NPTE REVIEW · STUDY GUIDE

Study Guide 4

This guide goes with Practice Exam 4. Chapter 7 closes the neuromuscular block with diseases where the diagnosis changes the dose: no overwork in Guillain Barre, keep the patient with MS cool, train during the levodopa on period, and pick the maneuver for the canal that is involved. Chapter 8 opens the cardiopulmonary block with the numbers that decide whether a patient is safe to treat today: vital signs, exercise responses, rhythms, blood gases and lab values. Learn the diagram, run every worked case with a pencil, and finish each chapter with its ten board-style items.

WHAT THIS GUIDE COVERS

- Chapter 7 · Parkinson signs, freezing and cueing, levodopa timing, MS courses and heat sensitivity, energy conservation, ALS, localizing weakness along the motor unit, Guillain Barre, diabetic neuropathy, post polio, myasthenia and Lambert Eaton, muscular dystrophies, BPPV by canal, hypofunction, central versus peripheral signs, Bell palsy, cerebellar ataxia, Huntington disease and dizziness red flags.
- Chapter 8 · the cardiac cycle, cardiac output and EF, conduction, lung volumes, V/Q and positioning, oxygen transport, vital signs, normal and abnormal exercise responses, Karvonen, RPE, RPP, lines and oxygen devices, ECG intervals and rhythms, heart blocks, ST changes, pacemakers and ICDs, breath sounds, imaging, PFTs, ABGs with ROME, lab values and when to stop.

CHAPTER 7

Neuromuscular: Progressive, Peripheral and Vestibular Disorders

Read it in full: **Chapter 7 in the textbook**. Practice it: **Practice Exam 4** and the **flashcards**.

What to know

Parkinson disease is loss of dopamine neurons in the substantia nigra, so movement becomes small, slow and hard to start. TRAP: **T**remor at rest (4 to 6 Hz pill rolling), **R**igidity (velocity independent, lead pipe or cogwheel), **A**kinesia and bradykinesia, **P**ostural instability, which

appears later and marks Hoehn and Yahr stage 3. Gait is short stepped with en bloc turns, festination and freezing at doorways and turns.

Train during the **on period**, about 45 to 60 minutes after levodopa. Peak dose dyskinesia means too much drug effect, not worse disease. The guideline supports aerobic exercise (about 60 to 85 percent HRR), resistance and balance training, amplitude based training (LSVT BIG) and **external cues** for freezing: floor lines, a metronome, "big step." Turn in a wide arc.

Multiple sclerosis is CNS demyelination; peripheral nerves are spared. Fatigue is the most common symptom. The **Uhthoff phenomenon** is temporary worsening with heat that resolves with cooling; a true relapse lasts at least 24 hours without fever. About 85 percent begin relapsing remitting. Exercise is safe: cool room, morning sessions, intervals, cool pool water below about 84 to 85 °F, and the four Ps (plan, pace, prioritize, position). EDSS 6.0 means a unilateral device for about 100 m.

ALS mixes UMN and LMN signs, sparing sensation, eye movements and continence; median survival is about 3 to 5 years. Exercise only antigravity muscles, submaximally, and plan equipment early. FVC below about 50 percent of predicted prompts a talk about noninvasive ventilation. Overwork weakness (fatigue over 30 minutes, weakness the next day) is the shared danger in ALS, Guillain Barre and post polio syndrome.

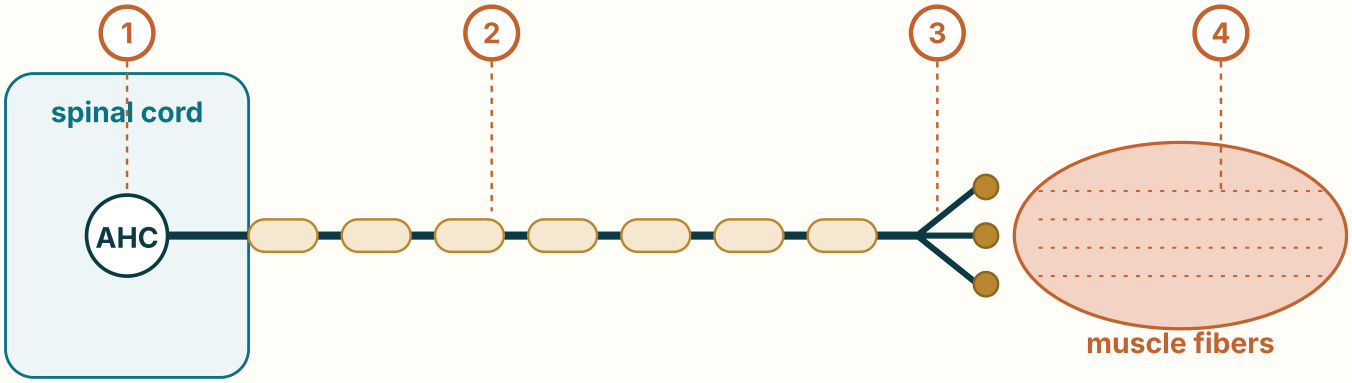
Localize weakness along the motor unit. **Anterior horn cell**: patchy, fasciculations, normal sensation. **Peripheral nerve**: distal, stocking glove sensory loss, low reflexes. **Neuromuscular junction**: fatigable, normal sensation. **Muscle**: proximal, high CK, Gowers sign. **Guillain Barre** ascends, is areflexic, has autonomic swings and may need ventilation; watch vital capacity (about 20 mL/kg is a common intubation threshold). Myasthenia worsens with use; Lambert Eaton improves with use and suggests small cell lung cancer.

Inability to feel the **5.07 (10 g) monofilament** means loss of protective sensation. A warm, red, swollen insensate foot is acute Charcot until proven otherwise: offload and refer. Duchenne is X linked, starts at 2 to 5 years with hip weakness and a Gowers sign; avoid eccentric and high resistance work.

BPPV: otoconia in a canal. Posterior canal (80 to 90 percent) gives **upbeating torsional** nystagmus on Dix-Hallpike toward the down ear, with latency, under 60 seconds and fatigable; treat with the Epley maneuver on that side. Horizontal canal is tested with the supine roll test: geotropic nystagmus is canalithiasis (stronger side affected), apogeotropic is cupulolithiasis (weaker side affected). Downbeating suggests the anterior canal or a central lesion.

Unilateral hypofunction (vestibular neuritis) gives continuous vertigo, nystagmus beating away from the lesion, suppressed by fixation, and a corrective saccade on head impulse toward the lesion. Treat with gaze stabilization (VOR x1, VOR x2), habituation, substitution and balance work. A **normal head impulse** in acute vertigo, direction changing nystagmus or skew deviation suggests a **central** cause: refer urgently.

Bell palsy is a LMN facial palsy of the whole half face including the forehead; a central (UMN) palsy spares the forehead. Protect the eye first, then gentle mirror based retraining; avoid forceful grimacing and routine electrical stimulation, which may promote synkinesis. Cerebellar signs are ipsilateral with a mostly negative Romberg. Huntington disease is autosomal dominant (50 percent risk to each child) with chorea, cognitive decline and psychiatric change.



1 Horn cell (AHC)	2 Peripheral nerve	3 Junction (NMJ)	4 Muscle
ALS, polio, SMA	GBS, CIDP, diabetes	myasthenia, LEMS	dystrophy, myopathy
patchy; fasciculations; sensation normal	distal; stocking glove loss; reflexes low	fatigable; reflexes normal in MG	proximal; high CK; Gowers sign

Find the site first, then dose the exercise to it: no overwork at sites 1 and 2 (ALS, GBS, post polio), time it to medication at site 3, avoid eccentric work at site 4 (Duchenne).

Four places weakness can start. Each site leaves a fingerprint in the pattern of weakness, reflexes and sensation, and each changes how you dose exercise.

LOCK THESE IN

- PD: TRAP; postural instability = Hoehn and Yahr 3; train in the on period.
- Freezing: external cues and wide arc turns.
- MS: cool, paced, morning; Uhthoff resolves with cooling.
- GBS, ALS, post polio: avoid overwork weakness.
- Myasthenia worse with use; Lambert Eaton better with use.
- Posterior canal BPPV: upbeating torsional on Dix-Hallpike; Epley.
- Normal head impulse in acute vertigo = think central.
- Bell palsy hits the forehead; central palsy spares it.

Where is the weakness coming from?

Site	Fingerprint
Anterior horn cell	Patchy, asymmetric; fasciculations; normal sensation (ALS adds UMN signs)
Peripheral nerve	Distal; stocking glove sensory loss; reflexes low or absent
Neuromuscular junction	Fatigable; ptosis and bulbar signs in MG; normal sensation
Muscle	Proximal and symmetric; high CK; Gowers sign
Guillain Barre	Ascending, areflexic, autonomic swings; IVIG or plasma exchange
Post polio	New weakness 15 or more years later; pace and unload
Duchenne	X linked; age 2 to 5; Gowers; avoid eccentric work

Vestibular decisions

Finding	Meaning and action
Upbeating torsional, latency, < 60 s	Posterior canalithiasis: Epley on that side
Same, persists while held	Posterior cupulolithiasis: Semont
Geotropic on roll test	Horizontal canalithiasis; stronger side affected; roll to the other side
Apogeotropic on roll test	Horizontal cupulolithiasis; weaker side affected
Corrective saccade on head impulse	Peripheral hypofunction toward that side
Normal head impulse with acute vertigo	Possible central lesion: urgent referral
Unilateral hypofunction dose	About 3 times a day, 12 or more minutes acute
Bilateral loss	Oscillopsia; substitution, night lights, often a cane

Worked cases

WORKED CASE 1 · FREEZING IN PARKINSON DISEASE

A 71 year old with PD (Hoehn and Yahr 3) freezes in doorways and on turns and has fallen twice. He took levodopa 50 minutes ago. What is the best intervention for freezing?

STEP 1 · CHECK TIMING

50 minutes after a dose is the on period: the right time to train.

STEP 2 · NAME THE DEFICIT

Freezing reflects defective internally generated movement.

STEP 3 · CHOOSE

External cues: transverse floor lines, a metronome near his cadence, or "step over the line," plus wide arc turns and doorway practice.

SAFETY

Two falls and stage 3: home safety assessment and a gait belt.

WORKED CASE 2 · HEAT AND MS

A 34 year old with RRMS (EDSS 3.5) has fatigue and poor walking endurance. A hot shower makes her legs "rubbery" for an hour. What plan fits?

STEP 1 · READ THE CLUE

Short lived worsening with heat is the Uhthoff phenomenon, not a relapse.

STEP 2 · CHOOSE THE DOSE

Graded moderate aerobic and resistance training early in the day in a cool room, with pre cooling or a vest, plus the four Ps.

WHY NOT REST

Deconditioning worsens fatigue, and exercise does not cause relapses. Warm pools provoke heat sensitivity.

WORKED CASE 3 · WHICH EAR, WHICH MANEUVER?

A 68 year old has brief spins when rolling onto her left side or looking up. Left Dix-Hallpike: after 3 seconds, upbeating torsional nystagmus toward the left ear for 20 seconds. Right test negative.

STEP 1 · READ THE NYSTAGMUS

Upbeating and torsional on Dix-Hallpike: posterior canal.

STEP 2 · READ THE TIMING

Latency and under 60 seconds: canalithiasis.

STEP 3 · CHOOSE

Left canalith repositioning (Epley), starting in the left Dix-Hallpike position.

SAFETY

Screen the neck and vertebral arteries first; let her sit a few minutes before standing.

WORKED CASE 4 · BELL PALSY OR STROKE?

A 39 year old woke two days ago with a drooping right mouth. She cannot raise her right eyebrow or close her right eye. Limbs are normal. She asks if she had a stroke.

STEP 1 · CHECK THE FOREHEAD

Whole right face including the forehead: lower motor neuron, **Bell palsy**.

STEP 2 · NOTE THE CLOCK

Within 72 hours: see her physician promptly about corticosteroids.

STEP 3 · FIRST PT STEP

Eye protection (drops, night taping), then gentle mirror based retraining. Avoid vigorous grimacing and routine e-stim.

TRAPS PEOPLE FALL INTO

- **Calling peak dose dyskinesia disease progression.** It is too much dopamine effect.
- **Calling Uhthoff a relapse.** It resolves with cooling; a relapse lasts 24 hours or more without fever.
- **Progressive resistance in acute GBS.** Protect, position and monitor vital capacity; avoid overwork.
- **Gaze stabilization for BPPV.** BPPV needs a repositioning maneuver.
- **Assuming a normal head impulse is reassuring in acute vertigo.** It may mean a central lesion.
- **E-stim for Bell palsy.** Not recommended routinely; it may promote synkinesis.

Chapter 7 self-test · ten items

1. Which finding best separates the rigidity of Parkinson disease from spasticity?

A. Resistance occurs only with fast stretch
B. Resistance is greater in flexors only
C. Resistance gives way suddenly midrange
D. Resistance does not change with speed

D. Resistance does not change with speed Rigidity is velocity independent and bidirectional; spasticity is velocity dependent and may show a clasp knife release.

2. A patient with PD performs well on Monday and poorly on Wednesday. What should the therapist check first?

A. The patient's blood glucose level
B. The time of the last levodopa dose
C. Whether the disease stage has changed
D. Whether a new tremor has appeared

B. The time of the last levodopa dose Motor fluctuations follow the dose cycle. Schedule sessions about 45 to 60 minutes after a dose.

3. During a session in a warm gym, a patient with MS develops blurred vision and leg weakness that clear 30 minutes after cooling. What is this?

A. The Uhthoff phenomenon
B. An optic neuritis attack
C. A new MS relapse
D. Orthostatic hypotension

A. The Uhthoff phenomenon Heat slows conduction in demyelinated axons; it resolves with cooling. A relapse lasts at least 24 hours.

4. A man with ALS has antigravity strength in the quadriceps and 2/5 dorsiflexors. Which plan fits?

A. Eccentric training for the dorsiflexors
B. No exercise for any muscle at all
C. Submaximal exercise for the quadriceps only
D. Heavy resistance for both muscle groups

C. Submaximal exercise for the quadriceps only Exercise muscles with at least antigravity strength, submaximally; weaker muscles risk overwork. An AFO can help the dorsiflexors.

5. Four days after onset of GBS, weakness is still progressing and BP swings from 90/60 to 170/100. What is the priority?

A. High intensity cycling for endurance
B. Prolonged gait training in parallel bars
C. Positioning, ROM and close vital monitoring
D. Progressive resisted exercise of the legs

C. Positioning, ROM and close vital monitoring In the progressive phase with autonomic instability, protect and prevent: positioning, ROM, splints, skin and airway care.

6. A patient has ptosis and diplopia that worsen through the day and improve after rest. Reflexes and sensation are normal. Where is the problem?

A. Anterior horn cell body
B. Muscle fiber membrane
C. Peripheral nerve axon
D. Neuromuscular junction

D. Neuromuscular junction Fatigable weakness with ocular signs and normal sensation and reflexes is myasthenia gravis at the NMJ.

7. On the supine roll test, horizontal nystagmus beats toward the ground on both sides and is stronger with the head turned right. What is most likely?

A. Right horizontal canal canalithiasis
B. Right posterior canal canalithiasis
C. Right horizontal cupulolithiasis
D. Left horizontal canal canalithiasis

A. Right horizontal canal canalithiasis Geotropic nystagmus means canalithiasis, and the side with the stronger response is affected.

8. A patient with acute continuous vertigo has nystagmus that changes direction with gaze and a normal head impulse test. What is the best action?

A. Begin VOR x1 gaze stabilization today
B. Urgent medical referral for a central cause
C. Teach Brandt-Daroff exercises for home
D. Perform an Epley maneuver on both sides

B. Urgent medical referral for a central cause Direction changing nystagmus and a normal head impulse in acute vertigo are central signs.

9. After a left MCA stroke, a patient's lower right face droops but he can wrinkle his forehead. What does this show?

A. A left facial nerve lesion at the canal
B. A LMN palsy of the right facial nerve
C. Bell palsy on the right side of the face
D. An UMN facial palsy sparing the forehead

D. An UMN facial palsy sparing the forehead The upper face has input from both hemispheres, so a cortical lesion weakens only the opposite lower face.

10. A patient has dysmetria and intention tremor on the left, and is no worse with the eyes closed. Where is the lesion?

A. Left cerebellar hemisphere
B. Right cerebellar hemisphere
C. Right basal ganglia
D. Left dorsal columns

A. Left cerebellar hemisphere Cerebellar signs are ipsilateral, and cerebellar ataxia changes little without vision.

CHAPTER 8

Cardiovascular and Pulmonary Foundations: Physiology, Examination and Monitoring

Read it in full: **Chapter 8 in the textbook**. Practice it: **Practice Exam 4** and the **flashcards**.

What to know

Cardiac output is **HR × SV**, about 5 L/min at rest. Stroke volume depends on preload (Frank Starling), afterload and contractility. Normal EF is about 55 to 70 percent; HFrEF is 40 percent or less. MAP is about DBP plus one third of pulse pressure, and at least about 65 mmHg perfuses the organs. The coronaries fill in diastole, so tachycardia cuts supply as demand rises. The RCA usually supplies the SA and AV nodes and the inferior wall. S3 suggests volume overload (heart failure); S4 a stiff ventricle.

The SA node fires 60 to 100 a minute; the AV junction escapes at 40 to 60 and the ventricles at 20 to 40. Lung volumes: TV about 500 mL, IRV about 3,000, ERV about 1,100 to 1,200, RV about 1,200; VC about 4,800, FRC about 2,400, TLC about 6,000. RV cannot be measured by spirometry. Alveolar ventilation is (TV minus dead space) times rate, so rapid shallow breathing wastes air.

Ventilation and perfusion are both greatest at the bases, but the **V/Q ratio is highest at the apex**. Dead space is ventilation without perfusion (PE); shunt is perfusion without ventilation (pneumonia, atelectasis). For unilateral disease in an adult, put the **good lung down**, except with an abscess or bleeding, and in infants. **PaO_2 60 ≈ SaO_2 90**. A right shift (CO_2, acid, 2,3-BPG, exercise, temperature) unloads oxygen to muscle.

Resting values: HR 60 to 100, RR 12 to 20, BP below 120/80, SpO_2 95 to 100 percent. With graded exercise, HR and SBP rise (SBP about 10 mmHg per MET) and **DBP stays about the same**. Stop for an SBP fall of more than 10 mmHg with rising work, SBP over 250 or DBP over 115, a DBP rise over 10, or SpO_2 below about 88 to 90 percent. Orthostatic hypotension is a drop of 20 systolic or 10 diastolic within 3 minutes.

Karvonen: target HR = (HRmax − HRrest) × intensity + HRrest. Moderate is 40 to 59 percent of HRR. With **beta blockers**, use RPE (11 to 13 in cardiac rehab), not an age formula. RPP = HR × SBP reflects myocardial oxygen demand; angina recurs at a reproducible RPP. One MET is 3.5 mL O_2/kg/min. No BP cuff over a PICC, arterial line, fistula or at risk lymphedema arm. Keep chest tube drainage upright and below the chest, never clamped.

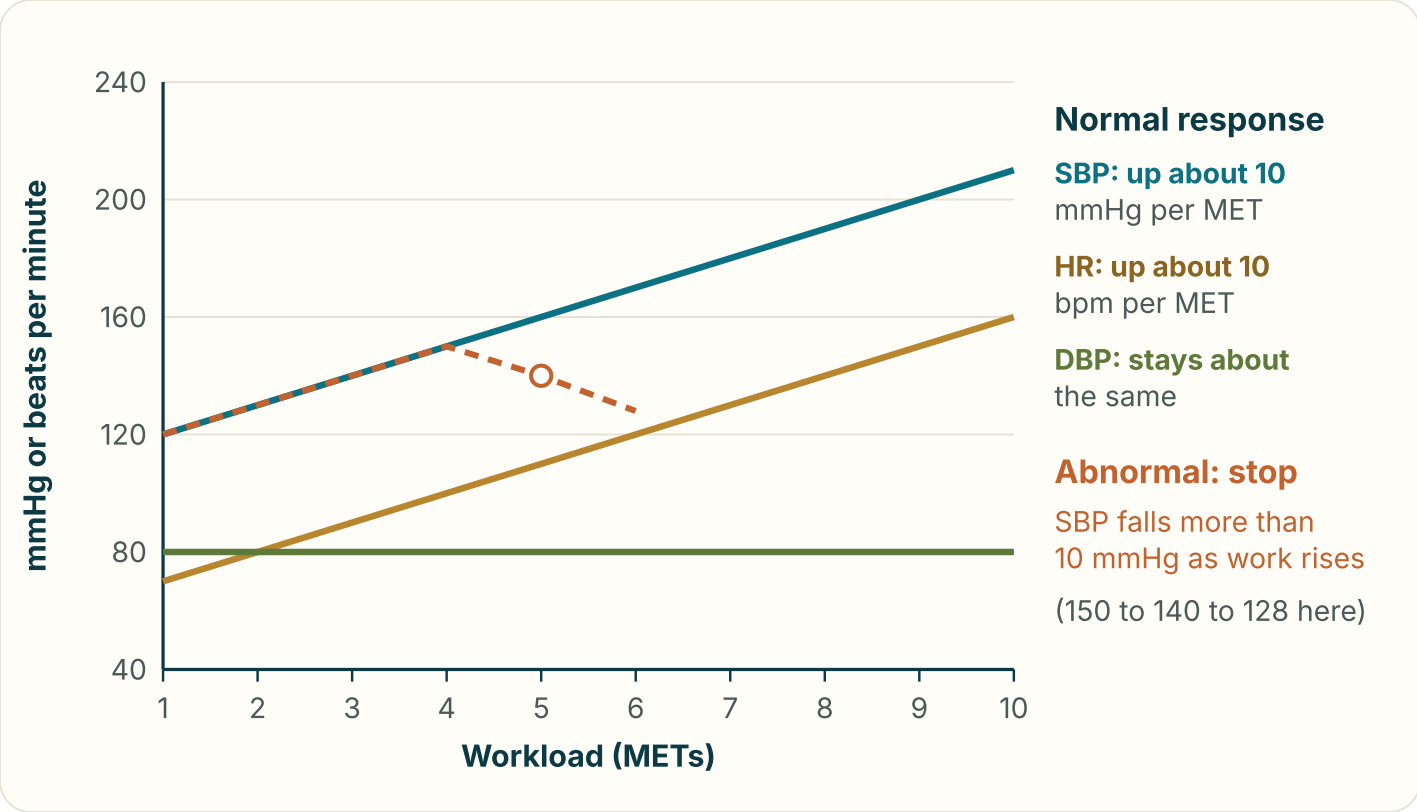
ECG paper: small box 0.04 s, large box 0.20 s. PR 0.12 to 0.20 s; QRS under 0.12 s. Rate = 300 ÷ large boxes between R waves, or QRS in 6 s × 10 for an irregular rhythm. Atrial fibrillation: no P waves, irregularly irregular. Three or more PVCs in a row is **VT: stop**. First degree and Wenckebach are usually benign; **Mobitz II and third degree** mean no exercise. ST depression of 1 mm or more suggests ischemia; ST elevation suggests injury; Q waves an old infarct. Keep exercise HR 10 to 20 below an ICD detection rate.

Breath sounds: fine crackles (atelectasis, fibrosis, edema), coarse crackles and rhonchi (secretions), wheezes (narrowed airways), stridor (upper airway emergency). Consolidation gives bronchial sounds, egophony, more fremitus and dullness; effusion gives less fremitus and dullness; pneumothorax gives hyperresonance. **FEV_1/FVC below 0.70** is obstruction (air trapping, high RV); a **low TLC** defines restriction.

Read blood gases with **ROME**: Respiratory Opposite, Metabolic Equal. pH 7.35 to 7.45, $PaCO_2$ 35 to 45, HCO_3 22 to 26. Decide acid or base from pH, find the cause, then judge compensation. A

rising $PaCO_2$ in a tiring COPD or asthma patient is ominous.

Labs: Hgb about 13.5 to 17.5 (men) and 12 to 16 (women); a falling trend matters more than one value. Platelets 150,000 to 450,000; below about 20,000 means essential mobility only after consulting the team. INR 2.0 to 3.0 on warfarin is therapeutic. Glucose: **below 70, treat first** (rule of 15); 100 to 250 exercise; over 250 check ketones. K^+ 3.5 to 5.0. A rising troponin means active injury. Absolute contraindications include unstable angina, decompensated heart failure, symptomatic severe aortic stenosis and acute PE or untreated DVT.



The normal exercise response, and the one that means stop. Systolic pressure and heart rate climb with the workload while diastolic pressure stays flat. A systolic pressure that falls as work rises is always abnormal.

LOCK THESE IN

- CO = HR × SV; EF 55 to 70%; MAP ≥ 65.
- V/Q highest at apex; good lung down in adults.
- PaO_2 60 = SaO_2 about 90.
- Exercise: HR and SBP up, DBP flat. SBP drop > 10 = stop.
- Beta blocker: use RPE 11 to 13.
- Small box 0.04 s, large box 0.20 s; rate = 300 ÷ large boxes.
- VT, Mobitz II, third degree block: stop or do not start.
- $FEV_1/FVC < 0.70$ obstruction; low TLC restriction; ROME for gases.

Formulas and numbers

Item	Value or formula
Cardiac output	HR × SV; about 5 L/min at rest
Karvonen	THR = (HRmax − HRrest) × % + HRrest
Age predicted max	220 − age; Tanaka 208 − 0.7 × age
Rate pressure product	HR × SBP
MET	3.5 mL O_2/kg/min
CaO_2	(1.34 × Hb × SaO_2) + (0.003 × PaO_2)
ECG rate	300 ÷ large boxes; 1,500 ÷ small boxes
ABG normals	pH 7.35 to 7.45; $PaCO_2$ 35 to 45; HCO_3 22 to 26

Lab thresholds for activity

Lab	Commonly taught guide
Hemoglobin	≥ 10 usual; 8 to 10 monitor closely; < 8 symptom limited, team decision
Platelets	> 50,000 progressive; 20,000 to 50,000 light; < 20,000 essential only
INR on warfarin	2.0 to 3.0 therapeutic; discuss above about 4
Glucose < 70	Do not start; 15 g fast carbohydrate, recheck in 15 min
Glucose 70 to 100	15 to 30 g carbohydrate first
Glucose > 250	Check ketones; postpone if present
Potassium	3.5 to 5.0; defer with significant abnormality
Troponin	Rising = ongoing injury; hold beyond team limits

Worked cases

WORKED CASE 1 · A KARVONEN TARGET

A 60 year old has a resting HR of 70 and is not on a beta blocker. What is the target HR at 50 percent of heart rate reserve?

STEP 1 · MAXIMUM

220 − 60 = 160.

STEP 2 · RESERVE

160 − 70 = 90.

STEP 3 · INTENSITY

90 × 0.50 = 45.

STEP 4 · ADD REST BACK

45 + 70 = **115 bpm**.

WORKED CASE 2 · A FALLING SYSTOLIC PRESSURE

A 58 year old on metoprolol walks 150 feet. Before: HR 64, BP 128/76. After: HR 78, BP 112/74, lightheaded, RPE 15.

STEP 1 · COMPARE SBP

128 − 112 = a 16 mmHg fall with more work: abnormal.

STEP 2 · WEIGH SYMPTOMS

Lightheaded with RPE 15: the load is too hard.

STEP 3 · DISCOUNT HR

A small HR rise is expected on a beta blocker and is not reassuring.

STEP 4 · ACT

Stop, sit her down, recheck vitals and notify the nurse or physician.

WORKED CASE 3 · READING A BLOOD GAS

A 72 year old with a COPD exacerbation has pH 7.31, $PaCO_2$ 58, HCO_3 29, PaO_2 56 on 2 L/min.

STEP 1 · PH

7.31 is below 7.35: acidemia.

STEP 2 · ROME

$PaCO_2$ is high, opposite to pH: **respiratory acidosis**.

STEP 3 · COMPENSATION

HCO_3 29 is above 26 and pH is still abnormal: **partially compensated**, typical of chronic CO_2 retention made worse.

STEP 4 · PLAN

Forward lean sitting, pursed lip and diaphragmatic breathing, short low intensity bouts, oxygen within the order (often SpO_2 88 to 92 percent). Report drowsiness or rising CO_2.

WORKED CASE 4 · TREND BEATS A SINGLE NUMBER

Two days after TKA: Hgb 8.6 (10.4 yesterday), platelets 182,000, INR 1.3, K^+ 3.9. Resting HR 104, BP 102/64, "washed out."

STEP 1 · FIND THE CHANGE

10.4 − 8.6 = a 1.8 g/dL fall in one day.

STEP 2 · ADD THE VITALS

Resting tachycardia and soft BP suggest bleeding or hypovolemia.

STEP 3 · ACT

Talk with the nurse or surgeon before progressing; bedside activity with close monitoring only if cleared. Other labs are acceptable.

WORKED CASE 5 · HEART RATE FROM A STRIP

On a regular rhythm strip, R waves are 4 large boxes apart. Another irregular strip shows 9 QRS complexes in 6 seconds. Find both rates.

STEP 1 · REGULAR

300 ÷ 4 = **75 bpm**.

STEP 2 · IRREGULAR

9 × 10 = **90 bpm**.

CHECK

A small box is 0.04 s, so 4 large boxes = 20 small boxes = 0.80 s per beat; 60 ÷ 0.80 = 75.

TRAPS PEOPLE FALL INTO

- **Trusting HR on a beta blocker.** Use RPE, BP and symptoms.
- **Calling a flat DBP abnormal.** DBP normally stays about the same with exercise.
- **Lying the bad lung down for pneumonia.** Good lung down, unless abscess or bleeding.
- **Treating Wenckebach like Mobitz II.** Mobitz II and third degree block are the dangerous ones.
- **Reading one hemoglobin value without the trend.** A fast fall with tachycardia matters more than a stable low.
- **Stopping a patient whose INR is 2.5 on warfarin.** 2.0 to 3.0 is therapeutic.

Chapter 8 self-test · ten items

1. A patient's heart rate is 80 bpm and stroke volume 70 mL. What is the cardiac output?

A. 5.0 L/min
B. 4.8 L/min
C. 6.4 L/min
D. 5.6 L/min

D. 5.6 L/min 80 × 70 mL = 5,600 mL/min = 5.6 L/min.

2. Which volume cannot be measured with simple spirometry?

A. Residual volume
B. Inspiratory reserve volume
C. Tidal volume
D. Vital capacity

A. Residual volume RV needs plethysmography or gas dilution, so FRC and TLC cannot be measured by spirometry either.

3. An adult has left lower lobe pneumonia. Which position best improves oxygenation?

A. Left side lying, left side down
B. Right side lying, left side up
C. Prone with the head down
D. Supine with the bed flat

B. Right side lying, left side up Good lung down sends perfusion to ventilated alveoli and puts the involved lobe up for drainage.

4. During graded exercise, BP goes from 130/80 at rest to 150/82, then to 136/84 at the next stage. What should happen?

A. Increase the workload to recheck it
B. Continue: diastolic change is normal
C. Stop: SBP fell more than 10 mmHg
D. Continue: the SBP is still above rest

C. Stop: SBP fell more than 10 mmHg A systolic fall of more than 10 mmHg as work increases is abnormal and a reason to stop.

5. A 70 year old has a resting HR of 60 and is not on a beta blocker. What is the target HR at 60 percent of HRR using 220 minus age?

A. 105 bpm
B. 90 bpm
C. 120 bpm
D. 114 bpm

D. 114 bpm HRmax 150; reserve 90; 90 × 0.60 = 54; 54 + 60 = 114.

6. Which is the best way to set intensity for a patient taking a beta blocker?

A. An age predicted target heart rate
B. The Karvonen formula at 60 percent
C. A rating of perceived exertion
D. The resting heart rate plus 40 bpm

C. A rating of perceived exertion Beta blockers blunt HR, so age based targets are invalid. Use RPE (11 to 13) or a medicated test.

7. The PR interval is constant, and suddenly a P wave is not followed by a QRS. What is this rhythm and what is the action?

A. Mobitz II; do not exercise, notify
B. Atrial flutter; reduce workload only
C. First degree block; continue with care
D. Wenckebach; usually benign, continue

A. Mobitz II; do not exercise, notify A constant PR with dropped beats is Mobitz II, which can progress to complete block.

8. A patient has dullness, decreased fremitus and absent breath sounds over the right base. What is most likely?

A. Pneumothorax
B. Pleural effusion
C. Lobar consolidation
D. Emphysema

B. Pleural effusion Fluid between lung and wall dulls percussion and reduces fremitus. Consolidation increases fremitus; pneumothorax is hyperresonant.

9. pH 7.50, $PaCO_2$ 30, HCO_3 24. How is this read?

A. Partly compensated respiratory acidosis
B. Uncompensated respiratory alkalosis
C. Compensated metabolic alkalosis
D. Uncompensated metabolic alkalosis

B. Uncompensated respiratory alkalosis High pH with low CO_2 (opposite) is respiratory; normal HCO_3 means no compensation yet.

10. A patient on insulin has a pre-exercise glucose of 62 mg/dL. What is the first step?

A. Begin exercise at a lower intensity
B. Begin exercise and recheck after it
C. Give insulin and wait 30 minutes
D. Give 15 g of fast carbohydrate, recheck

D. Give 15 g of fast carbohydrate, recheck Below 70 is hypoglycemia: do not start. Use the rule of 15, then a snack before resuming.

ONE PAGE

Cram sheet

One page for Study Guide 4. Cover the right column and say the answer before you look.

Progressive and vestibular

Topic	Rule
PD	TRAP; on period 45 to 60 min after dose; cues for freezing
MS	Cool, paced; Uhthoff resolves; four Ps
ALS	UMN + LMN; spares sensation and eyes; FVC < 50% discuss NIV
Overwork	GBS, ALS, post polio: submaximal, rested
NMJ	MG worse with use; LEMS better with use
Neuropathy	10 g monofilament; hot swollen foot = Charcot
BPPV	Posterior: upbeat torsional, Epley. Horizontal: roll test
Central signs	Direction changing nystagmus, normal head impulse, skew
Bell palsy	Whole half face; protect eye; no grimacing
HD	Autosomal dominant; chorea, cognition, mood

Cardiopulmonary foundations

Topic	Rule
Vitals	HR 60 to 100; RR 12 to 20; BP < 120/80; SpO_2 95 to 100%
Exercise	SBP up about 10 per MET; DBP flat; stop if SBP falls > 10
Hypertensive stop	SBP > 250 or DBP > 115
Intensity	Karvonen; RPE with beta blockers; RPP = HR × SBP
ECG	PR 0.12 to 0.20; QRS < 0.12; 3 PVCs in a row = VT
Blocks	1st and Wenckebach usually OK; Mobitz II and 3rd = no
ST	Depression ischemia; elevation injury; Q old infarct
PFT	FEV_1/FVC < 0.70 obstruction; low TLC restriction
ABG	ROME; compensation if the other value moves
Labs	Glucose < 70 treat; > 250 ketones; INR 2 to 3 OK

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