostal artery (posterior intercostals 1 and 2)*

Posterior intercostal space (from superior to inferior: VAN) M Subcostales post deep V Intercostal lymph nodes post deep *VAN (vein, artery, nerve, superior to inferior) in the costal groove; pass a needle along the superior border of the rib inferior to the space; posterior intercostal arteries 3 to 11 come from the thoracic aorta, 1 and 2 from the supreme intercostal*

Tenth to twelfth thoracic vertebrae and subcostal vessels B Tenth thoracic vertebra inf B Eleventh thoracic vertebra inf B Twelfth thoracic vertebra inf A Subcostal artery inf deep V Subcostal vein inf deep *T10, T11, T12 carry single full costal facets for ribs 10 to 12; oesophageal hiatus at T10, aortic hiatus at T12*

Posterior: posterior mediastinum 25

Thoracic oesophagus Or Posterior mediastinum V Hemiazygos vein inf ⭐ V Posterior mediastinal lymph nodes post deep Or Oesophagus post ⭐ N Oesophageal plexus inf ⭐ Or Thoracic part of the oesophagus post A Oesophageal branches of the thoracic aorta ant V Oesophageal veins post V Juxta-oesophageal lymph nodes lat deep Or Aortic constriction of the oesophagus lat Or Bronchial constriction of the oesophagus ant *Oesophageal constrictions at 15, 25, 40 cm from the incisors: cricopharyngeal (C6), aortic arch and left main bronchus (T4/T5), diaphragmatic (T10); DATES (posterior mediastinum: descending aorta, azygos and hemiazygos veins, thoracic duct, oesophagus, sympathetic trunk and splanchnic nerves)*

↳ Ascending lumbar vein inf

Vagus nerves and oesophageal plexus Oesophageal branches of the vagus nerve med *Vagus passes posterior to the lung root, phrenic anterior; the two vagi form the oesophageal plexus on the oesophagus*

Diaphragmatic constriction and vagal trunks Or Diaphragmatic constriction of the oesophagus inf M Oesophageal hiatus med ⭐ M Right crus of the diaphragm post ⭐ N Anterior vagal trunk ant N Posterior vagal trunk post Or Abdominal part of the oesophagus inf *LARP (Left vagus becomes Anterior trunk, Right becomes Posterior trunk); oesophagus and vagal trunks pass the diaphragm at T10*

Thoracic aorta Thoracic aortic plexus lat *Descends from the left side of T4 to the aortic hiatus at T12 (At 12), moving towards the midline anterior to the vertebral bodies*

Hemiazygos veins Accessory hemiazygos vein sup *Hemiazygos crosses to the azygos at T9, accessory hemiazygos at T8*

Sympathetic trunk on the rib heads White rami communicantes lat *White rami only T1 to L2 (thoracolumbar outflow); grey rami to every spinal nerve*

Splanchnic nerves Thoracic cardiopulmonary splanchnic nerves sup Lesser splanchnic nerve lat Least splanchnic nerve inf *Greater T5 to T9, lesser T10 to T11, least T12*

Inferior: diaphragm and thoracic outlet 14

Domes and central tendon of the diaphragm B Inferior thoracic aperture inf M Central tendon of the diaphragm med M Caval opening sup ⭐ *I 8 10 Eggs At 12 (IVC T8, oesophagus T10, aortic hiatus T12); letter count also works: 'vena cava' 8, 'oesophagus' 10, 'aortic hiatus' 12; right dome higher (liver), reaching the 5th rib*

Sternal and costal parts of the diaphragm Sternal part of the diaphragm ant Sternocostal triangle ant Lumbocostal triangle post *Morgagni anterior (sternocostal triangle, superior epigastric vessels); Bochdalek is Back and Left (lumbocostal triangle, posterolateral hernia)*

Crura, arcuate ligaments and hiatuses Lumbar part of the diaphragm post Left crus of the diaphragm post Median arcuate ligament ant Medial arcuate ligament med Lateral arcuate ligament lat Aortic hiatus post ⭐ *I 8 10 Eggs At 12 (IVC T8, oesophagus T10, aortic hiatus T12); letter count also works: 'vena cava' 8, 'oesophagus' 10, 'aortic hiatus' 12; median arcuate over the aorta, medial over psoas, lateral over quadratus lumborum; right crus L1 to L3, left L1 to L2*

Thoracic surface of the diaphragm V Superior diaphragmatic lymph nodes sup deep N Phrenicoabdominal branches inf *C3, 4, 5 keeps the diaphragm alive: central diaphragmatic pain refers to the shoulder tip (C4); the periphery is supplied by intercostal nerves*

Heart pins · front

General: pericardium and heart wall 19

Fibrous pericardium and phrenic nerve Or
Fibrous pericardium superf. N
Phrenic nerve ant ⭐ A
Pericardiacophrenic artery ant V
Pericardiacophrenic vein ant A
Pericardial branches of the thoracic aorta post Or Sternopericardial ligaments ant Or
Pericardiacophrenic ligament inf
C3, 4, 5 keeps the diaphragm alive; phrenic also carries pericardial pain, referred to the shoulder tip

Parietal serous pericardium and pericardial cavity
Parietal layer of serous pericardium deep Pericardial cavity *Superficial to deep: fibrous pericardium, parietal serous layer, pericardial cavity, visceral serous layer (epicardium)*

Reflections and pericardial sinuses
Reflection of serous pericardium around the arteries sup
Transverse pericardial sinus post ⭐ Superior aortic recess sup
Reflection of serous pericardium around the veins post Oblique pericardial sinus post ⭐ Fold of the left vena cava lat *Transverse sinus separates the arteries (aorta, pulmonary trunk, anterior) from the veins (SVC, pulmonary veins, posterior); oblique sinus is the cul-de-sac posterior to the left atrium between the pulmonary veins and IVC*

Layers of the heart wall and coronary sulcus
Visceral layer of serous pericardium (epicardium) superf. Myocardium Endocardium deep Coronary sulcus ⭐ *Inner to outer: endocardium, myocardium, epicardium; the coronary sulcus divides atria from ventricles*

Superior: base and great vessels 24

Base, superior border and ascending aorta
Or Base of the heart (posterior surface) post V Right superior pulmonary vein sup V Right inferior pulmonary vein inf V Left superior pulmonary vein sup V
Left inferior pulmonary vein inf ⭐ Or Superior border sup V
Superior vena cava lat ⭐ A
Ascending aorta med ⭐ A
Pulmonary trunk ant ⭐ *Base faces posteriorly (mostly left atrium); apex points anteriorly, inferiorly and to the left*
↳ Aortic bulb inf
↳ Bifurcation of the pulmonary trunk sup Right pulmonary artery post
Left pulmonary artery lat

Pulmonary trunk and its bifurcation
Ligamentum arteriosum sup ⭐ *Pulmonary trunk bifurcates at T4/T5 in the concavity of the arch; ligamentum arteriosum (ductus remnant) joins the left pulmonary artery to the arch, with the left recurrent laryngeal nerve hooking posterior to it*

Cardiac plexus
Superficial part of cardiac plexus ant superf. Deep part of cardiac plexus post deep *Superficial cardiac plexus in the concavity of the aortic arch, deep cardiac plexus anterior to the tracheal bifurcation; sympathetic nerves speed the heart, the vagus slows it*
↳ Coronary plexuses inf

Sympathetic cardiac nerves
Superior cervical cardiac nerve sup Middle cervical cardiac nerve sup Inferior cervical cardiac nerve sup Thoracic cardiac nerves inf *Cardiac sympathetics: 3 cervical ganglia + T1 to T4; cardiac pain travels back to T1 to T4 and refers to the left chest and medial arm*

Vagal cardiac branches
Superior cervical cardiac branches of vagus nerve sup Inferior cervical cardiac branches of vagus nerve sup Thoracic cardiac branches of vagus nerve inf *Vagus slows the heart: right vagus mainly to the SA node, left vagus mainly to the AV node*

Anterior: sternocostal surface, right ventricle, anterior interventricular branch 26

Sternocostal surface and left coronary artery
Or Sternocostal surface ant A
Right coronary artery ant ⭐ A
Left coronary artery lat ⭐
Borders: right border = right atrium, inferior border = right ventricle, left border = left ventricle (and left auricle); the right ventricle forms most of the sternocostal surface
↳ Opening of right coronary artery ant ⭐ Right conus branch ant Sinuatrial nodal branch sup ⭐
↳ Anterior interventricular branch ant ⭐
↳ Anterior interventricular branch:
Diagonal branches lat Anterior septal branches med deep
↳ Opening of left coronary artery lat ⭐

Anterior interventricular sulcus Or
Anterior interventricular sulcus ant ⭐ V Great cardiac vein ant ⭐ *Veins pair with arteries: great cardiac vein with the anterior interventricular branch, middle cardiac vein with the posterior interventricular branch, small cardiac vein with the right marginal branch*

Right ventricle: wall and inflow part Or
Right ventricle ant ⭐ A Right marginal branch inf ⭐ Or Inflow part of the right ventricle inf M Trabeculae carneae of right ventricle inf M Anterior papillary muscle of right ventricle ant ⭐ Or Interventricular septum (right surface) med M Septomarginal trabecula med ⭐ M Septal papillary muscle of right ventricle med *Septomarginal trabecula (moderator band) carries the right bundle branch to the anterior papillary muscle*

Papillary muscles and chordae of the right ventricle
Or Chordae tendineae of tricuspid valve sup M Posterior papillary muscle of right ventricle inf *Right ventricle: 3 papillary muscles (anterior, posterior, septal) for 3 tricuspid cusps; left ventricle: 2 for 2 mitral cusps*

Supraventricular crest and conus arteriosus
Or Conus arteriosus (infundibulum) sup ⭐ M Supraventricular crest med A Left conus branch lat Or Pulmonary orifice sup *Supraventricular crest separates inflow (rough, trabeculated) from outflow (smooth conus arteriosus)*

Right: exterior (right atrium surface, right coronary artery, small cardiac vein) 7

Right border and terminal sulcus Or
Right pulmonary surface lat Or Right border lat V Inferior vena cava inf Or Terminal sulcus lat M Crista terminalis lat ⭐ *Right border = right atrium from SVC to IVC; the terminal sulcus outside matches the crista terminalis inside, with the SA node at its superior end*

Right auricle and origin of the right coronary artery
Or Right auricle ant ⭐ M Pectinate muscles ant *Right aortic sinus gives the right coronary artery; the SA nodal branch comes from the right coronary artery in about 60%*

Right: interior of the right atrium (sinus venarum, crista terminalis, fossa ovalis, triangle of Koch, openings) 21

Right atrium: venous sinus and pectinate part
Or Right atrium lat ⭐ V Coronary sinus post ⭐ A Atrial branches of right coronary artery sup V Anterior cardiac veins ant Or Sinus of venae cavae post Or Opening of superior vena cava sup Or Intervenous tubercle post Or Opening of inferior vena cava inf Or Valve of inferior vena cava ant *Crista terminalis divides the smooth sinus of the venae cavae (posterior) from the rough pectinate part (anterior, auricle)*
↳ Oblique vein of left atrium post

Interatrial septum, right surface
Interatrial septum (right surface) med Fossa ovalis med ⭐ Limbus of fossa ovalis med Torus aorticus ant *Fossa ovalis = foramen ovale remnant; limbus = septum secundum edge*

Triangle of Koch and coronary sinus opening
Triangle of Koch med Opening of coronary sinus inf ⭐ Valve of coronary sinus inf Tendon of Todaro sup Right atrioventricular orifice ant *Koch's triangle: tendon of Todaro, septal cusp of the tricuspid valve, opening of the coronary sinus; the AV node sits at its apex*

Smallest cardiac veins Or
Openings of smallest cardiac veins V Smallest cardiac veins *Smallest cardiac veins (Thebesian veins) open directly into the chambers, mostly the right atrium*

Heart pins · back

Left (lateral): left ventricle, left border, circumflex branch 17

Apex of the heart
Apex of the heart lat ⭐ **Notch of the cardiac apex** inf *Apex beat in the 5th left intercostal space, midclavicular line (about 9 cm from the midline)*

Left border and left marginal vessels
Or **Left border** lat A **Circumflex branch** lat ⭐ V **Left marginal vein** lat Or **Left pulmonary surface** lat *Left border = left ventricle (with the left auricle superiorly); circumflex runs in the coronary sulcus and gives the left marginal branch*

↳ **Left marginal branch** lat

Branches of the circumflex and intermediate arteries
Intermediate branch of left coronary artery ant **Posterior left ventricular branch** inf *Circumflex gives the SA nodal branch in about 40% (the right coronary in about 60%); an intermediate branch (ramus intermedius) makes the left coronary artery trifurcate*

Left ventricle: inflow and papillary muscles
Or **Left ventricle** lat ⭐ Or **Inflow part of the left ventricle** inf M **Trabeculae carneae of left ventricle** inf M **Anterior papillary muscle of left ventricle** ant M **Posterior papillary muscle of left ventricle** inf Or **Chordae tendineae of mitral valve** sup *Left ventricle: 2 papillary muscles (anterior, posterior) for 2 mitral cusps; wall about 3 times thicker than the right*

Aortic vestibule
Aortic vestibule sup **Aortic orifice** sup *Anterior cusp of the mitral valve separates the inflow from the smooth outflow (aortic vestibule), as the supraventricular crest does in the right ventricle*

Posterior: left atrium, pulmonary veins, coronary sinus 10

Left atrium and pulmonary veins
Or **Left atrium** post ⭐ A **Left atrial branches** sup Or **Openings of pulmonary veins** post Or **Interatrial sulcus** post *Four pulmonary veins enter the left atrium, the most posterior chamber; it lies directly anterior to the oesophagus (an enlarged left atrium indents it)*

Left auricle
Or **Left auricle** lat M **Pectinate muscles of left auricle** lat *Left auricle is the commonest site of thrombus in atrial fibrillation*

Interior of the left atrium
Interatrial septum (left surface) med **Valve of foramen ovale** med **Left atrioventricular orifice** ant *Valve of the foramen ovale = septum primum; the foramen stays probe-patent in about 25% of adults*

Coronary sinus
Valve of the great cardiac vein lat *Coronary sinus lies in the posterior coronary sulcus and drains into the right atrium: great, middle, small cardiac veins, posterior vein of the left ventricle, oblique vein of the left atrium*

Inferior: diaphragmatic surface, posterior interventricular branch, middle cardiac vein 12

Diaphragmatic surface and inferior vena cava
Or **Diaphragmatic surface** inf A **Posterior interventricular branch** inf ⭐ V **Middle cardiac vein** inf ⭐ Or **Inferior border** inf V **Small cardiac vein** lat *Diaphragmatic surface: left ventricle two-thirds, right ventricle one-third*

↳ **Posterior septal branches** med deep

↳ **Right marginal vein** inf

Posterior interventricular sulcus and crux
Or **Posterior interventricular sulcus** inf Or **Crux of the heart** post A **Atrioventricular nodal branch** post A **Right posterolateral branch** lat V **Posterior vein of left ventricle** inf *Dominance = the artery that gives the posterior interventricular branch: right dominant about 70%, left about 10%, codominant about 20%; the AV nodal branch arises near the crux from the dominant artery*

Inside: valves 28

Tricuspid valve
Tricuspid valve inf ⭐ **Anterior cusp of tricuspid valve** ant **Posterior cusp of tricuspid valve** post **Septal cusp of tricuspid valve** med **Right fibrous ring** *LAB RAT (Left Atrium Bicuspid, Right Atrium Tricuspid); All Physicians Take Money (aortic 2nd right ICS, pulmonary 2nd left ICS, tricuspid 4th left ICS at the sternal border, mitral 5th left ICS midclavicular line); Try Pulling My Aorta (tricuspid, pulmonary, mitral, aortic: the order blood meets them)*

Pulmonary valve
Pulmonary valve ant ⭐ **Anterior semilunar cusp of pulmonary valve** ant **Right semilunar cusp of pulmonary valve** med **Left semilunar cusp of pulmonary valve** lat **Nodule of semilunar cusp of pulmonary valve** med **Lunule of semilunar cusp of pulmonary valve** lat **Pulmonary sinuses** sup *Pulmonary valve cusps: anterior, right, left; All Physicians Take Money (aortic 2nd right ICS, pulmonary 2nd left ICS, tricuspid 4th left ICS at the sternal border, mitral 5th left ICS midclavicular line)*

Mitral valve
Mitral valve post ⭐ **Anterior cusp of mitral valve** ant **Posterior cusp of mitral valve** post **Commissures of mitral valve** **Left fibrous ring** *LAB RAT (Left Atrium Bicuspid = mitral, like a bishop's mitre); All Physicians Take Money (aortic 2nd right ICS, pulmonary 2nd left ICS, tricuspid 4th left ICS at the sternal border, mitral 5th left ICS midclavicular line)*

Aortic valve cusps
Aortic valve med ⭐ **Right semilunar cusp of aortic valve** ant **Left semilunar cusp of aortic valve** lat **Posterior semilunar cusp of aortic valve** post **Nodule of semilunar cusp of aortic valve** med **Lunule of semilunar cusp of aortic valve** lat *Aortic valve cusps: right, left, posterior (non-coronary); All Physicians Take Money (aortic 2nd right ICS, pulmonary 2nd left ICS, tricuspid 4th left ICS at the sternal border, mitral 5th left ICS midclavicular line)*

Aortic sinuses
Aortic sinuses sup **Right aortic sinus** ant **Left aortic sinus** lat **Posterior aortic sinus** post **Sinotubular junction** sup *Right aortic sinus gives the right coronary artery, left sinus the left coronary artery, posterior sinus none (non-coronary)*

Inside: septa, fibrous skeleton and conducting system 15

Sinuatrial node and interatrial septum
Sinuatrial node sup ⭐ **Interatrial septum** **Atrioventricular node** inf ⭐ *Conduction order: SA node, AV node, AV bundle (of His), right and left bundle branches, Purkinje fibres*

Fibrous trigones and atrioventricular bundle
Fibrous rings **Right fibrous trigone** med **Left fibrous trigone** lat **Tendon of the infundibulum** ant **Atrioventricular bundle** med *AV bundle pierces the right fibrous trigone (central fibrous body): the only electrical path from atria to ventricles*

Interventricular septum and bundle branches
Interventricular septum ⭐ **Membranous part of interventricular septum** sup **Atrioventricular septum** sup **Muscular part of interventricular septum** inf **Right bundle branch** med deep **Left bundle branch** med deep **Subendocardial branches (Purkinje fibres)** deep *SA, AV, His, bundle branches, Purkinje; the membranous septum is the commonest VSD site*