

LAST-HOUR CRAM SHEET · Physical Education

CBSE Class 12 Physical Education (048) · Theory 70
+ Practical 30 · Read this in the 60 minutes before
you walk in

A. The Paper at a Glance

Unit	Name	Marks	Priority
1	Management of Sporting Events	5 + 4 b*	Fixtures are drawn, not described
2	Children and Women in Sports	7	Deformities + Female Athlete Triad
3	Yoga as Preventive Measure	6 + 1 b*	Procedure / Benefits / Contraindications
4	Physical Education for CWSN	4 + 4 b*	ADHD, SPD, ASD, ODD full forms
5	Sports and Nutrition	7	Pre / During / Post competition diet
6	Test and Measurement in Sports	8	Khelo India + Rikli & Jones lists
7	Physiology and Injuries	4 + 4 b*	Effects of exercise; strain vs sprain
8	Biomechanics and Sports	10	LARGEST UNIT — draw everything
9	Psychology and Sports	7	Big Five + aggression types
10	Training in Sports	9	Methods: name + how + example

STRATEGY Unit 8 (10) + Unit 10 (9) +

Unit 6 (8) = 27 of 70. These three are almost pure lists and diagrams — the highest marks per hour in the paper. *b** questions are competency-based: tactile diagram, data interpretation or case study.

SECTION STRUCTURE — from the official 2026-27 sample paper

Section	Questions	Each	Attempt	Worth
A	1–18	1 mark	all 18	18 — MCQ, no choice
B	19–24	2 marks	any 5 of 6	10 — 60–90 words
C	25–30	3 marks	any 5 of 6	15 — 100–150 words
D	31–33	4 marks	all 3	12 — case studies, internal choice
E	34–37	5 marks	any 3 of 4	15 — 200–300 words

$18 + 10 + 15 + 12 + 15 = 70$. You actually answer **34 of the 37** questions. *Why the unit table above adds to 80, not 70: the paper prints 80 marks, but sections B, C and E give you more questions than you answer. The unit weightages are marks printed; your paper*

is still out of 70. Both numbers are right.

New in 2026-27: Section D now says “There is an internal choice available.” The 2025-26 paper did not. So the case studies are no longer all compulsory — read them before you pick.

Sections B, C and E let you drop questions. Scan all of them first and answer your strongest; there is no credit for attempting extras.

B. Every Formula and Number

FIXTURES (Unit 1)

Knock-out matches = $N - 1$

Byes = Next higher power of 2 – N

Single league = $N(N-1)/2$ Double league = $N(N-1)$

BODY MEASURES

BMI = Weight (kg) ÷ Height² (m) — <18.5 under · 18.5–24.9 normal · 25–29.9 over · 30+ obese

Waist-Hip Ratio = Waist ÷ Hip — risk above 0.90 (men), 0.85 (women)

Cardiac Output = Stroke Volume × Heart Rate

TESTS

Harvard Fitness Index = $(\text{Duration in sec} \times 100) \div (2 \times \text{sum of 3 pulse counts})$

Barrow GMA = $2.2(\text{Broad Jump}) + 1.6(\text{Medicine Ball}) - 1.0(\text{Zig-Zag Run})$

NUTRITION

Carbohydrate 4 kcal/g · **Protein** 4 kcal/g · **Fat** 9 kcal/g

BIOMECHANICS

F = m × a (Newton's second law)

Best projectile angle = 45° when release and landing heights are equal

C. The Lists You Must Recite

Topic	The list
Event management functions	POSDC — Planning, Organising, Staffing, Directing, Controlling
7 postural deformities	Knock knees · Bow legs · Flat foot · Round shoulders · Lordosis · Kyphosis · Scoliosis
Female Athlete Triad	Eating disorders → Amenorrhoea → Osteoporosis
5 lifestyle diseases	Obesity · Diabetes · Asthma · Hypertension · Back Pain & Arthritis

4 disorders (CWSN)	ADHD Attention Deficit Hyperactivity · SPD Sensory Processing · ASD Autism Spectrum · ODD Oppositional Defiant
3 disability games	Special Olympics Bharat (intellectual) · Paralympics (physical) · Deaflympics (hearing, oldest 1924)
Khelo India 5–8 yrs (3)	BMI · Flamingo Balance · Plate Tapping
Khelo India 9–18 yrs (6)	BMI · 50 m Dash · 600 m Run/Walk · Sit & Reach · Partial Curl Up · Push Ups
Rikli & Jones (6)	Chair Stand · Arm Curl · Chair Sit & Reach · Back Scratch · 8 Foot Up & Go · 6 Minute Walk
Barrow (3)	Standing Broad Jump · Zig-Zag Run · Medicine Ball Put
Newton's laws	Inertia · Acceleration ($F=ma$) · Action-Reaction
Big Five	OCEAN — Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism
3 aggression types	Hostile (harm) · Instrumental (goal) · Assertive (within rules)
4 psychological attributes	Self-Esteem · Mental Imagery · Self-Talk · Goal Setting
7 coordinative abilities	Orientation · Coupling · Reaction · Balance · Rhythm · Adaptation · Differentiation
First aid	PRICE — Protection, Rest, Ice, Compression, Elevation

D. The Pairs That Decide Marks

NEVER MIX THESE UP

- **Knock knees** = knees touch, ankles apart. **Bow legs** = knees apart, ankles touch.
- **Lordosis** = lower back, inward → forward bending. **Kyphosis** = upper back, outward → backward bending. **Scoliosis** = sideways → lateral bending. *Correction is always the opposite direction.*
- **Strain** = muscle or Tendon. **Sprain** = Ligament at a joint.
- **Laceration** = irregular tear. **Incision** = clean straight cut.
- **Hypertrophy** = fibres get bigger. *Exercise never increases fibre number.*
- **Intramural** = within the institution. **Extramural** = between institutions.
- **Interval** = planned, timed, fixed recovery. **Fartlek** = unplanned, athlete varies pace on natural terrain.
- **Isometric** = no movement. **Isotonic** = movement. **Isokinetic** = constant speed, needs a machine.

- **Intrinsic** motivation = from within. **Extrinsic** = external reward.
- **ADHD** = child **cannot** focus. **ODD** = child **will not** obey.
- **Static** equilibrium = at rest. **Dynamic** = moving at constant velocity.
- **Food intolerance** = digestive, not dangerous. **Food allergy** = immune, can be fatal.
- **Micro nutrients** give **NO** energy — only carbs, protein and fat do.

E. Facts You Must Not Get Wrong

MEMORISE EXACTLY

- Third class lever is the most common in the body (biceps curl). 1st = Fulcrum middle, 2nd = Resistance middle, 3rd = Effort middle.
- Deaflympics is the oldest (Paris, 1924), not Paralympics. Hearing aids are banned during Deaflympics.
- Paralympics: IPC, 1989, motto "Spirit in Motion", symbol three Agitos.
- Circuit training: Morgan and Adamson, 8-12 stations.
- Fartlek is Swedish for "speed play".
- Stability rises with a lower CG, wider base and greater weight.
- Hypertension = above 140/90, the "silent killer". Avoid Halasana, Chakrasana, Kapalbhati.
- Mandukasana is the key diabetes asana (presses the pancreas). Anuloma-Viloma is the key asthma pranayama. Shavasana for hypertension.
- Pre-competition meal: HIGH carb, LOW fat, LOW fibre, 3-4 hours before.

- **Post-competition: carb + protein within 30 min to 2 hours, ratio about 3:1 or 4:1.**
- **Fat-soluble vitamins: A, D, E, K. Rest are water-soluble.**
- **WHO: 5-17 yrs = 60 min daily. 18-64 = 150-300 min per week.**
- **Rockport = one mile walk $\rightarrow$ VO_2 max. Harvard = step test $\rightarrow$ fitness index.**
- **Jung gave introvert / extrovert / ambivert.**

F. Master Question Triggers

If the question says...	Answer	Unit
"11 teams, knock-out"	5 byes, 10 matches	1
"inter-school competition"	Extramural	1
"knees touch, ankles apart"	Knock knees $\rightarrow$ horse riding, Padmasana	2
"spine curved sideways"	Scoliosis $\rightarrow$ Trikonasana	2
"thin athlete, no periods, stress fracture"	Female Athlete Triad	2
"asanas for a diabetic"	Mandukasana, Bhujangasana, Kapalbhathi	3

"high BP — which asana to avoid?"	Halasana, Chakrasana, Kapalbhathi	3
"cannot sit still, blurts out answers"	ADHD	4
"avoids eye contact, resists change"	ASD	4
"visual signals, no hearing aids"	Deaflympics	4
"night blindness" / "goitre" / "scurvy"	Vitamin A / Iodine / Vitamin C	5
"meal 3 hours before the match"	High carb, low fat, low fibre	5
"balance test for a 6-year-old"	Flamingo Balance Test	6
"lower body strength in the elderly"	Chair Stand Test	6
"twisted ankle, ligament torn"	Sprain → PRICE	7
"resting pulse of athlete is 45"	Bradycardia	7
"swimmer pushes water back"	Newton's third law	8
"standing on tiptoe"	Second class lever	8
"wrestler crouches, feet apart"	Lower CG + wider base → stability	8
"spikes on shoes" / "wax on skis"	Friction advantage / reducing friction	8
"punched opponent in anger"	Hostile aggression	9
"hard tackle to win the ball"	Instrumental aggression	9

"visualised the jump beforehand"	Mental imagery	9
"pushing against a wall"	Isometric exercise	10
"varied pace at will over hills"	Fartlek	10
"held the stretch 20 seconds"	Static stretching	10
"partner resisted, then stretched further"	PNF	10

G. How to Write for Marks

Marks	What the examiner wants
1	One term, one full form, or one formula.
3	Three named points with a one-line explanation each.
5	Five points with bold headings + example. Draw the diagram if the topic has one.
b*	Competency question — fixture diagram, data interpretation or case study. Name → define → quote the case.
Asanas	Always three headings: Procedure / Benefits / Contraindications.
Diagrams	Knock-out fixture · levers with F-A-R labelled · projectile parabola with angle · base of support. Each carries its own mark.

THE THREE HABITS THAT SAVE MARKS — **1.** For every test, add **what it measures** — the most commonly dropped mark. **2.** For every deformity, name **two corrective asanas** — "do stretching" earns nothing. **3.** For

every “effect of exercise”, use the **technical term** —
hypertrophy, bradycardia, stroke volume, VO_2 max.

Chapter 1 · Management of Sporting Events

CBSE Class 12 Physical Education (048) · Unit 1 =

9 marks (5 + 4 b*) · Ultimate Revision Sheet

60-SECOND RECALL

5 functions	POSDC — Planning, Organising, Staffing, Directing, Controlling
Committees	Pre · During · Post event
Knock-out formula	Matches = $N - 1$ (N = number of teams)
League formula	Matches = $N(N-1)/2$ (single league)
Byes	= Next power of 2 – N
Intramural vs Extramural	Intra = within the same institution · Extra = between institutions

1. Functions of Sports Event Management

POSDC — Planning, Organising, Staffing, Directing, Controlling

1. **Planning** — deciding in advance what to do: budget, venue, date, equipment, officials. The **first and most important** function.

2. **Organising** — arranging resources and forming **committees**; assigning duties and authority.
3. **Staffing** — appointing the right people to the right posts — officials, coaches, volunteers, medical staff.
4. **Directing** — guiding, motivating and supervising staff so that the plan is executed.
5. **Controlling** — comparing actual performance with the plan and taking **corrective action**.

2. Committees and Their Responsibilities

THE THREE PHASES — a favourite 5-marker

Phase	Committees and duties
PRE-event	Publicity committee — invitations, media, posters
	Transport committee — travel for teams and officials
	Boarding & lodging committee — stay and food
	Grounds & equipment committee — marking, apparatus
	Finance committee — budget and funds
	Registration committee — entries and eligibility

DURING event

Reception committee — welcoming guests and teams

Officials committee — referees, judges, timekeepers

Medical / first-aid committee — injuries and emergencies

Refreshment committee

Announcement committee — commentary, results

Discipline committee

POST-event

Prize distribution committee

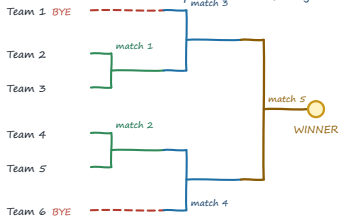
Finance / accounts settlement

Ground clearance committee

Certificate and report committee — records and evaluation

3. Tournaments — Types and Fixtures

Knock-out with 6 teams: next power of 2 is 8, so byes = $8 - 6 = 2$.



Count the matches:

$$5 = 6 - 1 \quad \checkmark$$

Total matches is always $N - 1$.

Teams with a bye skip round 1 and enter straight at round 2.

Placing them: upper half takes the EVEN byes counting from the bottom, lower half the ODD byes from the top. Odd number of byes → the lower half gets the extra one.

With 11 teams: next power of 2 is 16, so byes = 5 — but still only $11 - 1 = 10$ matches.

Byes exist only to shrink round 1 until the survivors are a power of two.

THE FORMULAS — every fixture question uses these

Knock-out: Total matches = $N - 1$

Byes = Next higher power of 2 - N

Single League: Total matches = $N(N - 1) / 2$

Double League: Total matches = $N(N - 1)$

**Combination: matches = (matches within groups)
+ (knock-out among winners)**

WORKED EXAMPLE — byes $N = 11$ teams,
knock-out.

Next power of 2 above 11 = 16

Byes = $16 - 11 = 5$ byes

Total matches = $11 - 1 = 10$ matches

Distribution of byes: upper half gets the even-numbered byes from the bottom; lower half gets the odd-numbered byes from the top. If byes are odd, the lower half gets one more.

WORKED EXAMPLE — league $N = 8$ teams.

Single league = $8 \times 7 / 2 = 28$ matches

Double league = $8 \times 7 = 56$ matches

Type	How it works	Best for
Knock-out (elimination)	A team is out after one defeat	Many teams, little time ; economical
League (round robin)	Every team plays every other team; ranked on points	Fair result; identifies the truly best team

Combination	League within groups, then knock-out among group winners	Large tournaments — combines fairness and economy
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League methods

Staircase method — fixtures arranged like a staircase; no byes needed, no team number issue.

Cyclic method — team 1 fixed, others rotate clockwise. If teams are odd, a **bye** is fixed at position 1.

Tabular method — a table with teams on both axes.

Deciding the winner in a league

British method: $\text{Percentage} = (\text{Points scored} \div \text{Maximum possible points}) \times 100$

American method: $\text{Percentage} = \text{Wins} \div (\text{Wins} + \text{Losses}) \times 100$

Knock-out — advantages

- **Economical** — fewer matches, less time and money
- Raises the **standard** of the game
- Fewer officials needed
- Creates **excitement**

Knock-out — disadvantages

- A **good team may be eliminated** early by chance
- Weak teams get **little playing experience**
- Chance plays a large role

League — advantages

- **Best team wins** — result is reliable
- All teams get **full playing experience**
- No team eliminated early

League — disadvantages

- **Expensive** and time consuming
- Needs **more officials** and grounds
- Not suitable when teams are many

4. Intramural and Extramural

Basis	INTRAMURAL	EXTRAMURAL
Meaning	Competitions organised within the walls of the same institution	Competitions outside the walls , between institutions
Participants	Students of the same school	Students of different schools
Standard	Comparatively low	High
Aim	Mass participation , recreation, talent spotting	Competition , representing the institution

Objectives of intramurals: provide opportunity for **all** students to participate · develop leadership and cooperation · identify **talent** for extramurals · develop the habit of using leisure time well · develop sportsmanship.

Significance of extramurals: improves the **standard** of sports · provides wider exposure and experience · develops **social qualities** and cooperation · brings recognition to the institution · gives students a chance to learn new techniques.

5. Community Sports Programmes

Meaning: sports activities organised for the **general public** to promote health, fitness and social integration.

Programme	Purpose
Sports Day	Annual event promoting mass participation and school spirit
Health Run	Creates awareness about fitness and an active lifestyle
Run for Fun	Non-competitive; encourages participation regardless of ability
Run for Specific Cause	Raises awareness or funds for a cause — cancer, environment, girl child
Run for Unity	Promotes national integration and communal harmony

Significance: improves community health · develops **social integration** and harmony · creates awareness about fitness · keeps youth away from harmful habits · identifies talent at the grassroots.

6. Question Triggers

what the wording is really asking

If the question says...	Do this
"draw a fixture for 11 teams, knock-out"	Byes = $16 - 11 = 5$; matches = 10
"how many matches in a league of 9 teams?"	$9 \times 8 / 2 = \mathbf{36}$
"double league of 6 teams"	$6 \times 5 = \mathbf{30}$
"competition within the school"	Intramural
"inter-school competition"	Extramural
"committee that handles injuries"	Medical / first-aid committee (during event)
"committee for invitations and media"	Publicity committee (pre-event)
"committee for prize distribution"	Post-event
"marathon to raise cancer awareness"	Run for a specific cause
"many teams, limited days"	Knock-out — economical
"want the genuinely best team to win"	League tournament

MOST-ASKED BOARD QUESTIONS

1. [5M] Draw a knock-out fixture for N teams showing byes. (the b^* question is usually this)
2. [3-5M] Explain the committees and their responsibilities before, during and after an event.
3. [3M] Differentiate between intramural and extramural tournaments.
4. [3M] Explain the advantages and disadvantages of knock-out and league tournaments.
5. [1M] Formula for byes? → Next power of 2 - N
6. [1M] Matches in a single league of N teams? → $N(N-1)/2$

THE HABIT THAT SCORES — Fixture questions are drawn, not described. Practise drawing a knock-out bracket with byes until it takes two minutes. Show the calculation of byes and matches beside the diagram — both carry marks separately.

Chapter 2 · Children and Women in Sports

CBSE Class 12 Physical Education (048) · Unit 2 =

7 marks · Ultimate Revision Sheet

60-SECOND RECALL

WHO guideline	5–17 yrs: 60 min moderate-vigorous daily · 18–64: 150–300 min moderate per week · 65+: same + balance training
7 deformities	Knock knees · Flat foot · Round shoulders · Lordosis · Kyphosis · Scoliosis · Bow legs
Spine trio	Lordosis = inward curve of lower back · Kyphosis = outward curve of upper back · Scoliosis = sideways curve
Female Athlete Triad	Osteoporosis + Amenorrhoea + Eating disorders
Menarche	The first menstrual period
Knock knees vs Bow legs	Knock = knees touch, ankles apart · Bow = knees apart, ankles touch

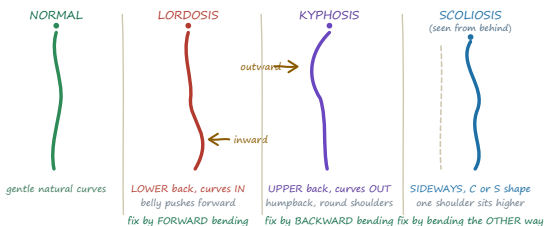
1. WHO Exercise Guidelines by Age Group

Age group	Recommendation
Under 5 years	At least 180 minutes of physical activity spread through the day; limit sedentary screen time.
5–17 years	At least 60 minutes of moderate-to-vigorous activity daily , mostly aerobic; vigorous activity and muscle/bone strengthening at least 3 days a week .

18–64 years	150–300 minutes moderate, or 75–150 minutes vigorous aerobic activity per week; muscle strengthening 2 or more days a week.
65 years and above	Same as adults, plus multi-component activity emphasising balance and strength at least 3 days a week to prevent falls.

2. Common Postural Deformities and Corrections

Side view, person facing right — except scoliosis, which is only visible from **BEHIND**.



Lordosis is **low and inward**, kyphosis is **high and outward**, scoliosis is **sideways**. Each correction bends the opposite way.

THE SEVEN — cause, description, correction

Deformity	What it is / cause	Corrective measures
Knock Knees <i>Genu Valgum</i>	Knees touch each other, ankles stay apart . Caused by vitamin D and calcium deficiency, obesity, rickets, early walking.	Horse riding , Padmasana, Gomukhasana, walking on the outer edge of the feet, keeping a pillow between the ankles

Bow Legs <i>Genu Varum</i>	Knees stay apart, ankles touch — opposite of knock knees. Caused by calcium/phosphorus deficiency, obesity, forcing a child to walk early.	Walking on the inner edge of the feet, Ardha Matsyendrasana, Garudasana, vitamin D supplementation
Flat Foot <i>Pes Planus</i>	No arch in the sole; the whole foot touches the ground. Causes pain in walking and running.	Walking on toes and heels , jumping on toes, picking up objects with the toes, using an arch support , Vajrasana
Round Shoulders	Shoulders are drawn forward and the head hangs down. Caused by poor posture, sitting hunched, carrying heavy bags.	Chakrasana , Dhanurasana, Bhujangasana, holding a rod behind the back, backward stretching
Lordosis	Inward (forward) curve of the lower back ; abdomen protrudes. Caused by obesity, weak abdominal muscles, improper exercise.	Halasana , Paschimottanasana, forward bending, sit-ups, toe touching
Kyphosis	Outward (backward) curve of the upper back — humpback. Caused by malnutrition, weak muscles, poor sitting posture, illness.	Dhanurasana , Bhujangasana, Chakrasana, backward bending
Scoliosis	Sideways (lateral) curve of the spine — C or S shape. Caused by carrying weight on one shoulder, unequal leg length, poor posture.	Trikonasana , Ardha Chakrasana, hanging on a bar, bending to the opposite side, swimming

THE THREE SPINE DEFORMITIES — never mix these up

Lordosis → **LOWER** back, curves **INWARD** → corrected by **forward** bending (Halasana, Paschimottanasana).

Kyphosis → **UPPER** back, curves **OUTWARD** → corrected by **backward** bending (Dhanurasana, Chakrasana).

Scoliosis → **SIDEWAYS** → corrected by **lateral** bending (Trikonasana).

The correction is always the **opposite** direction of the deformity.

3. Women's Participation in Sports

Benefits — Physical

- Improves **cardiovascular** health and bone density
- Controls **weight** and body composition
- Reduces risk of **osteoporosis**, diabetes, heart disease
- Improves posture and physical fitness

Benefits — Psychological

- Reduces **stress**, **anxiety** and **depression**
- Improves **self-esteem** and body image

- Develops **confidence** and emotional stability
- Improves concentration

Benefits — Social

- Develops **leadership** and teamwork
- Promotes **gender equality** and empowerment
- Widens the **social circle**
- Provides career and financial independence

Reasons for low participation in India

- **Social and cultural** restrictions
- Lack of **facilities** and female coaches
- Lack of **awareness** about benefits
- Safety concerns and family responsibilities
- Fewer **role models** and less media coverage

4. Special Considerations — Menarche and Menstrual Dysfunction

Term	Meaning
Menarche	The first menstrual bleeding, marking the start of reproductive capacity. Usually 11–15 years. Intense training may delay menarche.
Menstrual dysfunction	Any abnormality of the menstrual cycle in athletes.

Amenorrhoea	Absence of menstruation. Primary = never started by age 15. Secondary = stops for 3 or more consecutive cycles.
Dysmenorrhoea	Painful menstruation with cramps.
Oligomenorrhoea	Infrequent or irregular menstruation.

Causes in athletes: intense training, low body fat, inadequate calorie intake, hormonal imbalance, physical and emotional stress.

5. The Female Athlete Triad

DEFINITION — a guaranteed question The **Female Athlete Triad** is a syndrome of three interrelated conditions found in physically active girls and women:

1. **Eating disorders** (low energy availability) → 2. **Amenorrhoea** → 3. **Osteoporosis**.

They occur as a **chain**: inadequate energy intake lowers oestrogen, which stops menstruation, which weakens bone.

Component	Meaning
Eating disorders	Anorexia nervosa — extreme food restriction from fear of gaining weight. Bulimia — binge eating followed by purging.
Amenorrhoea	Absence of menstruation caused by low oestrogen from insufficient energy availability.

Osteoporosis

Loss of **bone mineral density** making bones brittle and prone to **stress fractures**.

Prevention: adequate calorie, calcium and vitamin D intake · balanced training load · regular medical checks · counselling and awareness · avoiding pressure to be thin.

6. Question Triggers identify the condition

If the case says...	The answer is
"knees touch but ankles remain apart"	Knock knees (Genu Valgum)
"ankles touch but knees remain apart"	Bow legs (Genu Varum)
"no arch in the sole"	Flat foot
"inward curve of the lower back, abdomen out"	Lordosis → forward bending asanas
"humpback, outward curve of upper back"	Kyphosis → backward bending asanas
"spine curved sideways, C shape"	Scoliosis → Trikonasana
"shoulders drawn forward, head hangs"	Round shoulders → Chakrasana
"athlete stopped menstruating"	Amenorrhoea
"painful menstruation with cramps"	Dysmenorrhoea
"thin athlete, no periods, stress fracture"	Female Athlete Triad
"fear of gaining weight, refuses food"	Anorexia nervosa
"binge eating then vomiting"	Bulimia

"60 minutes daily for a 14-year-old"

WHO guideline for **5-17** years

MOST-ASKED BOARD QUESTIONS

1. **[5M]** Explain any three postural deformities with their causes and corrective measures.
2. **[3-5M]** What is the female athlete triad? Explain its components.
3. **[3M]** Explain the WHO exercise guidelines for different age groups.
4. **[3M]** Discuss the physical, psychological and social benefits of women's participation in sports.
5. **[1M]** Sideways curve of the spine is called? → **Scoliosis**
6. **[1M]** What is menarche? → **The first menstrual period**

THE HABIT THAT SCORES — For every deformity, answer in three parts: **what it looks like** → **cause** → **two corrective asanas by name**. Naming the asana is where the mark sits — "do stretching exercises" earns nothing.

Chapter 3 · Yoga as Preventive Measure for Lifestyle Disease

CBSE Class 12 Physical Education (048) · Unit 3 = 7 marks

(6 + 1 b*) · Ultimate Revision Sheet

60-SECOND RECALL

5 lifestyle diseases	Obesity · Diabetes · Asthma · Hypertension · Back Pain & Arthritis
Answer format	Every asana question wants Procedure → Benefits → Contraindications
The universal asana	Tadasana appears in obesity, asthma, hypertension and back pain
Never for hypertension	Inversions and strong backbends — Halasana, Chakrasana, Kapalbhati
Best for diabetes	Mandukasana, Bhujangasana, Kapalbhati — they compress the pancreas
Best for asthma	Anuloma-Viloma, Kapalbhati, Bhujangasana — chest expansion

1. Lifestyle Diseases — Overview

DEFINITION *Lifestyle diseases are diseases that result largely from the way a person lives — poor diet, physical inactivity, stress, smoking and alcohol. They develop **slowly** and are largely **preventable**.*

Disease	What it is / main causes
Obesity	Excessive fat accumulation. BMI 30+ . Caused by overeating, inactivity, genetics, endocrine disorders.
Diabetes	High blood glucose from insufficient insulin (Type 1) or insulin resistance (Type 2). Symptoms: excessive thirst, frequent urination, fatigue, slow wound healing.

Asthma	Narrowing and inflammation of the airways causing wheezing, breathlessness, chest tightness and coughing. Triggered by allergens, dust, pollution, cold air.
Hypertension	Persistently high blood pressure — above 140/90 mmHg . Called the silent killer . Caused by stress, obesity, excess salt, smoking, heredity.
Back Pain & Arthritis	Back pain from poor posture, weak muscles, disc problems. Arthritis is inflammation of the joints causing pain and stiffness.

2. The Asana Table — which asana for which disease

THE MASTER TABLE — this is the whole unit

Disease	Prescribed asanas (syllabus list)
OBESITY	Tadasana, Katichakrasana, Pavanmuktasana, Matsyasana, Halasana , Paschimottanasana, Ardha Matsyendrasana, Dhanurasana, Ushtrasana, Suryabhedan pranayama
DIABETES	Katichakrasana, Pavanmuktasana, Bhujangasana , Shalabhasana, Dhanurasana, Supta Vajrasana, Paschimottanasana, Ardha Matsyendrasana, Mandukasana , Gomukhasana, Yogmudra, Ushtrasana, Kapalbhati
ASTHMA	Tadasana, Urdhwahastottanasana, Uttan Mandukasana, Bhujangasana , Dhanurasana, Ushtrasana, Vakrasana, Kapalbhati , Gomukhasana, Matsyasana, Anuloma-Viloma
HYPERTENSION	Tadasana, Katichakrasana, Uttanpadasana, Ardha Halasana , Sarala Matsyasana, Gomukhasana, Uttan Mandukasana, Vakrasana, Bhujangasana, Makarasana, Shavasana , Nadi-shodhana pranayama , Sheetali pranayama
BACK PAIN & ARTHRITIS	Tadasana, Urdhwahastottanasana, Ardha Chakrasana, Ushtrasana, Vakrasana, Sarala Matsyendrasana, Bhujangasana , Gomukhasana, Bhadrasana, Makarasana , Nadi-shodhana pranayama

THE PATTERN THAT SAVES MEMORISATION

- **Obesity** → asanas that **compress the abdomen** and **burn fat** (Halasana, Paschimottanasana, Dhanurasana).
- **Diabetes** → asanas that **press the pancreas** (Mandukasana, Bhujangasana, Shalabhasana) + Kapalbhati.
- **Asthma** → asanas that **expand the chest** + **breathing pranayamas** (Anuloma-Viloma, Kapalbhati).
- **Hypertension** → **calming asanas** and **cooling pranayamas** (Shavasana, Makarasana, Sheetalī).
No inversions.
- **Back pain** → **spine-strengthening** and **relaxing asanas** (Bhujangasana, Makarasana, Bhadrasana).

3. Key Asanas — Procedure, Benefits, Contraindications

ANSWER FORMAT — use this for every asana

1. **Procedure** — starting position, the movement, breathing, how long to hold.
2. **Benefits** — two or three specific effects, naming the organ or system.
3. **Contraindications** — who must avoid it.

Asana	Procedure (short)	Benefits	Contraindications
Tadasana <i>Mountain pose</i>	Stand erect, feet together, interlock fingers, raise arms above head with palms up, rise on toes, stretch up, hold.	Improves posture and height ; strengthens the spine, thighs, ankles; relieves sciatica	Headache , insomnia, low blood pressure, vertigo

Bhujangasana <i>Cobra pose</i>	Lie prone, palms under shoulders, inhale and raise the chest, keeping the navel down, look up, hold, exhale down.	Strengthens the spine ; stimulates pancreas and abdominal organs; opens the chest — good for asthma and diabetes	Hernia , back injury, pregnancy , ulcer, recent abdominal surgery
Halasana <i>Plough pose</i>	Lie supine, raise legs to 90°, then take them over the head to touch the floor behind, hold, return slowly.	Reduces abdominal fat ; improves digestion; stimulates thyroid; good for obesity	Hypertension , neck injury, pregnancy , slipped disc, enlarged thyroid
Shavasana <i>Corpse pose</i>	Lie supine, legs apart, palms up, close the eyes, relax every body part, breathe naturally.	Relieves stress and hypertension ; calms the nervous system; reduces fatigue	Practically none — avoid falling asleep
Mandukasana <i>Frog pose</i>	Sit in Vajrasana, make fists with thumbs inside, place at the navel, exhale and bend forward pressing the abdomen, look ahead.	Strongly stimulates the pancreas — the primary asana for diabetes ; improves digestion	Ulcer, hernia, knee pain , back injury, high blood pressure
Kapalbhati <i>(pranayama)</i>	Sit in Padmasana/Sukhasana, inhale normally, exhale forcefully pulling the abdomen in; inhalation is passive.	Cleanses lungs — good for asthma ; stimulates pancreas — good for diabetes ; reduces belly fat	Hypertension , heart disease, hernia, pregnancy , epilepsy, ulcer

Anuloma-Viloma <i>Alternate nostril</i>	Close the right nostril with the thumb, inhale through the left; close the left, exhale through the right; then reverse. One round.	Improves lung capacity — best for asthma ; balances the nervous system; reduces stress and hypertension	Very few — avoid during acute cold or blocked nostrils
Makarasana <i>Crocodile pose</i>	Lie prone, fold arms, rest the forehead or chin on the hands, legs apart, relax completely.	Relieves back pain and spinal tension; relaxing; helpful in asthma and hypertension	None significant; avoid with severe spinal injury
Vakrasana <i>Twisted pose</i>	Sit with legs extended, fold one knee and place the foot beside the opposite knee, twist the trunk to that side, hold.	Stimulates pancreas and liver ; improves spinal flexibility; good for diabetes and back pain	Severe back or spinal injury, pregnancy , ulcer

4. Question Triggers which asana / which disease?

If the question says...	Answer with
"asanas for a diabetic patient"	Mandukasana, Bhujangasana, Kapalbhathi + 2 more
"asanas for asthma"	Anuloma-Viloma, Kapalbhathi, Bhujangasana
"asanas for hypertension"	Shavasana, Makarasana, Nadi-shodhana, Sheetal
"asanas for obesity"	Halasana, Paschimottanasana, Dhanurasana
"asanas for back pain"	Bhujangasana, Makarasana, Bhadrasana

"patient has high BP — which asana to AVOID?"	Halasana, Chakrasana, Kapalbhati (inversions)
"pregnant woman — contraindicated?"	Halasana, Bhujangasana, Kapalbhati, Vakrasana
"which asana stimulates the pancreas?"	Mandukasana
"which pose is for complete relaxation?"	Shavasana
"BP above 140/90"	Hypertension — the "silent killer"
"BMI 30 or above"	Obesity

MOST-ASKED BOARD QUESTIONS

1. [5M] Explain the procedure, benefits and contraindications of any two asanas for (given disease).
2. [3-5M] Which asanas help prevent obesity / diabetes / asthma? Explain any three.
3. [3M] What is hypertension? Name asanas that help control it.
4. [1M] Which asana is best for complete relaxation? → **Shavasana**
5. [1M] Name a pranayama contraindicated in hypertension. → **Kapalbhati**

THE HABIT THAT SCORES — Never write an asana answer as prose. Use three labelled headings — **Procedure / Benefits / Contraindications** — because the marking scheme allots marks separately to each. Missing contraindications alone costs a third of the question.

Chapter 4 · Physical Education and Sports for CWSN

CBSE Class 12 Physical Education (048) · Unit 4 =

8 marks (4 + 4 b*) · Ultimate Revision Sheet

60-SECOND RECALL

CWSN	Children W ith S pecial N eeds — also called <i>Divyang</i>
Disability vs Disorder	Disability = limitation of function · Disorder = disturbance of normal functioning
4 disorders	ADHD · SPD · ASD · ODD (+ OCD)
3 organisations	Special Olympics Bharat (intellectual) · Paralympics (physical) · Deaflympics (hearing)
Inclusion	Educating CWSN together with other children in the same classroom
Key professional	Adapted physical education teacher — modifies activity to suit the child

1. Concept of Disability

Term	Meaning
Disability	A condition that limits a person's movements, senses or activities.
Impairment	Loss or abnormality of a body structure or function — physiological or psychological.

Disorder	A disturbance in the normal functioning of mind or body.
Handicap	A disadvantage resulting from an impairment that limits fulfilling a normal role.

Types of Disability

1. **Cognitive disability** — impairment in mental functioning, learning, memory, problem solving. *Eg: intellectual disability, dyslexia.*
2. **Intellectual disability** — significant limitation in intellectual functioning and adaptive behaviour, appearing before age 18.
3. **Physical disability** — limitation of physical function, mobility, dexterity or stamina. *Eg: cerebral palsy, amputation, muscular dystrophy.*

Causes of Disability

Genetic — chromosomal disorders such as Down syndrome · **Prenatal** — malnutrition, infection, drugs or alcohol during pregnancy · **Perinatal** — birth injury, lack of oxygen, premature birth · **Postnatal** — accidents, infections, malnutrition, poisoning.

2. Disability Etiquette

DEFINITION Disability etiquette is a set of guidelines on how to interact respectfully with people with disabilities, treating them with the same dignity as anyone else.

- Speak **directly to the person**, not to their companion or interpreter.
- **Ask before helping** — do not assume help is wanted.
- Do not touch or move a **wheelchair, cane or guide dog** without permission — they are part of the person's personal space.
- Sit at **eye level** when talking to a wheelchair user.
- Use **person-first language** — “a person with a disability”, not “a disabled person”. Avoid words like “handicapped”, “victim”, “suffering from”.
- Be **patient** and give the person time to speak or act; do not finish their sentences.
- Announce yourself when approaching a person with a **visual** impairment, and say when you are leaving.

3. Advantages of Physical Activity for CWSN

Physical

- Improves **motor skills, balance and coordination**
- Increases muscular strength and flexibility
- Controls weight and improves cardiovascular health
- Reduces secondary health complications

Psychological & Social

- Raises **self-esteem and confidence**
- Reduces anxiety and depression
- Develops **social interaction** and friendship
- Develops teamwork, discipline and a sense of belonging
- Improves **cognitive functioning** and concentration

4. Strategies to Make Physical Activity Accessible

THE FIVE STRATEGIES — a common 4-marker 1.

Medical check-up — assess the nature and degree of disability before designing the programme.

2. Adapted physical education — modify the activity, rules and equipment to suit the child, rather than excluding them.

3. Assistive technology — prosthetics, wheelchairs, hearing aids, modified sports equipment.

4. Modified equipment and environment — ramps, larger and brighter balls, audible balls for the visually impaired, lower nets, shorter distances.

5. Specific and trained personnel — adapted PE teachers, physiotherapists, special educators, counsellors.

6. Inclusive classroom and peer support — buddy systems and cooperative games.

5. Disorders — ADHD, SPD, ASD, ODD, OCD

THE FOUR YOU MUST KNOW COLD

Disorder	Full form & meaning	Symptoms
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ADHD	Attention Deficit Hyperactivity Disorder — a neurodevelopmental disorder affecting attention and impulse control	Inattention — careless mistakes, does not listen, loses things, easily distracted Hyperactivity — fidgets, cannot stay seated, runs about, talks excessively Impulsivity — blurts out answers, cannot wait for a turn, interrupts
SPD	Sensory Processing Disorder — the brain has trouble receiving and responding to sensory information	Over-sensitive: distressed by noise, light, touch, clothing tags Under-sensitive: constantly seeks movement, touch, does not notice pain Poor balance and coordination , clumsiness
ASD	Autism Spectrum Disorder — a developmental disorder affecting communication and behaviour	Difficulty with social interaction and eye contact Repetitive behaviours and restricted interests Delayed speech; resists change in routine Unusual response to sensory input
ODD	Oppositional Defiant Disorder — a persistent pattern of angry, defiant behaviour toward authority	Frequent temper tantrums and anger Argues with adults, refuses to follow rules Deliberately annoys others; blames others for own mistakes Spiteful and vindictive

OCD

Obsessive Compulsive Disorder — unwanted repeated thoughts and repetitive behaviours

Obsessions — recurring unwanted thoughts, fear of germs
Compulsions — repeated hand-washing, checking, counting, arranging

THE ONE STUDENTS CONFUSE *ADHD vs ODD.*

ADHD is about attention and impulse control — the child cannot sit still or focus. ODD is about defiance — the child will not obey and is deliberately hostile. “Cannot” versus “will not”.

6. Disability Sports Organisations

THE THREE — know who each serves

Organisation	For whom	Key facts
Special Olympics Bharat	Intellectual disabilities	National body accredited by Special Olympics International. Founded on inclusion through sport . Oath: “Let me win. But if I cannot win, let me be brave in the attempt.” Emphasis is on participation , not elite competition; every athlete is recognised.

Paralympics	Physical disabilities	Governed by the International Paralympic Committee (IPC) , formed 1989 . Held immediately after the Olympic Games in the same city. Motto: " Spirit in Motion ". Symbol: three Agitos (red, blue, green).
Deaflympics	Hearing impairment	Organised by ICSD . First held in Paris, 1924 — the oldest of the three. Athletes must have a hearing loss of at least 55 dB . No hearing aids allowed during competition. Signals are visual — lights and flags instead of whistles and starting pistols.

TRAP Deaflympics is the oldest (1924), not the Paralympics. And in the Deaflympics **hearing aids are banned** during competition to keep it fair — a favourite 1-marker.

7. Inclusion in Sports

Inclusion means educating and involving CWSN **together with** children without disabilities in the same setting, with appropriate support.

Advantages: develops **self-esteem** and confidence in CWSN · teaches **empathy and acceptance** to other children · improves social and communication skills · removes

stigma and discrimination · prepares all children for an inclusive society.

Role of various professionals: Adapted PE teacher (modifies activities) · Physiotherapist (restores movement and function) ·

Occupational therapist (daily-living skills) ·

Speech therapist · Special educator ·

Counsellor · Physician.

8. Question Triggers

identify the disorder / organisation

If the case says...	The answer is
"cannot sit still, blurts out answers, loses things"	ADHD
"deliberately annoys, argues, refuses rules"	ODD
"avoids eye contact, repetitive behaviour, resists change"	ASD
"distressed by loud noise and clothing tags"	SPD
"washes hands repeatedly, checks locks"	OCD
"games for athletes with intellectual disability"	Special Olympics Bharat
"held after the Olympics, Agitos symbol"	Paralympics
"visual signals, no hearing aids"	Deaflympics
"audible ball for a blind player"	Modified equipment strategy

"speak directly to the person,
not the helper"

Disability etiquette

"teaching CWSN in the same
classroom"

Inclusion

MOST-ASKED BOARD QUESTIONS

1. **[4-5M]** Explain the types of disorders (ADHD, SPD, ASD, ODD) and their symptoms.
2. **[4M]** Explain the strategies to make physical activity accessible for CWSN.
3. **[3M]** Explain the aims and objectives of Special Olympics Bharat / Paralympics / Deaflympics.
4. **[3M]** Discuss the advantages of physical activity for children with special needs.
5. **[1M]** Full form of CWSN? → **Children With Special Needs**
6. **[1M]** Which is the oldest disability games? → **Deaflympics (1924)**

THE HABIT THAT SCORES — For every disorder, give the full form first, then one line of meaning, then **three named symptoms**. The full form alone is often worth a mark, and it is the easiest mark in this unit.

Chapter 5 · Sports and Nutrition

CBSE Class 12 Physical Education (048) · Unit 5 =

7 marks · Ultimate Revision Sheet

60-SECOND RECALL

Macro nutrients (3)	Carbohydrates · Proteins · Fats — needed in large amounts, give energy
Micro nutrients (2)	Vitamins · Minerals — needed in small amounts, no energy
Energy values	Carbohydrate 4 kcal/g · Protein 4 kcal/g · Fat 9 kcal/g
Non-nutritive (5)	Water · Fibre/roughage · Colour compounds · Flavour compounds · Preservatives
Fat-soluble vitamins	A, D, E, K — the rest (B complex, C) are water-soluble
Pre-competition	High carbohydrate, low fat, low fibre , 3–4 hours before

1. Balanced Diet and Nutrition

DEFINITIONS **Nutrition** is the process by which a living organism takes in and uses food for growth, repair and maintenance. **Nutrients** are the chemical substances in food that provide energy and support body functions.

A balanced diet is one that contains **all the nutrients in the correct proportion** and in adequate quantity to meet the body's needs.

Elements of a balanced diet: carbohydrates, proteins, fats, vitamins, minerals, water and roughage — in the right proportion, adjusted for age, sex, activity level and climate.

2. Macro Nutrients

THE THREE MACROS

Nutrient	Function	Sources	Notes
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Carbohydrates <i>4 kcal/g</i>	Main and quickest source of energy; saves protein; needed for brain function	Rice, wheat, potato, sugar, bread, fruits, honey, jaggery	Simple (glucose, fructose — quick) and Complex (starch, cellulose — slow). Stored as glycogen in liver and muscles.
Proteins <i>4 kcal/g</i>	Body building — growth and repair of tissues; makes enzymes, hormones and antibodies	Milk, eggs, meat, fish, pulses, soya, nuts	Made of amino acids . First class (complete, animal source) contain all essential amino acids; second class (plant) do not.
Fats <i>9 kcal/g</i>	Concentrated energy; insulates the body; protects organs; carries vitamins A, D, E, K	Ghee, butter, oil, nuts, cheese, meat	Saturated (animal, solid, raises cholesterol) and Unsaturated (plant, liquid, healthier).

3. Micro Nutrients

VITAMINS

Vitamin	Type	Source	Deficiency disease
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A	Fat soluble	Carrot, milk, green vegetables, liver	Night blindness , xerophthalmia
D	Fat soluble	Sunlight , fish oil, egg yolk, milk	Rickets (children), osteomalacia (adults)
E	Fat soluble	Vegetable oil, nuts, wheat germ	Infertility, muscular weakness
K	Fat soluble	Green leafy vegetables, tomato	Delayed blood clotting
B₁	Water soluble	Whole grains, pulses, nuts	Beri-beri
B₂	Water soluble	Milk, egg, green vegetables	Cracked lips, sore tongue
B₁₂	Water soluble	Meat, fish, egg, milk	Anaemia
C	Water soluble	Citrus fruits, amla, guava, tomato	Scurvy , bleeding gums

MINERALS

Mineral	Function	Source	Deficiency
Calcium	Bones and teeth; muscle contraction; blood clotting	Milk, cheese, green leafy vegetables	Rickets, osteoporosis
Iron	Forms haemoglobin ; carries oxygen	Green leafy vegetables, jaggery, liver, dates	Anaemia

Iodine	Thyroid hormone production	Iodised salt, sea food	Goitre
Sodium & Potassium	Fluid balance, nerve and muscle function	Salt, banana, potato	Cramps, weakness
Phosphorus	Bones and teeth; energy transfer	Milk, meat, pulses	Weak bones

TRAP *Micro nutrients give NO energy.*

Vitamins and minerals are needed in tiny amounts and act as **regulators**. Only carbohydrates, proteins and fats supply calories. A common wrong answer is “vitamins give energy”.

4. Nutritive and Non-Nutritive Components

Type	Components
Nutritive	Carbohydrates, proteins, fats, vitamins, minerals, water — they nourish the body
Non-nutritive	Water (also nutritive), Fibre / roughage , Colour compounds (chlorophyll, carotene), Flavour compounds , Preservatives , plant compounds like caffeine — they add no nutrients but serve other purposes

Roughage / dietary fibre — indigestible plant material. Prevents **constipation**, adds bulk, helps control cholesterol and blood sugar,

gives a feeling of fullness. Sources: whole grains, fruits, vegetables, pulses.

Water — regulates body temperature, transports nutrients, removes waste, lubricates joints. Dehydration of even 2% of body weight reduces performance sharply.

5. Eating for Weight Control

HEALTHY WEIGHT

$$\text{BMI} = \text{Weight (kg)} \div \text{Height}^2 \text{ (m}^2\text{)}$$

Under 18.5 underweight · 18.5–24.9

normal · 25–29.9 overweight · 30+ obese

Pitfalls of dieting

- **Loss of muscle** along with fat
- **Slowed metabolism** — body conserves energy
- **Nutrient deficiency** and weakness
- **Dehydration** and electrolyte imbalance
- **Yo-yo effect** — weight regained quickly
- **Eating disorders** and psychological stress

Food myths — and the truth

- “Skipping meals reduces weight” → it slows metabolism

- “Fat-free food causes no weight gain” → it may be **high in sugar**
- “Eating at night causes obesity” → **total calories** matter, not timing
- “All fats are bad” → **unsaturated fats are essential**
- “More protein always builds more muscle” → excess is stored as fat

Food intolerance — difficulty **digesting** a food, causing bloating, gas, cramps and diarrhoea. It involves the **digestive system**, not the immune system, and is **not life-threatening**. Eg: lactose intolerance, gluten intolerance.

Food allergy — an **immune** reaction that can be severe and even fatal.

6. Diet in Sports — Pre, During, Post

THE THREE PHASES — a guaranteed question

Phase	What to eat and why
PRE-competition	Main meal 3–4 hours before. High carbohydrate (to fill glycogen stores), low fat and low fibre (they digest slowly and cause discomfort), moderate protein , plenty of fluid . Avoid new or spicy foods. A light carbohydrate snack may be taken 1 hour before.

DURING competition

Focus on **fluid and electrolyte replacement** to prevent dehydration. Sports drinks with **6–8% carbohydrate** and electrolytes for events over an hour. Small, frequent sips rather than large amounts. Easily digestible carbohydrates such as glucose, banana or energy gel.

POST-competition

Replenish glycogen with carbohydrate within **30 minutes to 2 hours** (the recovery window). **Protein** to repair muscle tissue. **Fluid and electrolytes** to restore hydration. Recommended ratio roughly **3 or 4 parts carbohydrate to 1 part protein**.

TRAP

*Pre-competition food must be **LOW** in fat and fibre, not high. Fat and fibre slow gastric emptying and cause cramps and heaviness during performance. Carbohydrate is the one to load.*

7. Question Triggers

which nutrient / which phase?

If the question says...	Answer
"quickest source of energy"	Carbohydrates
"body building nutrient"	Proteins
"most concentrated source of energy"	Fats (9 kcal/g)
"needed in small amounts, no energy"	Micro nutrients — vitamins and minerals
"night blindness"	Vitamin A deficiency
"rickets in children"	Vitamin D / calcium deficiency

"bleeding gums, scurvy"	Vitamin C deficiency
"goitre"	Iodine deficiency
"anaemia, low haemoglobin"	Iron deficiency
"prevents constipation, adds bulk"	Roughage / dietary fibre
"meal 3 hours before the match"	Pre-competition — high carb, low fat, low fibre
"what to consume during a marathon"	Fluids + electrolytes , 6–8% carb drink
"recovery within 30 minutes"	Post-competition — carb + protein
"bloating after milk"	Food intolerance (lactose), not allergy
"BMI is 31"	Obese

MOST-ASKED BOARD QUESTIONS

1. **[5M]** Explain the pre, during and post competition nutritional requirements of an athlete.
2. **[3-5M]** Explain macro and micro nutrients with their functions and sources.
3. **[3M]** What are the pitfalls of dieting? / Explain any three food myths.
4. **[3M]** Differentiate between nutritive and non-nutritive components of diet.

5. [1M] Energy value of fat? → 9 kcal per gram
6. [1M] Name the fat-soluble vitamins. → A, D, E, K

THE HABIT THAT SCORES — Nutrient answers need **function + source + deficiency**, all three. “Vitamin A is good for eyes” is a third of the answer; “Vitamin A — needed for vision; found in carrots and milk; deficiency causes night blindness” is the full mark.

Chapter 6 · Test and Measurement in Sports

CBSE Class 12 Physical Education (048) · Unit 6 =

8 marks · Ultimate Revision Sheet

60-SECOND RECALL

Khelo India age groups	5–8 years (3 tests) 9–18 years (6 tests)
Rikli & Jones	Senior citizens fitness test — 6 items
Senior Citizen test items	Chair stand · Arm curl · Chair sit-and-reach · Back scratch · Eight foot up-and-go · Six minute walk
Barrow test	3 items — Standing broad jump, Zig-zag run, Medicine ball put
Harvard Step Test	Measures cardiovascular endurance → Fitness Index
Rockport Test	One mile walk → estimates VO₂ max

1. SAI Khelo India Fitness Test

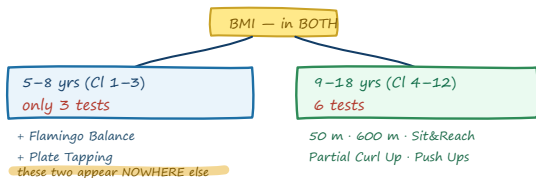
PURPOSE The Khelo India Fitness Test is a national school-level assessment by the **Sports Authority of India** to measure the physical fitness of children, identify talent, and create a fitness database.

AGE GROUP 5–8 YEARS (Class 1–3) — 3 tests

Test	Measures
1. Body Mass Index (BMI)	Body composition
2. Flamingo Balance Test	Balance — stand on one leg on a beam, count falls in 1 minute
3. Plate Tapping Test	Speed of limb movement / coordination — tap two discs alternately 25 times

AGE GROUP 9–18 YEARS (Class 4–12) — 6 tests

Test	Measures
1. Body Mass Index (BMI)	Body composition
2. 50 m Dash / Standing Start	Speed
3. 600 m Run / Walk	Cardiovascular endurance
4. Sit and Reach Test	Flexibility (lower back and hamstring)
5. Partial Curl Up	Abdominal muscular strength and endurance
6. Push Ups (boys) / Modified Push Ups (girls)	Upper body strength and endurance



BMI is the hinge — it is the only item the two age groups share.

TRAP Do **not** mix the two lists. The 5–8 group has **3** tests and includes **Flamingo Balance** and **Plate Tapping** — neither appears in the 9–18 group. BMI is the only test common to both.

2. Rikli and Jones Senior Citizen Fitness Test

PURPOSE Developed by **Roberta Rikli** and **Jessie Jones**, this test assesses the functional fitness of **older adults (60+)** — the physical capacity needed to perform normal everyday activities safely and independently.

THE SIX ITEMS

Test	Procedure	Measures

1. Chair Stand Test	Sit and stand from a chair as many times as possible in 30 seconds , arms crossed on chest	Lower body strength
2. Arm Curl Test	Curl a weight (5 lb women / 8 lb men) as many times as possible in 30 seconds	Upper body strength
3. Chair Sit and Reach Test	Sit at the edge of a chair, one leg extended, reach towards the toes; measure the distance	Lower body flexibility
4. Back Scratch Test	Reach one hand over the shoulder and the other up the back; measure the gap between fingertips	Upper body (shoulder) flexibility
5. Eight Foot Up and Go Test	Stand from a chair, walk 8 feet round a cone and sit back; record the time	Agility and dynamic balance
6. Six Minute Walk Test	Walk as far as possible in 6 minutes on a marked course	Aerobic / cardiovascular endurance

3. Barrow Three-Item General Motor Ability Test

THE THREE ITEMS

Test	Procedure	Measures
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1. Standing Broad Jump	Stand behind a line, swing arms and jump forward as far as possible with both feet. Three trials; best is recorded.	Explosive strength of legs
2. Zig-Zag Run	Run a figure-of-eight course around five cones for three complete circuits without touching them. Time is recorded.	Agility
3. Medicine Ball Put	Throw a medicine ball (6 lb) forward as far as possible from behind a restraining line. Three trials.	Arm and shoulder explosive strength

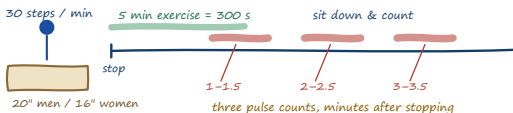
General Motor Ability = 2.2 (Standing Broad Jump) + 1.6 (Medicine Ball Put) – 1.0 (Zig-Zag Run)

4. Cardiovascular Fitness Tests

HARVARD STEP TEST *Procedure:* Step up and down a bench (**20 inches** for men, 16 for women) at **30 steps per minute** for **5 minutes**. Then sit and count the pulse three times: 1 to 1.5 min, 2 to 2.5 min, and 3 to 3.5 min after stopping.

Fitness Index = (Duration of exercise in seconds × 100) ÷ (2 × sum of the three pulse counts)

Rating: below 55 poor · 55–64 low average · 65–79 high average · 80–89 good · 90+ excellent



The three counting windows are each 30 seconds, taken while seated.

ROCKPORT ONE MILE WALK TEST Procedure:

Walk **one mile (1609 m)** as fast as possible on a flat surface. Record the **time taken** and the **heart rate** immediately at the finish.

Purpose: estimates VO_2 max — the maximum volume of oxygen the body can use per minute, the best single measure of aerobic fitness. Suitable for people who cannot run.

WORKED EXAMPLE — Harvard Step Test Exercise

duration **300 seconds**. Pulse counts: **60, 50, 45**.

Sum of pulses = $60 + 50 + 45 = 155$

Fitness Index = $(300 \times 100) \div (2 \times 155)$
 $= 30,000 \div 310 = 96.7$

Rating: **Excellent** (above 90)

5. Computing BMI, Waist-Hip Ratio and Bone Density

FORMULAS

BMI = Weight (kg) $\div$ Height² (metres)

Waist-Hip Ratio = Waist circumference $\div$ Hip circumference

BMI: <18.5 underweight · 18.5–24.9 normal · 25–29.9 overweight · 30+ obese

WHR risk: above **0.90** for men and **0.85** for women indicates abdominal obesity and higher health risk.

6. Computing Basal Metabolic Rate (BMR)

BMR is the number of calories the body needs to maintain basic life-sustaining functions at complete rest — the energy your internal organs use even when you do nothing at all. Measured in kcal.

FORMULA — THE MIFFLIN-ST JEOR EQUATION

Male $\text{BMR} = (10 \times \text{weight kg}) + (6.25 \times \text{height cm}) - (5 \times \text{age}) + 5$

Female $\text{BMR} = (10 \times \text{weight kg}) + (6.25 \times \text{height cm}) - (5 \times \text{age}) - 161$

Everything before the last term is identical. The only difference between the two formulas is the final constant: +5 for males, -161 for females. Learn the common part once and just remember the two endings.

Equipment: stadiometer (height), weighing machine (weight), pen and paper.

TRAP CBSE prescribes the **Mifflin-St Jeor** equation, **not** Harris-Benedict. Many guide books print Harris-Benedict — if you write that one, the constants are wrong. Second trap: **BMR is not BMI**. BMI is a weight-for-height ratio with no units; BMR is an energy requirement in kcal. **Factors affecting BMR:** muscle mass, age, gender, genetics, body composition, state of mind, and environmental heat or cold.

WORKED EXAMPLE

A male, 60 kg, 170 cm, 18 years:

$$\begin{aligned} \text{BMR} &= (10 \times 60) + (6.25 \times 170) - (5 \times 18) + 5 \\ &= 600 + 1062.5 - 90 + 5 = 1577.5 \text{ kcal} \end{aligned}$$

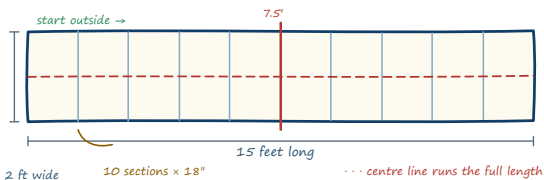
The same person as a female would be
 $600 + 1062.5 - 90 - 161 = 1411.5$
kcal.

7. Johnsen-Metheny Test of Motor Educability

Motor educability = how quickly and easily a person can learn a new motor skill. The battery measures neuromuscular skill capacity.

THE DATES AND NUMBERS THAT GET ASKED

1932	Johnson designed the original Educability Test — 10 items
1938	Metheny revised it and eliminated 6 items , leaving 4
Boys / Girls	4 stunts for boys, 3 stunts for girls
Mat area	15 feet long × 2 feet wide , length divided into 10 sections of 18" each
Max score	10 points per stunt



The test area. Each half is 7.5' — one roll goes in each half.

THE FOUR STUNTS — AND HOW EACH IS SCORED

Stunt	Performance	Scoring
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1. Front Roll	Start outside the marked area, perform two front rolls — one in each 7.5' half — without touching the limits	5 points per correct roll = 10 max. -2 for over-reaching a side line; -1 for over-reaching the end limit; -5 if it is not a true front roll
2. Back Roll	Two back rolls in the 2-foot lane, one in each half. Same method as the front roll	Same as front roll — 10 max
3. Jumping Half-Turns	Start with feet on the first 3" line, jump with both feet to each successive line executing a half turn in alternate directions	4 perfect jumps = 10 points. -2 per wrong jump (not landing on the line with both feet, or turning the wrong way)
4. Jumping Full-Turns	Start outside the area at the centre of the lane, jump feet-together into alternate rectangles executing full turns in the same direction , landing on both feet each time	5 perfect jumps = 10 points. -2 for losing balance on landing, turning too far, or overstepping the square

TRAP Note the asymmetry examiners love: *Half-Turns = 4 jumps for 10 points but Full-Turns = 5 jumps for 10 points.* Also, *Half-Turns alternate direction; Full-Turns rotate the same way every time.*

8. Question Triggers

which test measures what?

If the question asks for a test of...	Answer
Balance in a 6-year-old	Flamingo Balance Test
Limb speed / coordination in a 7-year-old	Plate Tapping Test
Speed in a 14-year-old	50 m Dash
Cardiovascular endurance in a 15-year-old	600 m Run/Walk
Flexibility in a school student	Sit and Reach Test
Abdominal strength	Partial Curl Up
Upper body strength (school)	Push Ups / Modified Push Ups
Lower body strength in an elderly person	Chair Stand Test
Shoulder flexibility in an elderly person	Back Scratch Test
Agility and dynamic balance in the elderly	Eight Foot Up and Go
Aerobic endurance in the elderly	Six Minute Walk Test
Explosive leg strength	Standing Broad Jump
Agility (Barrow)	Zig-Zag Run
Cardiovascular efficiency using a bench	Harvard Step Test
VO ₂ max without running	Rockport One Mile Walk
How fast someone learns a new motor skill	Johnsen–Metheny Test of Motor Educability
Calories needed at complete rest	BMR (Mifflin–St Jeor equation)

MOST-ASKED BOARD QUESTIONS

1. [5M] Explain the Rikli and Jones Senior Citizen Fitness Test items and what each measures.
2. [5M] Explain the SAI Khelo India Fitness Test for the 9–18 age group.
3. [3M] Explain the Barrow three-item general motor ability test.
4. [3M] Explain the procedure of the Harvard Step Test and calculate the fitness index.
5. [1M] Which test measures VO_2 max? → **Rockport One Mile Walk Test**
6. [1M] How many items in the Khelo India test for ages 5–8? → **Three**
7. [3M] How can BMR be assessed? Write the Mifflin–St Jeor equation for males and females.
8. [5M] Explain the four stunts of the Johnsen–Metheny Test of Motor Educability and their scoring.
9. [1M] Who reduced the Johnson Educability Test from ten items to

four, and in which year? → **Metheny, 1938**

10. [1M] Which parameter is **not** needed to assess BMR — weight, height, age or name? → **Name**

THE HABIT THAT SCORES — For every test write **name** → **procedure in one line** → **what it measures**. The “what it measures” part is the mark most often dropped, and it is the easiest to remember because it is always one fitness component.

Chapter 7 · Physiology and Injuries in Sports

CBSE Class 12 Physical Education (048) · Unit 7 =

8 marks (4 + 4 b*) · Ultimate Revision Sheet

60-SECOND RECALL

Muscle fibre types	Slow twitch (Type I) = red, endurance · Fast twitch (Type II) = white, speed and power
Long-term exercise effect	Hypertrophy of muscle · lower resting heart rate (bradycardia) · larger stroke volume · higher VO₂ max
Cardiac output	Stroke Volume × Heart Rate
Tidal volume	Air inhaled or exhaled in one normal breath (about 500 ml)
Injury types	Soft tissue (contusion, strain, sprain, abrasion, laceration, incision) · Bone (fractures) · Joint (dislocation)
First aid	PRICE — Protection, Rest, Ice, Compression, Elevation

1. Physiological Factors Determining Components of Fitness

Component	Physiological factors that determine it
Strength	Size of the muscle (bigger = stronger) · muscle composition (more fast-twitch fibres = more strength) · body weight · intensity of nerve impulse · number of motor units recruited

Speed	Muscle composition (fast-twitch fibres) · explosive strength · flexibility · biochemical reserves (ATP, phosphocreatine) · mobility of nervous system
Endurance	Aerobic capacity / VO_2 max · oxygen intake, transport and uptake · energy reserves (glycogen) · slow-twitch fibre percentage · lactic acid tolerance
Flexibility	Muscle strength · joint structure · age and gender (flexibility falls with age; women generally more flexible) · internal and external temperature · previous injury

2. Effect of Exercise on the Muscular System

IMMEDIATE (short-term) EFFECTS Increase in *muscle temperature* · increased *blood flow* to working muscles · *micro-tears* in muscle fibres · accumulation of *lactic acid* causing fatigue · increased oxygen demand

LONG-TERM EFFECTS — the exam answer 1.

Muscle hypertrophy — increase in the *size* of muscle fibres, so the muscle becomes bigger and stronger.

2. *Increased number of capillaries* — better oxygen and nutrient supply to the muscle.

3. *Increased number and size of mitochondria* — more aerobic energy

production.

4. Increased stores of glycogen and myoglobin — more fuel and better oxygen storage.

5. Improved muscle tone and posture.

6. Delayed fatigue — better lactic acid tolerance and removal.

7. Stronger tendons and ligaments; increased bone density.

8. Improved reaction time and coordination.

TRAP Exercise causes **HYPERTROPHY**

(increase in the **size** of existing fibres), **not hyperplasia** (increase in the **number** of fibres). The number of muscle fibres is fixed at birth. This exact distinction is asked.

3. Effect of Exercise on the Cardio-Respiratory System

CARDIOVASCULAR — long-term effects 1.

Cardiac hypertrophy — the heart muscle (especially the left ventricle) becomes **larger and stronger** — the “athlete’s heart”.

2. **Decreased resting heart rate (bradycardia)** — an athlete may have a resting pulse of 40–50 against a normal 72.
3. **Increased stroke volume** — more blood pumped per beat, which is **why** the resting heart rate falls.
4. **Increased cardiac output** during maximal exercise.
5. **Increased blood volume and haemoglobin** — better oxygen carrying capacity.
6. **Faster recovery rate** — the pulse returns to normal more quickly.
7. **Reduced blood pressure** and lower risk of heart disease.

Cardiac Output = Stroke Volume × Heart Rate

RESPIRATORY — long-term effects

1. **Increased vital capacity** — more air can be expelled after a maximal inhalation.
2. **Increased tidal volume** during exercise.
3. **Decreased resting respiratory rate** — breathing becomes deeper and more efficient.
4. **Stronger respiratory muscles** —

diaphragm and intercostals.

5. Increased number of alveoli in use and better gaseous exchange.

6. Increased VO_2 max — the single best marker of aerobic fitness.

7. Reduced oxygen debt and faster recovery.

Term	Meaning
Tidal Volume	Air inhaled or exhaled in one normal breath — about 500 ml
Vital Capacity	Maximum air that can be expelled after a maximum inhalation — about 4800 ml
Residual Volume	Air remaining in the lungs after maximum exhalation — about 1200 ml
Second Wind	A phenomenon where an athlete, after initial breathlessness and fatigue, regains comfort and continues performing
Oxygen Debt	The extra oxygen consumed after exercise to repay the deficit incurred during anaerobic work

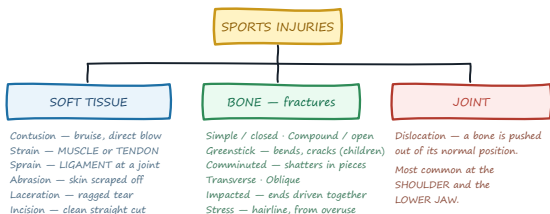
4. Physiological Changes due to Ageing

- **Muscular system** — loss of muscle mass and strength (**sarcopenia**); reduced elasticity; slower reaction.
- **Skeletal system** — reduced bone density (**osteoporosis**); joint stiffness; loss of height; cartilage wear.

- **Cardiovascular** — reduced maximum heart rate, stroke volume and cardiac output; arteries become **less elastic**; blood pressure rises.
- **Respiratory** — reduced vital capacity; weaker respiratory muscles; less efficient gaseous exchange.
- **Nervous system** — slower nerve conduction, poorer balance and coordination, slower reaction time.
- **Other** — declining vision and hearing; reduced flexibility; slower metabolism; changed body composition (more fat, less muscle).

Regular exercise slows all of these — this is why the Rikli and Jones test exists.

5. Sports Injuries — Classification



STRAIN = muscle/Tendon (both have a T) · SPRAIN = Ligament — think ankle sprain

Three families. Only one pair is really tested, and it is strain versus sprain.

THE THREE FAMILIES

Family	Injuries
SOFT TISSUE	Contusion — a bruise from a direct blow; bleeding under the skin Strain — over-stretching or tearing of a MUSCLE or TENDON Sprain — over-stretching or tearing of a LIGAMENT at a joint Abrasion — skin scraped off by friction Laceration — a deep, irregular tear in the skin Incision — a clean cut with sharp, straight edges
BONE	Simple / closed — bone breaks, skin intact Compound / open — broken bone pierces the skin Greenstick — incomplete break; bone bends and cracks — common in children Comminuted — bone shatters into several pieces Transverse — break at a right angle to the bone Oblique — break at an angle Impacted — broken ends are driven into each other Stress — a hairline crack from repetitive overuse
JOINT	Dislocation — a bone is displaced from its normal position at a joint. Common at the shoulder and lower jaw.

THE PAIR THAT DECIDES THE MARK STRAIN vs

SPRAIN.

- **Strain** = **MUSCLE** or **TENDON** — think “T” for Tendon. Caused by overstretching or sudden contraction.
- **Sprain** = **LIGAMENT** at a joint — think “ankle sprain”. Caused by a sudden twist. Also: **Laceration** is irregular and torn; **Incision** is clean and straight.

6. Prevention and First Aid

PRICE — immediate management of soft tissue injury

- P — Protection** — protect the injured part from further damage
- R — Rest** — stop activity immediately
- I — Ice** — apply for 15–20 minutes to reduce swelling and pain (never directly on skin)
- C — Compression** — a firm bandage to limit swelling
- E — Elevation** — raise the part above heart level to reduce blood flow

Causes of sports injuries: inadequate warm-up · poor fitness and technique · overuse and

fatigue · unsuitable or faulty **equipment** ·
poor playing surface · not following rules ·
lack of **protective gear** · extreme weather.

Prevention: proper **warm-up and cool-down**
· correct technique and progressive training ·
balanced diet and hydration · suitable
equipment and protective gear · adequate
rest and recovery · medical check-ups ·
following the rules of the game.

7. Question Triggers identify the injury

If the case says...	The answer is
"twisted his ankle, ligament torn"	Sprain
"pulled his hamstring muscle"	Strain
"bruise after a direct blow"	Contusion
"skin scraped after sliding"	Abrasion
"deep irregular tear in the skin"	Laceration
"clean cut with straight edges"	Incision
"bone broke and pierced the skin"	Compound / open fracture
"bone bent and cracked, child"	Greenstick fracture
"bone shattered into many pieces"	Comminuted fracture
"hairline crack from repeated running"	Stress fracture
"shoulder came out of its socket"	Dislocation
"resting pulse of an athlete is 45"	Bradycardia — long-term effect of exercise

"muscles became bigger after training"

Hypertrophy

"breathlessness eased and he continued"

Second wind

MOST-ASKED BOARD QUESTIONS

1. **[5M]** Explain the effects of exercise on the cardio-respiratory system.
2. **[5M]** Explain the effects of exercise on the muscular system.
3. **[4M]** Classify sports injuries and explain soft tissue injuries.
4. **[3M]** Differentiate between strain and sprain / laceration and incision.
5. **[3M]** Explain the physiological changes due to ageing.
6. **[1M]** What does PRICE stand for? → **Protection, Rest, Ice, Compression, Elevation**

THE HABIT THAT SCORES — For "effects of exercise" questions, give **numbered, named effects** — hypertrophy, bradycardia, increased stroke volume, increased VO_2 max. The technical term is the mark; "the heart becomes stronger" without naming **cardiac hypertrophy** earns less.

Chapter 8 · Biomechanics and Sports

CBSE Class 12 Physical Education (048) · Unit 8 =

10 marks — the largest unit · Ultimate Revision Sheet

60-SECOND RECALL

Newton's 3 laws	Inertia · Acceleration ($F = ma$) · Action-Reaction
3 levers	1st: F-A-R (fulcrum middle) · 2nd: A-R-F (resistance middle) · 3rd: A-F-R (effort middle)
Most common in body	THIRD class lever — e.g. biceps curl
Equilibrium	Static = at rest · Dynamic = moving at constant velocity
Stability rules	Lower centre of gravity + wider base + heavier body = more stable
Best projectile angle	45° when release and landing heights are equal

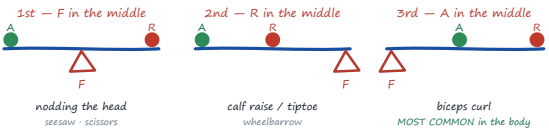
1. Newton's Laws of Motion in Sports

THE THREE LAWS — each needs a sports example

Law	Statement	Sports application
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1st — Law of Inertia	A body remains at rest or in uniform motion in a straight line unless acted upon by an external force.	A football lies still until kicked · a hockey ball keeps rolling until friction or a player stops it · a sprinter in blocks stays still until he pushes
2nd — Law of Acceleration	The acceleration of a body is directly proportional to the force applied and inversely proportional to its mass. $F = m \times a$	A harder kick sends the ball further · a shot put (heavier) travels less far than a discus for the same force · a heavier boxer needs more force to move
3rd — Law of Action and Reaction	For every action there is an equal and opposite reaction.	A swimmer pushes water backward and moves forward · a sprinter pushes the blocks and is propelled · a basketball bounces back off the floor · recoil in shooting

2. Levers and Their Application



read the MIDDLE letter — 1st = F 2nd = R 3rd = A

A = effort (the muscle) · F = fulcrum (the joint) · R = resistance (the load)

3rd class gives SPEED and RANGE but a mechanical DISADVANTAGE — muscle works harder than the load.

Three classes, one test: whatever sits between the other two names the class.

THE THREE PARTS

Fulcrum (F) — the pivot point (a joint in the body)

Effort / Force (A) — the applied force (muscle contraction)

Resistance / Load (R) — the weight to be moved (body part or implement)

THE THREE CLASSES — identified by WHAT IS IN THE MIDDLE

Class	Order	Middle	Body example
FIRST class	A — F — R	Fulcrum	Neck — nodding the head; the atlanto-occipital joint is the fulcrum. Also: seesaw, scissors.
SECOND class	A — R — F	Resistance	Calf raise — standing on tiptoe; the ball of the foot is the fulcrum, body weight the resistance. Also: wheelbarrow.
THIRD class	F — A — R	Effort	Biceps curl — elbow is the fulcrum, biceps the effort, the weight in the hand the resistance. MOST COMMON in the human body.

Memory hook: read the middle letter — 1st = Fulcrum, 2nd = Resistance, 3rd = Applied force. Or: **FRE 1-2-3.**

TRAP

The **third class lever** is the most common in the human body because muscles attach **close to the joint**. It gives a **speed and range advantage** but a **mechanical disadvantage** — the muscle must exert more force than the load it moves.

3. Equilibrium and Centre of Gravity

DEFINITIONS

Equilibrium is the state in which all the forces acting on a body are **balanced**, so it has no unbalanced acceleration.

Centre of Gravity (CG) is the point at which the **entire weight** of the body is considered to be concentrated. In a standing adult it is roughly at the **navel / upper sacral region**.

Type	Meaning	Sports example
Static equilibrium	The body is at rest ; no motion	A gymnast holding a handstand · a shooter aiming · a wrestler in a stance
Dynamic equilibrium	The body is moving at constant velocity ; forces still balanced	A skater gliding · a cyclist at steady speed · a runner at constant pace

THE FOUR PRINCIPLES OF STABILITY — a guaranteed question

1. **Lower the centre of gravity → MORE stable.** A wrestler crouches; a sprinter bends low in the blocks.
 2. **Wider the base of support → MORE stable.** Feet apart in a defensive stance.
 3. **The CG must fall WITHIN the base of support.** If the line of gravity falls outside, the body topples.
 4. **Greater the body weight → MORE stable.** A heavier sumo wrestler is harder to push over.
- Also: greater friction between body and surface increases stability.

APPLY IT BOTH WAYS Stability is not always desirable. A **sprinter in starting blocks** deliberately makes himself **unstable** — CG high and forward, near the edge of the base — so that he can accelerate quickly. A **wrestler** wants maximum stability. Mention this contrast and you show application.

4. Friction and Sports

DEFINITION

Friction is the force that opposes the relative motion of two surfaces in contact.

Type	Meaning
Static friction	Acts when the body is at rest and resists the start of motion — the greatest of the three
Sliding friction	Acts when one surface slides over another
Rolling friction	Acts when a body rolls over a surface — the least of the three

Friction is an **ADVANTAGE** when...

- **Spikes and studs** give grip in running and football
- **Gymnasts use chalk** for grip on bars
- **Basketball shoes** grip the court for quick turns
- **Grip on a bat, racquet or javelin**
- **Braking and stopping**

Friction is a **DISADVANTAGE** when...

- **Skating and skiing** — less friction means more speed, so blades are smooth and surfaces waxed
- **Swimming** — smooth suits and caps reduce drag

- Cycling — lubricated chains and smooth tyres
- Causes wear and tear of equipment and abrasion injuries

5. Projectile in Sports

DEFINITION A **projectile** is any body thrown into the air that then travels under the influence of **gravity and air resistance** alone. Its path is called the **trajectory** and is **parabolic**.

THE FIVE FACTORS AFFECTING PROJECTILE TRAJECTORY

1. **Angle of projection** — 45° gives the maximum horizontal distance **when release and landing heights are equal**. If released from above landing level (shot put, javelin), the optimum angle is **less than 45°** .
2. **Initial velocity / speed of release** — the **most important factor**; distance increases with the **square** of velocity.
3. **Height of release** — a greater release height increases distance and lowers the optimum angle.
4. **Gravity** — pulls the projectile down;

constant, and the same for all.

5. Air resistance — opposes motion; affects light objects (shuttlecock, table tennis ball) far more than heavy ones (shot put).

Also: spin, which produces the Magnus effect and curves the flight.

Event	Approximate optimum release angle
Long jump	About 20–22°
Shot put	About 38–42° (released above landing height)
Javelin / Discus	About 30–35° (aerodynamic lift matters)
High jump	Steep, about 50–60° — height, not distance, is the aim

6. Question Triggers which law / which lever?

If the question says...	The answer is
"swimmer pushes water back and moves forward"	Third law — action and reaction
"ball stays still until kicked"	First law — inertia
"harder kick makes the ball go further"	Second law — $F = ma$
"sprinter pushes the starting blocks"	Third law
"nodding the head"	First class lever
"standing on tiptoe / calf raise"	Second class lever
"biceps curl, elbow flexion"	Third class lever

"gymnast holds a handstand"	Static equilibrium
"skater glides at constant speed"	Dynamic equilibrium
"wrestler crouches with feet apart"	Lowering CG + widening base → more stability
"spikes on running shoes"	Friction as an advantage
"wax applied to skis"	Reducing friction
"best angle to throw for maximum distance"	45° (equal release and landing height)
"shuttlecock slows quickly in flight"	Air resistance

MOST-ASKED BOARD QUESTIONS

1. **[5M]** Explain Newton's three laws of motion with examples from sports.
2. **[5M]** Explain the types of levers with a diagram and their application in sports.
3. **[5M]** Explain the principles of stability / equilibrium and their application.
4. **[3-5M]** Explain the factors affecting a projectile trajectory.
5. **[3M]** Explain friction and its advantages and disadvantages in sports.
6. **[1M]** Which lever class is most common in the body? → **Third class**

THE HABIT THAT SCORES — This is a **10-mark unit** and every topic in it can be **drawn**. Draw the lever with F, A and R labelled; draw the parabolic trajectory with the angle marked; draw the base of support with the line of gravity. Labelled diagrams carry marks independently of the text.

Chapter 9 · Psychology and Sports

CBSE Class 12 Physical Education (048) · Unit 9 =

7 marks · Ultimate Revision Sheet

60-SECOND RECALL

Jung's types	Introvert · Extrovert · Ambivert
Big Five	OCEAN — Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism
Motivation types	Intrinsic (from within — joy, satisfaction) · Extrinsic (outside — medals, money, praise)
Aggression types	Hostile (intent to harm) · Instrumental (to achieve a goal) · Assertive (within rules)
4 psychological attributes	Self-esteem · Mental imagery · Self-talk · Goal setting
Exercise adherence	Sticking to an exercise programme over time

1. Personality

DEFINITION *Personality is the sum total of an individual's physical, mental, social and emotional characteristics that make him or her unique and determine how they interact with the environment.*

Jung's Classification

Type	Characteristics	Suited to
Introvert	Inward looking — reserved, quiet, shy, prefers solitude, thinks before acting, few close friends, self-centred in thought	Individual sports — archery, shooting, chess, long-distance running
Extrovert	Outward looking — sociable, talkative, friendly, confident, enjoys company, acts quickly, adjusts easily	Team and contact sports — football, basketball, boxing
Ambivert	Mixture of both — shows introvert and extrovert traits depending on the situation. Most people are ambiverts.	Adapts to most sports

Big Five Theory (OCEAN)

O-C-E-A-N — *Openness*, *Conscientiousness*, *Extraversion*, *Agreeableness*, *Neuroticism*

Trait	High score means
Openness to experience	Imaginative, curious, creative, open to new ideas and experiences. Low: conventional, prefers routine.
Conscientiousness	Organised, disciplined, dependable, goal-directed, plans ahead. Best predictor of sporting success. Low: careless, impulsive.

Extraversion	Outgoing, energetic, sociable, assertive, seeks stimulation. Low: reserved, quiet.
Agreeableness	Cooperative, trusting, kind, helpful, good team member. Low: competitive, critical, uncooperative.
Neuroticism	Anxious, moody, emotionally unstable, prone to stress. Low neuroticism (emotional stability) is desirable in sport.

TRAP In the Big Five, four traits are positive when **HIGH**, but **Neuroticism** is desirable when **LOW**. A successful athlete is typically high on conscientiousness and low on neuroticism.

2. Motivation

DEFINITION *Motivation is the internal drive or external stimulus that **initiates, directs and sustains** behaviour towards a goal.*

Type	Meaning	Examples
Intrinsic <i>internal</i>	Comes from within the person — doing the activity for the enjoyment and satisfaction it gives. More lasting and effective.	Love of the game, sense of achievement, self-satisfaction, fun, personal challenge

Extrinsic <i>external</i>	Comes from outside — performing to gain a reward or avoid punishment. Short-lived ; may reduce intrinsic motivation if overused.	Medals, trophies, prize money, praise, certificates, scholarships, fear of punishment
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Techniques of Motivation (6)

1. **Goal setting** — specific, realistic, measurable goals give direction.
2. **Praise and reward** — recognition of good performance reinforces effort.
3. **Healthy competition** — friendly rivalry pushes performance.
4. **Knowledge of results / feedback** — telling athletes how they performed improves the next attempt.
5. **Attractive facilities and equipment** — a good environment encourages participation.
6. **Positive attitude of the coach** — encouragement, fair treatment, and being a role model.

3. Exercise Adherence

DEFINITION

Exercise adherence is the extent to which a person **continues to follow** an exercise programme regularly over a long period.

Reasons people do NOT adhere

- **Lack of time** — the most cited reason
- Lack of **motivation** and willpower
- Lack of **facilities** or unsafe environment
- **Boredom** with a repetitive routine
- Fatigue, injury or ill health
- Unrealistic goals leading to disappointment
- Lack of family and social support

Benefits of adherence

- Improved **physical fitness** and body composition
- Prevention of **lifestyle diseases**
- Better **mental health** — less stress and anxiety
- Improved sleep and energy
- Increased longevity and quality of life
- Social interaction and enjoyment

Strategies for Enhancing Adherence (6)

1. **Set realistic, achievable goals** and record progress.
2. **Make it enjoyable** — vary the activity to prevent boredom.
3. **Exercise in a group** or with a partner for social support and accountability.
4. **Fix a regular time and place** so it becomes a habit.
5. **Reward yourself** for reaching milestones.
6. **Educate about the benefits** and get family and peer support.

4. Aggression in Sports

DEFINITION

Aggression in sport is behaviour intended to **harm** another person physically or psychologically, or forceful behaviour directed at achieving a goal.

THE THREE TYPES — distinguished by INTENT

Type	Intention	Example

Hostile aggression	The primary goal is to HARM the opponent. Accompanied by anger.	A bowler deliberately aiming a bouncer at the batsman's head out of anger · punching an opponent after a foul
Instrumental aggression	Harm is incidental ; the goal is to achieve something — a point, possession, victory. No anger involved.	A hard but legal tackle in football to win the ball · a boxer hitting to score points
Assertive behaviour	Not truly aggression. Playing with legitimate force and energy WITHIN the rules , with no intent to harm.	A rugby player driving forward hard but legally · a determined sprint finish

THE DECIDING QUESTION Ask: *what was the intention?*

- Intent to *injure* → *hostile*
- Intent to *win the ball or the point*, injury incidental → *instrumental*
- *Within the rules*, no intent to harm → *assertive*

The same physical act can be any of the three depending on intent.

5. Psychological Attributes in Sports

Attribute	Meaning	How it helps performance
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Self-Esteem	A person's overall evaluation of his or her own worth — how much they value themselves	High self-esteem gives confidence, willingness to take risks, resilience after failure. Low self-esteem causes fear of failure and avoidance of competition.
Mental Imagery	Visualising a skill or performance in the mind without physically doing it — also called visualisation	Improves skill learning, builds confidence, prepares for competition, reduces anxiety, helps rehearse strategy and recover from injury
Self-Talk	The inner dialogue an athlete has with himself. Can be positive ("I can do this") or negative ("I will fail")	Positive self-talk boosts confidence, maintains focus and controls anxiety. Negative self-talk must be replaced , not merely suppressed.
Goal Setting	Establishing specific targets to be achieved within a time frame	Gives direction and motivation, allows progress measurement, builds confidence as goals are met. Should be SMART — Specific, Measurable, Achievable, Realistic, Time-bound.

Types of goals: Outcome goals (winning — depends on others) · Performance goals (beating your own best time) · Process goals (improving technique). Performance and process goals are more within the athlete's control and therefore more motivating.

6. Question Triggers

identify the concept

If the case says...	The answer is
"quiet, reserved, prefers to train alone"	Introvert
"sociable, talkative, enjoys team games"	Extrovert
"shows both traits depending on situation"	Ambivert
"disciplined, organised, plans training"	Conscientiousness (Big Five)
"anxious, moody, stressed before matches"	Neuroticism (Big Five)
"plays for the love of the game"	Intrinsic motivation
"plays to win prize money and a trophy"	Extrinsic motivation
"punched the opponent out of anger"	Hostile aggression
"hard tackle to win the ball"	Instrumental aggression
"played forcefully but within the rules"	Assertive behaviour
"visualised the perfect jump before attempting"	Mental imagery
"told himself 'I can do this'"	Positive self-talk
"aims to improve his time by 2 seconds in 3 months"	Goal setting (performance goal, SMART)
"stopped going to the gym after two weeks"	Poor exercise adherence

MOST-ASKED BOARD QUESTIONS

1. [5M] Explain the Big Five theory of personality.
2. [3-5M] Explain the types of aggression in sports with examples.
3. [3-5M] Explain the psychological attributes in sports.
4. [3M] Differentiate between intrinsic and extrinsic motivation.
5. [3M] Explain strategies for enhancing exercise adherence.
6. [1M] Who classified personality as introvert and extrovert? → **Carl Jung**

THE HABIT THAT SCORES — Every concept in this unit is examined through a **short case**. Answer in three steps: **name the concept** → **define it in one line** → **quote the words from the case that prove it**. The third step is where most students lose half the mark.

Chapter 10 · Training in Sports

CBSE Class 12 Physical Education (048) · Unit 10

= 9 marks · Ultimate Revision Sheet

60-SECOND RECALL

Strength methods	Isometric (no movement) · Isotonic (movement) · Isokinetic (constant speed, machine)
Endurance methods	Continuous · Interval · Fartlek
Speed methods	Acceleration runs · Pace runs
Flexibility methods	Ballistic · Dynamic · Static (active/passive) · PNF
Coordination	Ability to perform movements smoothly and accurately
Circuit training	8–12 stations , minimal rest, developed by Morgan and Adamson

1. Talent Identification and Talent Development

Term	Meaning
Talent Identification	The process of recognising individuals with the potential to excel in a particular sport, using physical, physiological and psychological testing.
Talent Development	Providing the right environment, coaching, facilities and support so that identified talent reaches its potential.

Criteria used: anthropometric measures (height, weight, limb length) · physical fitness components · physiological factors (VO_2 max, muscle fibre type) · psychological attributes · skill and game sense · heredity.

Indian talent programmes: Khelo India · Target Olympic Podium Scheme (TOPS) · SAI training centres · sports schools and academies.

Importance: avoids wastage of time and resources · enables early specialised training · improves the national standard of sport · ensures the right athlete goes into the right sport.

2. Sports Training Cycle — Micro, Meso, Macro

A sectional plan breaks the training year into phases, periods and weeks. The three training cycles are sectional plans built from the needs of the annual plan. The longest unit of all is the long-term plan (8–15 years), which runs from basic training to peak performance.

THE THREE CYCLES — DURATION IS THE MARK

Cycle	Duration	Purpose and detail
Micro Cycle	3 to 10 days <i>(5–10 days for intermediate and high-performance athletes)</i>	Shortest cycle. The last day gives active recovery and relaxation to prepare for the next micro cycle. Load proportions of high to medium/low: 1:1 (one high day then one medium), 2:1 (two high then one medium), 3:1 (three high then one medium or low).
Meso Cycle	3 to 6 weeks <i>(4 weeks is considered best)</i>	Medium duration. Tackles specific tasks: learning and mastering skills · maintaining and stabilising performance · developing physical and motor fitness · preparing for a specific competition · attaining optimal performance · preparing for the next mesocycle. 4 weeks is the minimum period in which significant physiological and psychological change occurs. The last week is a transitional phase for recovery.
Macro Cycle	3 to 12 months	Longest cycle. Enables the athlete to peak at a specific time during competition. A macro cycle is made up of several meso cycles ; the last meso cycle ensures recovery for a smooth transition into the next macro cycle.

TRAP The durations are the marks — get them exact: **micro 3–10 DAYS, meso 3–6 WEEKS, macro 3–12 MONTHS**. Note the units change each time.

Remember the nesting direction: a **macro cycle contains meso cycles, which contain micro cycles** — not the other way round. The three periods of the training year are **preparatory, competition and transitional**.

3. Strength — Methods of Development

DEFINITION Strength is the ability of a muscle or muscle group to **overcome or act against resistance**.

Types: **Maximum strength** (against maximum resistance) · **Explosive strength** (strength × speed, e.g. shot put) · **Strength endurance** (strength × endurance, e.g. long-distance swimming).

THE THREE METHODS — distinguished by MOVEMENT

Method	What happens	Examples
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ISOMETRIC <i>iso = same, metric = length</i>	Muscle contracts but there is NO visible movement and no change in muscle length . Work is done but not seen.	Pushing against a wall · holding a plank · pressing palms together · holding a weight still
ISOTONIC <i>tonic = tension</i>	Muscle changes length and there IS visible movement . Tension stays roughly constant.	Weight training, push-ups, squats, running, most gym exercises
ISOKINETIC <i>kinetic = motion</i>	Contraction at a CONSTANT SPEED throughout the range, requiring special machines . Resistance varies to match the force applied.	Specialised isokinetic machines · rowing and swimming actions on such equipment

TRAP *Isometric = NO movement. Isotonic = movement. Isokinetic = constant SPEED and needs a machine. The word roots give it away: metric = length (unchanged), tonic = tension, kinetic = motion.*

4. Endurance — Methods of Development

DEFINITION *Endurance is the ability to resist fatigue and sustain activity for a long period.*

Types by duration: *Speed endurance* (up to 45 s) · *Short-term* (45 s – 2 min) ·

Medium-term (2 – 11 min) · *Long-term* (above 11 min). *By nature*: basic, general and specific endurance.

THE THREE METHODS

Method	How it works	Key point
CONTINUOUS	Exercise performed for a long duration without any rest , at a steady low-to-moderate intensity. Duration at least 30 minutes .	Develops aerobic capacity. Eg: long slow-distance running, cycling, swimming.
INTERVAL	Alternating periods of work and INCOMPLETE recovery . The athlete starts the next repetition before fully recovering (heart rate falls to about 120–130).	Develops both aerobic and anaerobic capacity. Eg: 8 × 400 m with 90 s recovery.
FARTLEK <i>Swedish for "speed play"</i>	Speed is varied by the athlete's own feeling , over varied natural terrain — uphill, downhill, soft ground. No fixed intervals , no timing.	Developed in Sweden . Athlete decides the pace, so it is less monotonous. Develops aerobic and anaerobic capacity.

INTERVAL vs FARTLEK — the classic distinction

Interval is planned and measured — fixed distance, fixed recovery, timed, usually on a track.

Fartlek is unplanned — the athlete varies the speed at will over natural terrain, with no stopwatch.

5. Speed — Methods of Development

DEFINITION *Speed is the ability to perform a movement or cover a distance in the shortest possible time. It is largely genetically determined (fast-twitch fibre percentage), so it is the hardest component to improve.*

Types: Reaction ability · Acceleration ability · Movement speed · Locomotor ability · Speed endurance.

THE TWO METHODS

Method	How it works
ACCELERATION RUNS	Used to develop explosive strength, acceleration ability and movement frequency . The athlete runs from a standing or crouch start, accelerating to maximum speed as quickly as possible , typically over 25–50 m. Adequate recovery between runs.

PACE RUNS / PACE RACES

Running the **whole distance at a uniform, pre-decided speed**. Used for distances of **800 m and above**. Develops **speed endurance** and teaches even pace judgement.

6. Flexibility — Methods of Development

DEFINITION *Flexibility is the range of motion available at a joint or group of joints.*

Types: Passive flexibility (with external help — always greater) · Active flexibility (without help), which is further static (held in position) or dynamic (during movement).

THE FOUR METHODS

Method	How it works
BALLISTIC	Stretching performed with a swing, bounce or bobbing action using momentum. Effective but carries the highest injury risk ; should be done only after a thorough warm-up.
DYNAMIC	Controlled movement through the full range of motion, gradually increasing reach and speed. Safer than ballistic — no bouncing. Ideal in a warm-up. Eg: leg swings, arm circles.

STATIC

The stretch is taken to the end of range and **HELD** for 10–30 seconds without movement. **Active static** = held by your own muscles; **Passive static** = held with help from a partner or gravity. Safest method; best in a **cool-down**.

PNF

*Proprioceptive
Neuromuscular
Facilitation*

A partner-assisted technique: the muscle is **stretched, then contracted isometrically against resistance, then relaxed and stretched further**. Usually the **most effective** method for increasing range, but needs a trained partner.

7. Coordinative Abilities

DEFINITION

Coordinative abilities are the abilities to perform a group of movements with smoothness, accuracy and control. They depend largely on the central nervous system.

Ability	Meaning
Orientation ability	Determining and changing the position of the body in time and space — e.g. a goalkeeper tracking the ball
Coupling ability	Combining movements of different body parts into one smooth action — e.g. a basketball lay-up
Reaction ability	Reacting quickly and correctly to a signal — e.g. a sprint start
Balance ability	Maintaining equilibrium during and after movement — e.g. gymnastics beam

Rhythm ability	Perceiving and reproducing the rhythm of a movement — e.g. hurdling stride pattern
Adaptation ability	Changing or adjusting the movement when the situation changes unexpectedly — e.g. adjusting to a deflected ball
Differentiation ability	Achieving a fine adjustment of force and effort in a movement — e.g. a delicate drop shot in badminton

8. Circuit Training

CONCEPT Circuit training was developed by R. E. Morgan and G. T. Adamson at the University of Leeds. The athlete moves through a series of **8 to 12 stations** arranged in a circuit, performing a different exercise at each with **little or no rest** between stations.

Advantages: develops several fitness components at once · large numbers can train in a small space · easily adapted to any age or level · little equipment needed · progress is easy to measure · not monotonous.

Design rule: arrange stations so that consecutive stations do not work the same muscle group — alternate upper body, lower body and core.

9. Question Triggers which method?

If the question says...	The answer is
"pushing against an immovable wall"	Isometric exercise
"weight training with visible movement"	Isotonic exercise
"constant speed on a special machine"	Isokinetic exercise
"running 30 minutes without rest"	Continuous method
"8 × 400 m with fixed 90 s recovery"	Interval method
"varied the pace at will over hills and forest"	Fartlek
"sprint 30 m from a crouch start, repeatedly"	Acceleration runs
"ran 800 m at a uniform planned speed"	Pace run
"bouncing while touching the toes"	Ballistic stretching
"held the stretch for 20 seconds"	Static stretching
"leg swings and arm circles in warm-up"	Dynamic stretching
"partner resisted, then stretched further"	PNF
"10 stations, no rest between"	Circuit training
"goalkeeper judging the ball's position in air"	Orientation ability
"adjusted the shot when the ball deflected"	Adaptation ability

MOST-ASKED BOARD QUESTIONS

1. [5M] Explain the methods of developing endurance / strength / flexibility.
2. [5M] Explain circuit training and its advantages.
3. [3-5M] Explain the coordinative abilities.
4. [3M] Differentiate between isometric, isotonic and isokinetic exercises.
5. [3M] Differentiate between interval training and fartlek training.
6. [1M] Who developed circuit training? → **Morgan and Adamson**
7. [1M] What does fartlek mean? → **Speed play** (Swedish)

THE HABIT THAT SCORES — Every method question wants the same three things: **name** → **how it works in one line** → **a concrete example**. For strength, remember the word roots — *metric* (length), *tonic* (tension), *kinetic* (motion) — and you can never confuse the three methods again.