



Attempt questions first; check the separate key afterward. Use labelled diagrams where asked. Give scientific reasons; answer key covers closed questions.

A. Very short answers - 1 mark each

1. Name the site of gas exchange in human lungs.
2. What is normal approximate tidal volume in an adult at rest?
3. Name the chief respiratory pigment in humans.
4. In what form is most CO_2 transported in blood?
5. Which brain region contains the main respiratory rhythm centre?
6. Does the diaphragm contract during normal inspiration?
7. Is normal quiet expiration mainly passive?
8. Name the enzyme accelerating CO_2 hydration in red cells.

B. Short answers / practice - 2 marks each

9. Trace air from nostrils to alveoli.
10. Distinguish conducting and respiratory parts of the airway.
11. Explain functions of pleura and pleural fluid.
12. Relate alveolar structure to efficient diffusion.
13. Explain pressure-volume changes during inspiration.
14. Explain normal expiration using muscle relaxation and elastic recoil.
15. Define inspiratory reserve volume and expiratory reserve volume.
16. Distinguish residual volume from functional residual capacity.
17. Define vital capacity and total lung capacity.
18. Find minute ventilation for tidal volume 500 mL and rate 12/min.
19. Find vital capacity if $\text{TV}=500$, $\text{IRV}=3000$, $\text{ERV}=1100$ mL.
20. Find total lung capacity if $\text{VC}=4600$ mL and $\text{RV}=1200$ mL.

C. Application / reasoning - 3 marks each

21. Explain partial-pressure gradients for O_2 in lungs and tissues.
22. Compare O_2 and CO_2 diffusion across respiratory membranes.
23. Draw and explain the oxyhaemoglobin dissociation curve.
24. How do high CO_2 , high H^+ and high temperature affect O_2 unloading?
25. Explain the forms of CO_2 transport in blood.
26. Describe bicarbonate formation in tissues and its reversal in lungs.
27. Can haemoglobin carry both O_2 and some CO_2 at different binding sites?
28. Explain the role of chemosensitive areas in breathing regulation.
29. Distinguish asthma and emphysema conceptually.
30. Explain how occupational dust exposure can impair respiration.
31. Why does an increase in respiratory rate not necessarily give proportional alveolar ventilation?

D. Extended practice - 5 marks each

32. Draw the human respiratory system and explain the mechanics of ventilation.
33. Explain gas exchange and transport from atmosphere to tissues and back.
34. Compare respiratory volumes and capacities with formulae and sample values.
35. Explain regulation of breathing and contrast major respiratory disorders in mechanism.

ANSWER KEY - Numerical / closed questions

- 1) Alveoli. 2) 500 mL. 3) Haemoglobin. 4) Bicarbonate ions. 5) Medulla oblongata. 6) Yes. 7) Yes. 8) Carbonic anhydrase. 18) 6 L/min. 19) 4600 mL. 20) 5800 mL. 27) Yes.