

Q14 List the muscles involved in respiration and briefly describe their function (Sept 2010)

UPPER AIRWAYS MUSCLES

- **NOSE** – alae nasi flare the nostrils
- **PHARYNX** – pharyngeal dilator muscles (glenioglossus, tensor and levator palate) maintain pharyngeal tone during respiration, preventing collapse of the pharynx with the generation of negative intrathoracic pressure that occurs during inspiration, and during sleep.
- **LARYNX** – during inspiration, the cricoarytenoid muscle rotates the arytenoid cartilage, abducting the vocal cords to reduce resistance to airflow. During expiration, the thyroarytenoid muscles cause adduction of the cords, increasing resistance to possibly prevent collapse of the lower airways.

MUSCLES OF INSPIRATION

- **DIAPHRAGM** – the most important respiratory muscle, a membranous dome shaped muscle which separates the abdominal and chest cavities, with a surface area of 900cm^2 in adults and innervated by the phrenic nerve (C3-5). When it contracts at the start of inspiration, the diaphragm flattens down to increase intrathoracic volume. This creates a negative intrathoracic pressure relative to atmospheric pressure, favouring the movement of air from the mouth down into the lungs
- **EXTERNAL INTERCOSTALS** – join adjacent ribs and contract at the start of inspiration to pull the ribs upward and outwards, augmenting the role of the diaphragm in increasing the intrathoracic volume
- **ACCESSORY MUSCLES**
 - Scalenes – anterior, middle, posterior. Pull the first two ribs upwards.
 - Sternocleidomastoid – pulls the sternum upwards
 - Pectoralis minor, vertebral extensors, serratus anterior

MUSCLES OF EXPIRATION

During quiet breathing, expiration is passive, using the elastic recoil of the lungs and chest wall to move gas out of the mouth. IN active breathing, muscles used include:

- **ANTERIOR ABDOMINAL WALL MUSCLES** – rectus abdominus, internal and external oblique and transversus abdominus. Contract on expiration and increase intra abdominal pressure, pushing the diaphragm up and increasing intrathoracic pressure to favour air movement out of the lungs
- **INTERNAL INTERCOSTALS** – join adjacent ribs. Oppose the external intercostals by moving ribs downwards and inwards, enhancing the effects of the abdominal muscles.