

Eight week study plan

A shared route to regional confidence and state-level reasoning

Weekly commitment

Each student: four 30-minute independent sessions plus one 90-minute partner session (3.5 hours/week; about 28 hours over eight weeks). Week 8 adds 20 minutes for a second full mock. A coach needs about 15 minutes weekly to select questions and check the error log.

A repeatable learning routine

Independent session: 5 minutes of closed-note recall, 15 minutes of focused learning, 10 minutes of questions. Revisit each new concept the next day, about three days later, and one week later. Draw, explain, predict and calculate; rereading alone is not a checkpoint.

Two students with shared responsibility

Both learn all three systems. Student A leads the first explanation in odd weeks; Student B leads in even weeks. The partner asks why/how and checks with the source, then they swap. During mocks, split sections after a quick scan and cross-check high-point answers. Rotate the starting system; do not create a single-system dependency.

Use the supplied materials efficiently

YR3 deck = 1-27 A&P-YR3_PDF.pdf (73 pages; PPTX is the paired deck). Compact 2027 = AP_Respiratory, Digestive, Immune Systems_Slides2027.pdf (39 pages). Handouts: files 6, 7 and 8. All page numbers are PDF pages. Use 2023 slides for extra diagrams. Hold UMSO out until week 8.

Scope and rules status

AP_RULE_2027.pdf contains official Division B rules B3-B4 and matches the Start Pack rule text. A team has up to two students, approximately 50 minutes, two Class II calculators, and ONE 8.5 x 11-inch sheet with information on BOTH sides. Lamination or a sheet protector is allowed; affixed labels and multiple sheets are prohibited. State additions below follow these rules, overriding national-only labels in the slides.

Start here

Open Practice Tool.html. Select Student A or Student B, choose All systems / Core / Quiz / 12 questions, and take the baseline without notes. Record scores by system. Print the reference double-sided on ONE US-letter sheet at actual size. The two pages are the front and back, not two separate sheets.

Weeks 1 and 2

Respiratory foundations and interpretation

WEEK 1 Map the respiratory system

Read: YR3 deck pp. 7-14; Respiratory Introduction pp. 1-2. Compact 2027 pp. 5-7 for review.

Session 1: Take a 12-question mixed baseline in Quiz mode, without notes. Save the score by system. Learn the air pathway; draw and label nose, pharynx, larynx, trachea, bronchi, bronchioles, alveoli and diaphragm.

Session 2: Explain conducting versus respiratory zones, lung lobes, pleura, mucus and cilia. Add type I cells, type II cells and macrophages as structure-function practice.

Session 3: Use pressure and volume to explain inhalation and quiet exhalation. Compare forced expiration. Learn eupnea, tachypnea, hyperpnea, hyperventilation, apnea and dyspnea.

Session 4 (state, 30 min): Make cause-target-effect cards for TB, pulmonary edema, pleurisy, lung cancers, pulmonary fibrosis and pneumoconiosis. Read compact 2027 p.13; these are state topics under rule 3a(viii).

Partner session: 15 min: each redraws the pathway. 20 min: teach breathing mechanics, then swap roles. 25 min: YR3 sample Stations A-B (question pages 1, 3; keys 2, 4). 20 min: explain mistakes. 10 min: draft the respiratory anatomy box.

Checkpoint: Each student labels at least 8 of 10 structures and explains the pressure-volume-airflow sequence without prompts. If not, replace the next extension activity with 15 minutes of repair.

WEEK 2 Explain gas exchange and lung data

Read: YR3 deck pp. 15-23; compact 2027 pp. 8-15. Use Source Review corrections for CO₂ transport.

Session 1: Recall week 1, then label TV, IRV, ERV and RV on a spirogram. Calculate VC, TLC, IC, FRC and minute ventilation; write units every time.

Session 2: Explain diffusion, surface area and membrane thickness. Trace oxygen and carbon dioxide between alveoli, blood and tissues. Study hemoglobin, the Bohr effect and breathing control.

Session 3: Compare asthma, emphysema, chronic bronchitis, pneumonia, sleep apnea and cystic fibrosis. Link each to a damaged structure and a consequence. Add exercise, altitude and CO₂/pH relationships.

Session 4 (state, 30 min): Read compact 2027 pp.14-15. Link CO₂, pH and breathing control; add a treatment/prevention principle to EVERY respiratory disorder card, including small-cell versus non-small-cell cancer and dust exposure prevention.

Partner session: 15 min: retrieval. 20 min: one student draws a spirogram; the other solves it. 25 min: YR3 Station C (p.5, key p.6; correct Q16) and selected Carolina respiratory graphs. 20 min: error repair. 10 min: refine sheet page 1.

Checkpoint: At least 80% on fresh core respiratory questions and 4 of 5 volume calculations correct. Data practice: interpret FEV₁/FVC and distinguish obstruction from restriction; do not diagnose from the ratio alone.

Weeks 3 and 4

Digestive structure and function

WEEK 3 Trace food and identify digestive tissues

Read: YR3 deck pp. 24-37; Digestive handout pp. 1-2; compact 2027 pp. 17-21, 26 for tissue layers.

Session 1: Spend 5 minutes on respiratory retrieval. Draw mouth to anus, including duodenum, jejunum, ileum and colon regions. Place liver, gallbladder and pancreas beside the pathway.

Session 2: Explain ingestion, propulsion, mechanical digestion, chemical digestion, absorption and defecation. Compare peristalsis with segmentation and bolus with chyme.

Session 3: Draw the gut wall from lumen outward. Identify mucosa, submucosa, muscularis externa and serosa/adventitia. Compare esophageal, stomach, small-intestinal and colonic linings.

Session 4 (state, 30 min): Read compact 2027 p.25. Compare diverticulosis/diverticulitis, GERD, PUD, ulcerative colitis, Crohn and celiac. Record site, cause/mechanism and one distinguishing feature.

Partner session: 15 min: retrieval. 20 min: follow a sandwich through the tract; swap narrator halfway. 25 min: YR3 Station D (p.7, key p.8) and Chicago digestive diagrams with color images. 20 min: explain mistakes. 10 min: draft digestive anatomy box.

Checkpoint: Each student labels at least 10 of 12 digestive structures and orders the four wall layers. Explain why villi help absorption and why food does not pass through the pancreas.

WEEK 4 Connect enzymes absorption and disorders

Read: YR3 deck pp. 38-44; Digestive handout pp. 2-3; compact 2027 pp. 22-27 for state disorders.

Session 1: Build a table with enzyme, source, site, substrate and product. Include amylase, pepsin, trypsin, lipase, lactase, sucrase and maltase. Explain why bile is not an enzyme.

Session 2: Trace sugars and amino acids to portal blood, and most long-chain lipids through chylomicrons and lacteals. Study parietal/chief/G cells, liver functions and pancreatic bicarbonate. Add gastrin, secretin and CCK for state practice.

Session 3: Compare ulcers, diarrhea, lactose intolerance, hepatitis, appendicitis and digestive cancers. Review fiber, nutrients, exercise and obesity. Learn GERD, diverticular disease, ulcerative colitis, Crohn and celiac for state.

Session 4 (state, 30 min): Read compact 2027 pp.26-27. Explain liver/pancreas functions and Kupffer cells. Add treatment/prevention to EVERY digestive disease card; distinguish inflammatory control, dietary management and surgery.

Partner session: 15 min: respiratory review. 20 min: enzyme-table recall, both students. 25 min: YR3 Stations F-G (pp.9,11; keys 10,12; correct Q40) and 6 tool questions. 20 min: correct errors and write mechanisms. 10 min: revise digestive sheet boxes.

Checkpoint: At least 80% on core digestive questions; correctly explain fat digestion and absorption in four steps. Each student identifies one personal weak topic to revisit in week 5.

Weeks 5 and 6

Immune mechanisms and disorders

WEEK 5 Build an immune response from start to finish

Read: YR3 deck pp. 45-61; Immune handout pp. 3-11, with Source Review corrections; compact 2027 pp. 29-32.

Session 1: Recall an older system. Map bone marrow, thymus, lymph nodes, spleen, skin and mucosal lymphoid tissue. Distinguish where cells originate, mature and respond.

Session 2: Compare barriers, phagocytes, NK cells, inflammation, fever and complement. Explain recognition, recruitment and phagocytosis. Match each cell to a job.

Session 3: Trace antigen presentation to helper T cells, B-cell activation, plasma-cell antibody production and memory. Contrast cytotoxic T cells with NK cells. Add MHC I/CD8 and MHC II/CD4 to explain adaptive mechanisms.

Session 4 (state, 30 min): Read compact 2027 p.38. Learn SLE, dermatomyositis, scleroderma, psoriasis and psoriatic arthritis: target tissue, mechanism, hallmark effects and treatment principles.

Partner session: 15 min: mixed retrieval. 20 min: stage an infection-response explanation; swap roles. 25 min: YR3 Stations H-I (pp.13,15; keys 14,16), then 6 immune tool questions. 20 min: correct mechanisms. 10 min: draft immune organs/cells boxes.

Checkpoint: Each student sorts at least 10 of 12 immune examples correctly and gives a six-step response explanation. Both must distinguish antigen, antibody, pathogen and immune cell.

WEEK 6 Compare immunity and immune disorders

Read: YR3 deck pp. 62-73; compact 2027 pp. 33-39 for all regional and state immune disorders.

Session 1: Study IgG, IgA, IgM, IgE and IgD; primary versus secondary responses; natural/artificial and active/passive immunity. Interpret an antibody-response graph.

Session 2: Compare allergy, autoimmunity and immunodeficiency. Learn HIV/AIDS, CVID, SCID, MS, RA, Hashimoto and Graves. Connect disease to target and effect.

Session 3: Regional: hypersensitivity I-IV and named examples. State: autograft/allograft, rejection, antibody therapies and CAR-T. ABO/Rh is optional older-test enrichment.

Session 4 (state, 30 min): Read compact 2027 pp.36-39. Teach transplantation, rejection prevention, antibody therapies and CAR-T. Complete treatment/prevention cards for ALL immune disorders and hypersensitivity examples.

Partner session: 15 min: recall all three systems. 25 min: immune quiz and explanations. 30 min: supplied Regional2027 sample as a team diagnostic (coach checks figure questions first). 20 min: score, log errors and finish sheet draft.

Checkpoint: Aim for 80% in each core system, not merely 80% overall. Identify high-confidence wrong answers first. Any system below 70% receives two extra 15-minute repair blocks next week.

Weeks 7 and 8

Integration and competition rehearsal

WEEK 7 Practice state reasoning and team execution

Read: Revisit pages behind errors; State2027 sample for the mock. Optional challenge: selected MIT curves, not the full exam.

Session 1: Work the weakest core system. Answer, explain why, and state why a tempting alternative is wrong. Reattempt old misses after a delay.

Session 2: State data lab: spirogram, FEV1/FVC, hemoglobin curve, absorption pathways and antibody-response graph. Make one prediction from a changed variable.

Session 3: Label mixed diagrams from Chicago and the 2023 slide diagrams. Use the reference sheet to find 10 facts; aim for 8 within 15 seconds each. Revise navigation, not just font size.

Session 4 (state, 30 min): Run 6 State practice questions and rehearse three 4-minute stations (lung graph, gut diagram, immune mechanism) with 8 minutes of review; use the remaining 10 minutes for the quiz.

Partner session: 50 min: supplied State2027 sample under a practice time limit. 30 min: score with key, verify ambiguous answers, then explain each lost point. 10 min: revise division of work and reference sheet.

Checkpoint: Coach target: at least 75% on state-practice items, all high-point questions attempted, and final five minutes protected for checking. These are training targets, not predicted tournament ranks.

WEEK 8 Rehearse compete and consolidate

Read: UMSO 2023 test, image sheet, answer sheet and draft key; Regional2023 or State2023 as a second unseen paper.

Session 1: Take a second mock individually or together: use Regional2023 for speed/core confidence, or State2023 for extra stretch. Use 50 minutes, adding 20 minutes to the usual individual-session budget.

Session 2: Review the mock for 30 minutes. Relearn the two highest-value weak topics. Each student teaches one difficult mechanism without looking at the sheet.

Session 3: Take a short mixed retrieval quiz, then check printed diagrams, sheet readability, units and allowed equipment. Keep this session light; avoid a large new topic list.

Session 4 (state, 30 min): Revisit the weakest state topic and do a fresh mixed check. Confirm both students can identify disease, mechanism and treatment principle; avoid adding new low-priority trivia.

Partner session: 50 min: UMSO 2023 held-out mock with its image sheet. 30 min: score using the draft key, discuss questionable items, and compare each system with week 1. 10 min: practice the opening scan and final check routine.

Checkpoint: Both students explain all three systems; core scores are consistently at least 80%; repeated error count falls; team finishes with checking time. Freeze the sheet after the final corrections.

Measure progress and work as a team

A score is useful when it tells you what to study next

Keep a short error log

For every miss, record: date; source/question; system/topic; your answer; correct explanation; error type (knowledge, diagram, calculation, wording or time); and retry date. A high-confidence wrong answer is a priority. Do not copy a key without understanding the mechanism.

Coach scoring routine

Score each system separately using points earned / points available. Track diagram and data questions separately from recall. For short answers, award points for each requested idea, not for length. In the tool, written responses use a displayed rubric and must be scored by the student or partner; they are not automatically judged.

Adjust workload using evidence

Below 70% core: replace extension work with two focused 15-minute blocks and a fresh 5-question check. At 70-79%: keep the schedule but repeat the missed concepts. At 80% or more on two separate checks: add state application. High confidence plus a wrong answer gets priority over low-confidence guessing.

A 50-minute practice-test routine

Minutes 0-2: scan sections, points and figures; assign first work. Minutes 2-38: solve in parallel, mark uncertain answers and avoid long stalls. Minutes 38-45: exchange hard/high-point items and finish gaps. Minutes 45-50: check units, question numbers, multi-select wording and missing answers. The rules specify approximately 50 minutes.

Build the reference sheet through retrieval

Weeks 1-2: respiratory anatomy, calculations and disorders. Weeks 3-4: digestive route, enzymes and absorption. Weeks 5-6: cells, antibodies, response sequence and disorders. Week 7: run lookup drills. Week 8: remove clutter and correct errors. A fact you can explain without notes earns its space when it also helps solve a question quickly.

Practice tool and privacy

The tool is free and offline, with editable student names and separate Student A, Student B and Team records. Save each completed result. The coach can review the dashboard in person or a printed session review. Records stay in that browser; there is no automatic computer-to-computer sync. Import replaces all three records. Refresh loses an unfinished quiz.

Coverage checklist and source cautions

Tick each item only after both students can explain it and answer a question

Respiratory coverage

Air pathway and zones; lobes/pleura; cells and mucociliary defense; ventilation; breathing patterns; volumes/capacities; spirometry; gas diffusion; oxygen/CO₂ transport; exercise/altitude; medulla/pons and pH; common disorders and treatment principles. Regional data skills include FEV₁/FVC practice and oxygen curve interpretation. State also adds all extra lung disorders and treatment/prevention. Reference: page 1, columns 1-2; weeks 1-2 and 7.

Digestive coverage

Alimentary canal and accessory organs; six digestive processes; wall layers and epithelial differences; enzymes and products; lipid versus sugar/protein absorption; stomach cells; liver/pancreas; hormones; nutrients/fiber; exercise/obesity; core diseases and treatment principles. Reference: page 1, column 3, and page 2, column 1; weeks 3-4 and 7.

Immune coverage

Immune organs; innate barriers, cells, inflammation and complement; adaptive B/T cells and presentation; antibodies; primary/secondary response; immunity sources; allergies and hypersensitivity; autoimmune and immunodeficiency disorders; transplants and immunotherapy. ABO/Rh is optional older-test enrichment, not specifically listed in the rules. Reference: page 2, columns 2-3; weeks 5-6 and 7.

State additions that must not be skipped

Rules B3-B4 require the additional respiratory, digestive and immune disorders at STATE as well as nationals. State also adds blood chemistry/breathing control, liver/pancreas and Kupffer cells, transplant types/rejection, cancer immunotherapies, and treatment/prevention of ALL listed disorders. Hypersensitivity I-IV is already regional. The national-only slide labels are incorrect.

Source corrections and test quality

Read Source Review before grading. Most CO₂ travels as bicarbonate; TLC includes RV but VC does not; most water is absorbed in the small intestine; blood cells originate in red marrow. YR3 sample Q16/Q40 and the immune handout need these corrections. Bile emulsifies; lipase hydrolyzes. Historical keys are references to verify.

Practice-test selection

Use the YR3 sample for short stations; keys alternate with question pages. Carolina adds graph practice; Northmont/OSU add selected labeling, and CUSO adds stretch reasoning. MIT is optional and unusually hard. UMSO stays unseen for week 8. Source Review inventories all 63 source files and lists corrections. These papers vary in scope and are not interchangeable score benchmarks.