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Multiple Choice Questions

- Decide which of the choices best completes the statement or answers the question.
- Locate that question number on the separate answer sheet provided.
- Use the procedure described by your teacher to answer each question. For example, “fill in the circle that corresponds to your choice” or “make an X over the letter corresponding to your choice.”

1. Which row below does NOT correctly match the structure to its description?

Row	Structure	Description
a.	nasal cavity	contains turbinate bones that warm and moisten incoming air
b.	larynx	contains the vocal cords
c.	trachea	connects directly to the alveoli
d.	lungs	contain millions of alveoli

2. Which of the following identifies the disadvantage of breathing through your mouth instead of through your nose?
- The air is not warmed or moistened when you breathe in through your mouth.
 - The air is not cleaned by the cilia in your trachea when you breathe in through your mouth.
 - The air inhaled through your mouth contains less oxygen than air inhaled through your nose.
 - The air inhaled through your mouth contains more carbon dioxide than air inhaled through your nose.

3. Which row below completes the following statement?

“The *i*, commonly known as the throat, is the passageway for air into the respiratory system. The *ii* is a flap of cartilage that lies behind the tongue and in front of the larynx. This flap of cartilage closes over the opening to the trachea, the *iii*, when a person swallows.

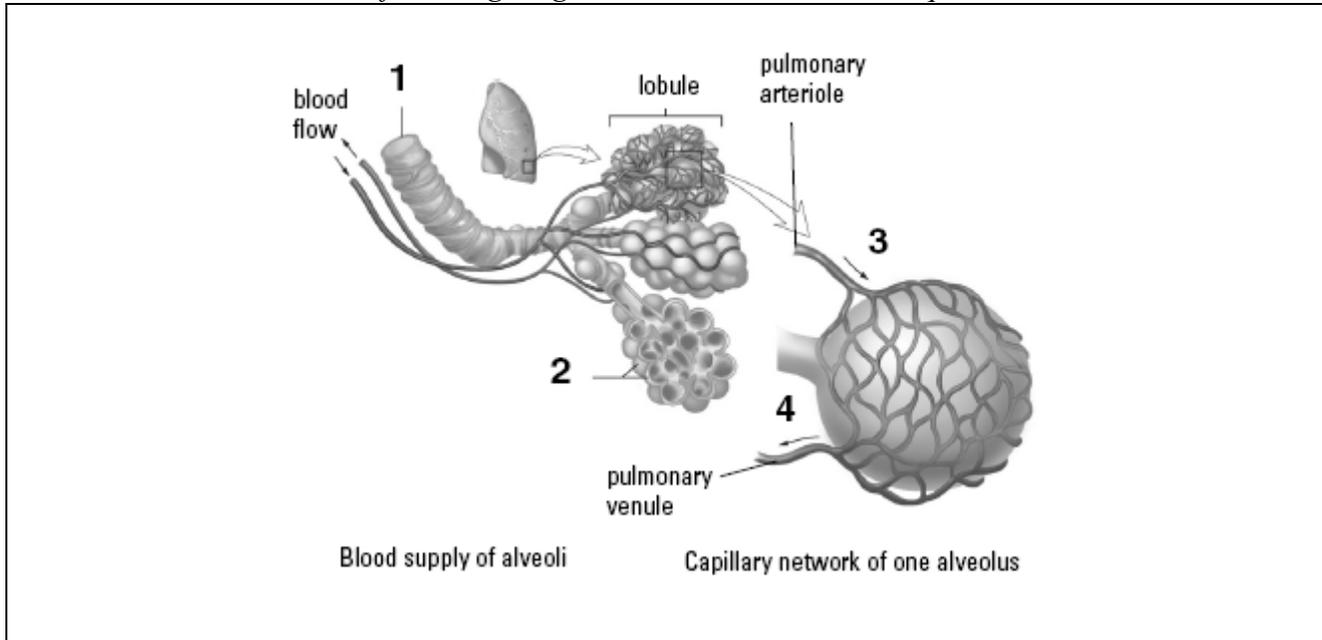
Row	<i>i</i>	<i>ii</i>	<i>iii</i>
a.	trachea	larynx	bronchus
b.	nasal passages	alveoli	bronchioles
c.	trachea	glottis	epiglottis
d.	pharynx	epiglottis	glottis

4. The maximum amount of air that that can be moved in and out during a single breath is called the
- expiratory reserve volume.
 - residual volume.
 - vital capacity.
 - tidal volume.

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5. The term “internal respiration” refers to
- the exchange of gases between the air and the blood in the lungs.
 - the exchange of gases between the blood and body cells.
 - the movement of air into the lungs.
 - the production of energy (ATP) inside the mitochondria of each cell.

Use the following diagram to answer the next two questions.



6. Structure 1 and Structure 2 on this diagram are the
- bronchus and alveoli, respectively
 - trachea and bronchiole, respectively
 - trachea and bronchus, respectively
 - bronchiole and alveoli, respectively
7. Which row describes the relative concentrations of oxygen and carbon dioxide in number 3 on this diagram?

Row	oxygen	carbon dioxide
a.	high	high
b.	high	low
c.	low	high
d.	low	low

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8. Two processes that are responsible for the movement of oxygen from the alveoli into the bloodstream are
- diffusion and facilitated diffusion.
 - osmosis and diffusion.
 - osmosis and facilitated diffusion.
 - diffusion and active transport.
9. If air enters the intrapleural space (the space between the pleura),
- the lungs could swell and burst.
 - a lobe of the lung can collapse.
 - the diaphragm will not contract.
 - nothing will happen because air is needed in the intrapleural space.
10. During inhalation, air enters the human lungs because
- atmospheric pressure is lower than the air pressure inside the lungs.
 - atmospheric pressure is greater than the air pressure inside the lungs.
 - although the air pressure is the same inside and outside the lungs, the partial pressure of oxygen is lower within the lungs.
 - although the air pressure is the same inside and outside the lungs, the partial pressure of oxygen is lower within the lungs.
11. Which of the following diseases is classified as an “upper respiratory” tract disorder?
- emphysema
 - pneumonia
 - tonsillitis
 - bronchitis
12. The two main requirements for external respiration are a
- large surface area for gas exchange; a moist environment to dissolve oxygen and carbon dioxide.
 - large surface area for gas exchange; a dry environment to dissolve oxygen and carbon dioxide.
 - small surface area for gas exchange; a moist environment to dissolve oxygen and carbon dioxide.
 - small surface area for gas exchange; a dry environment to dissolve oxygen and carbon dioxide.
13. Which of the following describes the correct path of air in the respiratory tract?
- nasal cavities → larynx → pharynx → trachea → bronchioles → bronchi
 - nasal cavities → pharynx → larynx → trachea → bronchi → bronchioles
 - pharynx → larynx → bronchi → trachea → bronchioles → alveoli
 - larynx → pharynx → trachea → bronchioles → bronchi → alveoli

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Use the following information to answer the next two questions

Pulmonary Tuberculosis

Pulmonary tuberculosis is caused by *Mycobacterium tuberculosis*, a type of bacterium. When tubercle bacilli invade the lung tissue, the cells build a protective capsule surrounding the bacteria. This isolates the bacteria but reduces the elasticity of the lungs. Symptoms of this disease include a dry cough or a more productive cough (coughing up mucous). Often, the individual coughs up blood. A person with pulmonary tuberculosis also experiences a low grade fever and fatigue. One pulmonary function test uses a spirometer to measure how much and how fast a person can blow air out of the lungs after taking a deep breath. Tuberculosis was a major killer in North America before the middle of the twentieth century, after which antibiotic therapy brought it largely under control.

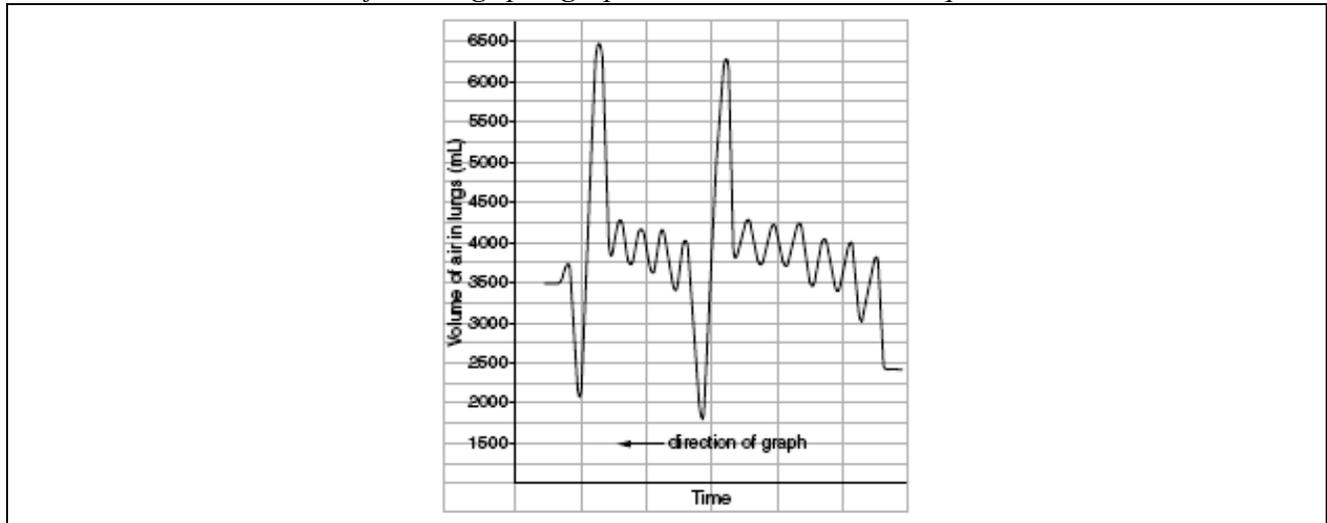
14. The pulmonary function test described above is measuring the
- residual volume.
 - tidal volume.
 - inspiratory reserve volume.
 - expiratory reserve volume.
15. Which structures in the lung would likely be most affected by this disease?
- trachea
 - bronchioles
 - alveoli
 - intercostal muscles
16. Which row identifies how 99 percent of the oxygen is transported from the lungs to the cells and 70 percent of carbon dioxide is transported from the body cells to the lungs?

Row	Oxygen from lungs to cells	Carbon dioxide from cells to lungs
a.	attached directly to hemoglobin molecules in red blood cells	attached directly to the hemoglobin molecules in red blood cells
b.	dissolved and carried in the plasma as bicarbonate ion (HCO_3^-)	dissolved and carried in the plasma as bicarbonate ion (HCO_3^-)
c.	dissolved and carried in the plasma as bicarbonate ion (HCO_3^-)	attached directly to hemoglobin molecules in red blood cells
d.	attached directly to hemoglobin molecules in red blood cells	dissolved and carried in the plasma as bicarbonate ion (HCO_3^-)

Numerical Response Questions

- Record your answer on the answer sheet provided.
- If an answer is a value between 0 and 1 (e.g., 0.25), then be sure to record the 0 before the decimal place.

Use the following spirograph to answer the next two questions.



- Calculate the vital capacity, in millilitres, of this individual. Record your **four-digit answer** on the answer sheet.
Answer: _____
- Calculate the inspiratory reserve volume, in millilitres, of this individual. Record your **four-digit answer** on the answer sheet.

Answer: _____

Use the following information to answer the next question.

Exhalation

The sequence of events in an exhalation is listed below.

- air pressure in thoracic cavity increases
- diaphragm and rib (intercostal) muscles relax
- high levels of carbon dioxide are detected by nervous system receptors
- rib cage moves down and in; diaphragm returns to normal position

- The order in which these events listed above would occur is _____, _____, _____, and _____. Record your **four-digit answer** in the numerical response section on the answer sheet.

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Use the following information to answer the next question.

Residual Volume

A spirometer was used to determine the following lung volumes:

- tidal volume = 500 mL
- vital capacity = 4800 mL
- total lung volume = 6000 mL

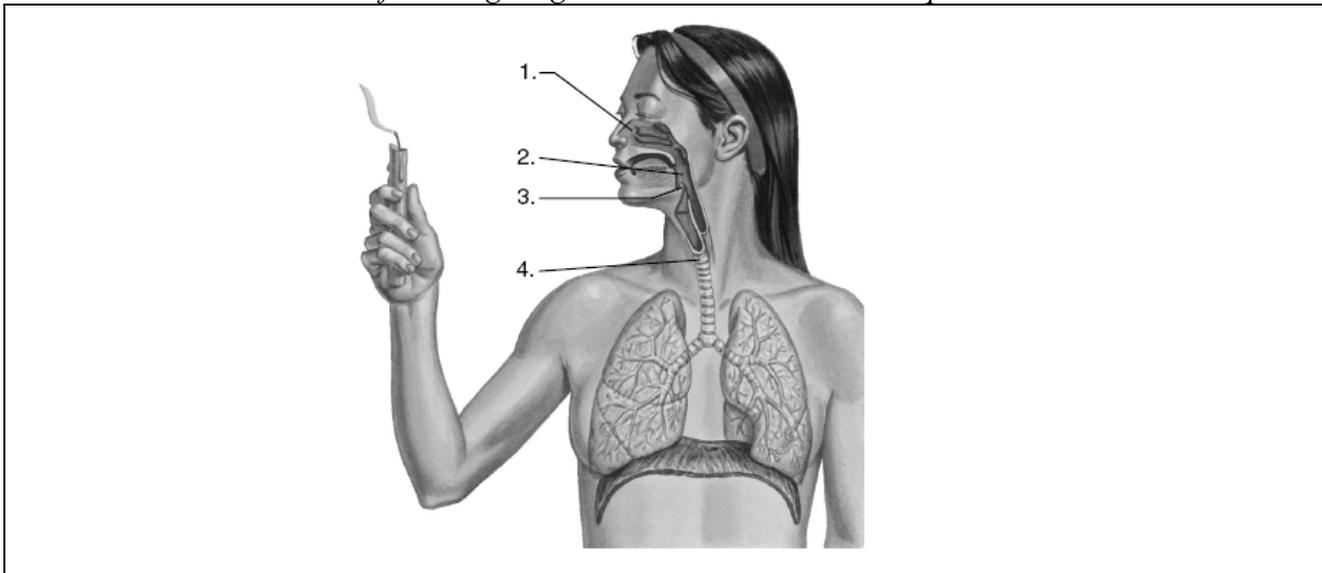
4. The residual volume of this individual would be

Answer: _____

Record your **four-digit answer** in the numerical response section on the answer sheet.

Multiple Choice Questions

Use the following diagram to answer the next two questions.



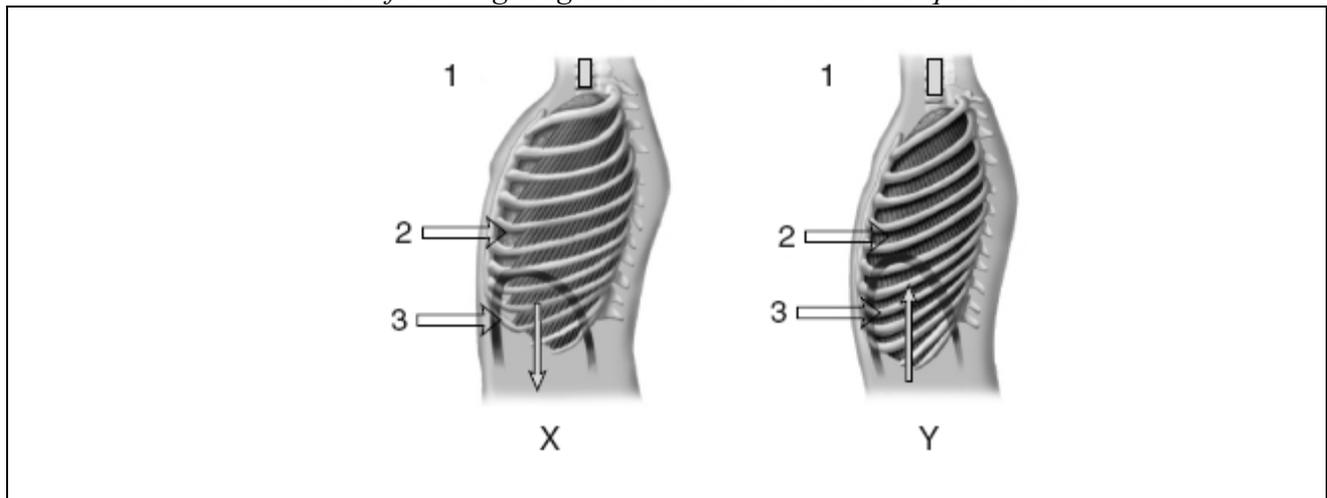
17. Identify the number and the name of the structure that matches the following description.

“This structure contains the turbinate bones that warm and moisten the air.”

- a. 4: trachea
- b. 2: pharynx
- c. 3: epiglottis
- d. 1: nasal cavities

18. Identify the number and the name of the structure that matches the following description.
 “C-shaped cartilage keeps this structure from collapsing during inhalation and exhalation.”
- 4: trachea
 - 2: pharynx
 - 3: epiglottis
 - 1: nasal cavities

Use the following diagram to answer the next two questions



19. The letters X and Y on this illustration represent the processes of
- internal respiration and external respiration, respectively.
 - breathing and cellular respiration, respectively
 - inhalation and exhalation, respectively
 - exhalation and inhalation, respectively
20. Which of the following statements best describes what is happening during X on this illustration?
- rib muscles contract; diaphragm contracts; rib cage moves up and out
 - rib muscles relax; diaphragm contracts; rib cage moves up and out
 - rib muscles contract; diaphragm relaxes; rib cage moves down and in
 - rib muscles relax; diaphragm relaxes; rib cage moves down and in
21. Identify the disorder that is caused by a bacterial infection that can be treated by antibiotics.
- bronchitis
 - asthma
 - laryngitis
 - pleurisy

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Use the information below to answer the following question.

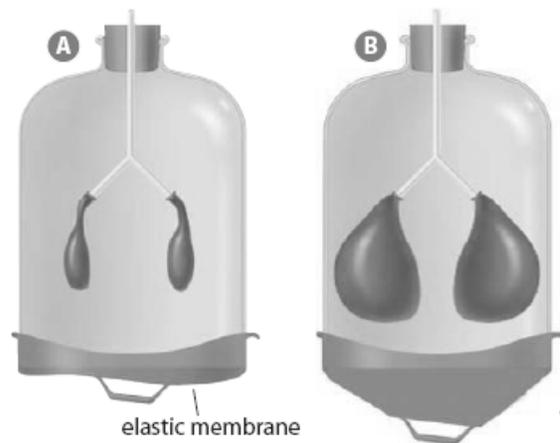
Photochemical Smog Can Kill

Most industrial cities have photochemical smog at least occasionally. Photochemical smog arises when primary pollutants react with one another under the influence of sunlight to form a more deadly combination of chemicals. For example, two primary pollutants, nitrogen oxides (NO_x) and hydrocarbons (HC), react with one another in the presence of sunlight to produce nitrogen dioxide (NO_2), ozone (O_3) and PAN (peroxyacetylnitrate). Ozone and PAN are commonly referred to as oxidants. Breathing oxidants affects the respiratory and nervous systems, resulting in respiratory distress, headache, and exhaustion.

22. Which of the following chronic obstructive lung diseases would likely be aggravated by photochemical smog?
- bronchitis
 - asthma
 - laryngitis
 - pleurisy

Use the following diagram to answer the next question.

A model demonstrating the mechanics of breathing



23. In this model, the elastic membrane represents the
- intercostal muscles.
 - diaphragm.
 - plueral membrane.
 - alveoli.

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Use the following information to answer the next question.

High Altitude Pulmonary Edema (HAPE)

The concentration of oxygen at sea level is about 21 percent and the barometric pressure averages 760 mmHg. As altitude increases, the concentration remains the same but the number of oxygen molecules per breath is reduced. At 3658 m, the barometric pressure is only 483 mmHg, so there are roughly 40 percent fewer oxygen molecules per breath. In order to properly oxygenate the body, your breathing rate (even at rest) must increase. This extra ventilation increases the oxygen content in the blood but not to sea level conditions. Since the amount of oxygen required for activity is the same, the body must adjust to having less oxygen. In addition, for reasons not entirely understood, high altitude and lower air pressure causes fluid to leak from the capillaries, which can cause fluid build-up in both the lungs and the brain. Continuing to higher altitude without proper acclimatization can lead to potentially serious, even life-threatening, illnesses.

High Altitude Pulmonary Edema (HAPE) results from fluid build-up in the lungs. The fluid in the lungs prevents effective oxygen exchange. As the condition becomes more severe, the level of oxygen in the bloodstream decreases, and this can lead to impaired cerebral function and even death. Symptoms include shortness of breath even at rest, tightness in the chest, extreme fatigue, a feeling of impending suffocation, weakness, and a persistent cough bringing up white, watery, or frothy fluid. Confusion and irrational behaviour are signs that insufficient oxygen is reaching the brain.

Source: <http://www.triplecitizen.com/Kili/hape.htm>

24. The structure in the lungs most affected by HAPE would be the
- larynx
 - trachea
 - alveoli
 - bronchi

Use the following information to answer the next question.

Streptococcus pneumoniae

Streptococcus pneumoniae (pneumococcus) is a type of bacterium that comes in pairs and is shaped like a lancet (a surgical knife with a short, wide, two-edged blade).

Pneumococcus is the leading cause of bacterial pneumonia and *otitis media* (middle ear infections) and an important contributor to bacterial meningitis. Pneumococcal infections are the most common invasive bacterial infections in children.

25. The *Streptococcus pneumoniae* bacterium is most likely to infect the ___ and result in the development of ___.
- pharynx; strep throat
 - tonsils; tonsillitis
 - bronchi; bronchitis
 - alveoli; pneumonia

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Written Response Questions

Use the following information to answer the next question.

Bronchoscopy

Bronchoscopy is a surgical technique for viewing the interior of the airways, using sophisticated flexible fibre optic instruments. The procedure involves inserting a tube with a tiny camera on the end through the nose or mouth into the respiratory tract.

1. a) If the flexible fibre optic instrument was inserted through the nose, **list**, in order, the parts of the respiratory system that the camera would pass. **(8 marks)**

- b) A doctor suspects her patient may have lung cancer. **What** is lung cancer and **identify** one reason why a doctor would order a bronchoscopy for this patient? **(3 marks)**

Use the additional information to answer the next question.

The Physiology of the Cough Reflex

Several stimuli can induce cough. If certain afferent cough receptors in the lungs are irritated, a signal is sent via the vagal nerve. Efferent nerves then send messages that stimulate effector organs such as the diaphragm and the intercostal, laryngeal, tracheal, bronchial and abdominal musculature. A cough is the end result of this muscular stimulation.

The Smoker's Cough

Smokers often suffer cough. Parental smoking is also a major cause of cough in children. Normally, the mucous is of sufficiently low viscosity that it is easily moved upward by ciliated cells. Smoking increases the volume of mucus produced in the lungs, and increases its viscosity. Smoking also decreases the activity of the ciliated cells. The pulmonary system must remove increased quantities of abnormally thickened mucus containing entrapped carcinogens, but this is simply not possible in the face of a clinically impaired muco-ciliary defense system.

Source: <http://www.uspharmacist.com>

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c) **Describe** smoker's cough and **explain** why people who smoke develop this problem. **(3 marks)**

Use the additional information to answer the next two questions.

Emphysema

Emphysema is an example of an obstructive pulmonary disorder. Emphysema is a chronic and incurable disorder in which the alveoli are distended and their walls are damaged.

d) **Identify** the three symptoms that a person with emphysema would have, and **explain** why these symptoms would occur. **(6 marks)**

e) Most people with emphysema are or were smokers. **Explain** the role that smoking plays in developing this disorder. **(3 marks)**
