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CUET · PHYSICAL EDUCATION · CLASS XI · CODE 321

Health Related Physical Fitness

CUET unit: Physical Fitness, Wellness and Lifestyle / Training in Sports

By **UniDrill** · NCERT-grounded study material

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📌 Snapshot

- Defines physical fitness as a state of health and well-being achieved through moderate/vigorous activity, balanced diet and recovery.
- Establishes the **five components of health-related physical fitness**: Muscular Strength, Endurance, Flexibility, Body Composition, Cardiovascular Endurance.
- Breaks down strength into Maximum, Explosive and Strength Endurance, with quantified effort percentages (100%, 70–80%, 50–60%).
- Explains endurance types (Basic / General / Specific) and methods of improvement (Continuous, Interval, Repetition, Competition).
- Covers flexibility (passive vs active; static vs dynamic), its determining factors, and methods (Ballistic, Stretch-and-hold, PNF).
- Defines Body Composition and Cardiovascular Endurance with measurement methods (hydrostatic weighing, skin-fold caliper, 12-minute run/walk test).

📖 Detailed Notes

2.1 Core concepts

- Physical fitness is "a state of health and well-being" that develops capacity to perform better in sports, job and daily routine — achieved through moderate/vigorous physical activity, balanced diet, and proper recovery (NCERT §Intro, p. 272).
- Regular activities like walking, jogging, cycling, swimming and yoga reduce risk of heart disease, diabetes, hypertension and depression (NCERT §Intro, p. 272).
- Five components of health-related physical fitness: Muscular Strength, Endurance, Flexibility, Body Composition, Cardiovascular Endurance (NCERT §Intro, p. 272).
- **Muscular Strength** is the ability of a muscle/group of muscles to exert force against resistance (internal — body weight, or external — opponent's weight) (NCERT §Muscular Strength, p. 273).
- Strength is divided into three parts: (a) **Maximum Strength** — 100% effort in a single contraction, used in weight-lifting, throws (NCERT §a, p. 273); (b) **Explosive Strength** (also elastic strength) — 70–80% effort with high speed, used in jumping, sprinting, boxing (NCERT §b, p. 274); (c) **Strength Endurance** — 50–60% effort

sustained for long duration under fatigue, used in cross-country hill running, cycling, swimming (NCERT §c, p. 274).

- Factors liberating force in muscles: Neural Control (number, size of motor units; intensity of nerve impulse), Muscle Cross-section, Muscle Fibre type (fast-twitch white = anaerobic, more force; slow-twitch red = less force), Energy Supply (ATP + CP breakdown), Psychological Factors (anger, aggression, motivation) (NCERT §Factors, pp. 274–275).
- Methods of strength improvement: (1) using own body weight as resistance — sit-ups, lunges, bicycle crunches, leg raises, high knees, turning kicks, chin-ups, full arch (NCERT §1, p. 276); (2) using external weight — weight plates, medicine ball, weight belts; also swimming against current, drag running (NCERT §2, p. 276).
- **Endurance** is the physiological and psychological ability to do specific work for longer duration with desired quality under fatigue; it is task-specific (NCERT §Endurance, pp. 277–278).
- Endurance types: Basic (aerobic, slow pace, not task-specific), General (longer duration with various movement patterns and pace), Specific (set type of work, aerobic + anaerobic, highly trainable) (NCERT §Endurance types, p. 278).
- Factors determining endurance: muscle fibre type, aerobic capacity (oxygen uptake, transport via haemoglobin, heart size/cardiac output, consumption), anaerobic capacity (phosphogen ATP+CP lasts 8–10 seconds; glycolysis; buffer system neutralises lactic acid), movement pattern (economy), psychological factors (NCERT §Factors, pp. 278–279).
- Methods to improve endurance: (1) **Continuous Method** — long duration without rest, sub-types: slow pace, fast pace, changing pace, **Fartlek** ("speed play", change of pace unplanned) (NCERT §1, pp. 280–281); (2) **Interval Method** — sub-maximal intensity with short break and incomplete recovery, load decided by heart rate (NCERT §2, p. 281); (3) **Repetition Method** — pace near/more than real competition, complete recovery interval (NCERT §3, p. 281); (4) **Competition Method** — develops specific endurance and tactics (NCERT §4, pp. 281–282).
- Benefits of endurance training (Table 1, p. 282): Cardio-respiratory — increases heart size, blood volume, haemoglobin, stroke volume, cardiac output, VO_2 max, lung volume; decreases resting heart rate, BP. Muscular-skeletal — increases mitochondria, myoglobin, triglyceride storage, oxidative phosphorylation; decreases injury risk. Other — increases HDL, heat acclimatisation; decreases body weight, body fat, total cholesterol, LDL (NCERT Table 1, p. 282).
- **Flexibility** is the ability to move body parts to maximum range around the joint; measured in degrees, radians or centimetres (NCERT §Flexibility, p. 282).
- Types: **Passive flexibility** (with external help — greater ROM) and **Active flexibility** (without external help). Active is sub-divided into **Static** (sitting/standing) and **Dynamic** (while moving) (NCERT §1–2, pp. 283; Do You Know, p. 284).

- Factors determining flexibility: Anatomical structure of joint (ball-and-socket has maximum ROM), Ligaments and muscle stretchability, Coordination between agonist–antagonist muscles, Strength of muscle (NCERT §Factors, p. 284).
- Methods to improve flexibility: (1) **Ballistic Method** — rhythmic swing movements, used in gymnastics (NCERT §1, pp. 284–285); (2) **Stretch and Hold** — stretch to limit and hold for a few seconds (NCERT §2, p. 285); (3) **Post-Isometric Stretch / PNF** (Proprioceptive Neuromuscular Facilitation) — muscle is isometrically contracted for 8–10 seconds then stretched (NCERT §3, pp. 285–286).
- **Body Composition** is the classification of body into fat weight and lean body weight. Direct method = hydrostatic / under-water weighing; Indirect method = skin-fold caliper (NCERT §Body Composition, p. 286).
- **Cardio-vascular Endurance** is the ability of heart, lungs and blood vessels to supply oxygen and nutrients to cells over prolonged moderate-intensity activity. Measured using the **12-minute run/walk test** (NCERT §Cardio-vascular Endurance, p. 286).

2.2 Definitions to memorise

Term	Definition	Page
Physical Fitness	State of health and well-being that develops capacity to perform better in sports, job and routine work	272
Muscular Strength	Ability of muscle/group of muscles to exert force on resistance to overcome or act against it	273
Maximum Strength	Force generated with 100% effort in a single contraction	273
Explosive Strength	Muscle contracting with high speed at 70–80% effort	274
Strength Endurance	Acting against resistance at 50–60% effort for longer duration under fatigue	274
Aerobic Capacity	Capacity to work in presence of maximum oxygen; work is of longer duration	273 (box)
Anaerobic Capacity	Capacity to work in less amount of O_2; work is of short duration	273 (box)
Endurance	Physiological + psychological ability to do specific work for long duration with desired quality under fatigue	278
Fartlek	"Speed play" — continuous training with unplanned changes of pace, ideal for mature athletes	281
Interval Method	Sub-maximal intensity with short break and incomplete recovery; load monitored by heart rate	281
Flexibility	Ability to move body parts to maximum range around the joint (measured in degrees, radians or cm)	282
Passive Flexibility	Movement around joint done with external help	283

Term	Definition	Page
Active Flexibility	Movement around joint done without external help (Static or Dynamic)	283
PNF	Proprioceptive Neuromuscular Facilitation — post-isometric stretch (8–10 s contraction then stretch)	286
Body Composition	Classification of body into fat weight and lean body weight	286
Cardio-vascular Endurance	Ability of heart, lungs and blood vessels to supply O_2 and nutrients to cells over prolonged moderate activity	286
Continuous Method	Endurance training of long duration without rest	280
Repetition Method	Endurance method at near-competition pace with complete recovery	281
Competition Method	Endurance training through full-event simulation	281
Ballistic Stretch	Flexibility method using rhythmic swing — gymnastics	285
Hydrostatic Weighing	Direct body-composition method (under-water weighing)	286
Skin-fold Caliper	Indirect body-composition method	286
VO_2 max	Maximal oxygen uptake during exercise	282
HDL / LDL	High/Low Density Lipoprotein cholesterol fractions	282
Motor Unit	Single motor neuron + the muscle fibres it innervates	274
Fast-twitch fibre	White, anaerobic, generates more force	275
Slow-twitch fibre	Red, aerobic, generates less force	275

2.3 Diagrams / processes to remember

- **Fig. 8.1 (p. 276):** Exercises with own body weight — Sit-ups, Lunges, Bicycle Crunches, Leg Raises, High Knees, Turning Kicks, Chin-ups, Full Arch.
- **Fig. 8.2 (p. 277):** Exercises with external weight as resistance — Dumbbell Bench Press, Leg Curl, Cable Pushdown, Seated Row, Dumbbell Shoulder Press, Lat Pull Down, Twist Abs, Incline Sit-up, Calf Raise.
- **Fig. 8.3 / 8.4 (p. 280):** Improvement of endurance with fast pace and through cross-country.
- **Fig. 8.5 (p. 282):** Passive vs Active flexibility.
- **Fig. 8.6 (p. 283):** Static flexibility examples.
- **Fig. 8.7 (p. 283):** Dynamic flexibility.
- **Fig. 8.8 (p. 284):** Ballistic method to improve flexibility.
- **Fig. 8.9 / 8.10 (pp. 285–286):** Stretching exercises with and without partner/ equipment.

- **Table 1, p. 282:** Benefits of Endurance Training across three systems (Cardio-respiratory, Muscular-skeletal, Other) — what increases and what decreases.
- **ATP + CP phosphogen system** lasts only **8–10 seconds** during anaerobic work (p. 279).

2.4 Common confusions / NTA trap points

- **Effort percentages get swapped** — Maximum = 100%, Explosive = 70–80%, Strength Endurance = 50–60%. NTA loves shuffling these.
- **Fast twitch = white = anaerobic = more force**; **Slow twitch = red = aerobic = less force**. Don't reverse colours.
- **Passive flexibility has GREATER ROM than active** (Do You Know box, p. 284) — common reversal trap.
- **PNF = Proprioceptive Neuromuscular Facilitation**, NOT "Progressive⋯" — full form is examined directly.
- **Phosphogen (ATP + CP) lasts 8–10 seconds** — not 8–10 minutes.
- **Cardio-vascular endurance is evaluated by the 12-minute run/walk test** (not Cooper's 1.5 mile, not Harvard step) — chapter specifies 12 minutes.
- **Hydrostatic weighing = direct method; skin-fold caliper = indirect method** for body composition.
- **Interval method = incomplete recovery; Repetition method = complete recovery** — easy swap.
- **Fartlek = unplanned pace change; Changing pace = planned pace change** — both are sub-types of continuous method.
- **Five components of health-related fitness** = Strength + Endurance + Flexibility + Body Composition + CV Endurance. Speed, Power, Agility are "skill-related" components and are NOT in the five.
- **PNF stretch** = isometric contraction for **8–10 seconds**, then stretch. Same numeric band as the phosphogen window — easy to confuse contexts.
- **Ballistic method = rhythmic swing**; used in gymnastics. NTA may swap with PNF.
- **Endurance types** = Basic / General / Specific. Basic is aerobic and not task-specific; General varies in pattern; Specific is task-specific and highly trainable.
- **Anaerobic glycolysis** produces lactic acid which the buffer system neutralises — not the aerobic system.

2.5 Key concepts table — fitness components, methods, fitness tests

#	Concept / test	NCERT detail	Page
1	Health-related components	Strength, Endurance, Flexibility, Body Composition, CV Endurance	272

#	Concept / test	NCERT detail	Page
2	Maximum Strength	100% effort, single contraction (weight-lifting, throws)	273
3	Explosive Strength	70–80% effort, high speed (sprint, jump, boxing)	274
4	Strength Endurance	50–60% effort, long duration under fatigue (cross-country)	274
5	Strength — neural control	More/larger motor units + stronger nerve impulse	274
6	Strength — cross-section	Larger cross-section = more strength	274
7	Strength — fibre type	Fast-twitch white (anaerobic, more force) vs slow-twitch red	275
8	Strength methods	Own body weight; external weight (plates, medicine ball)	276
9	Endurance	Specific work for long duration under fatigue	278
10	Basic endurance	Aerobic, slow pace, not task-specific	278
11	General endurance	Various movement patterns + pace, long duration	278
12	Specific endurance	Task-specific, aerobic + anaerobic, highly trainable	278
13	Phosphogen (ATP + CP)	Lasts 8–10 seconds	279
14	Continuous method	Long duration without rest — slow/fast/changing/ Fartlek	280–281
15	Fartlek	"Speed play" — unplanned pace change	281
16	Interval method	Sub-max + short break + INCOMPLETE recovery; HR-monitored	281
17	Repetition method	Near-competition pace + COMPLETE recovery interval	281
18	Competition method	Develops specific endurance + tactics	281–282
19	Flexibility	ROM around joint, in degrees/radians/cm	282
20	Passive flexibility	With external help; GREATER ROM	283, 284
21	Active flexibility	Without external help; Static + Dynamic	283
22	Ballistic stretch	Rhythmic swing; gymnastics	284–285
23	Stretch-and-hold	Stretch to limit, hold few seconds	285
24	PNF	Isometric contraction 8–10 s then stretch	285–286
25	Body Composition	Fat weight + Lean body weight	286

#	Concept / test	NCERT detail	Page
26	Body composition — direct method	Hydrostatic / under-water weighing	286
27	Body composition — indirect	Skin-fold caliper	286
28	CV Endurance	Heart-lung-vessel O_2 delivery in prolonged moderate work	286
29	CV Endurance — test	12-minute run/walk test	286
30	Endurance training benefits	↑ Heart size, blood volume, Hb, SV, CO, VO_2max, lung volume, HDL; ↓ RHR, BP, body fat, total cholesterol, LDL	Table 1, 282

2.6 Extended discussion — strength architecture, energy systems, fitness-test mapping

This is the **first quantitative chapter** in CUET PE — it ties physical fitness to numbers. The single most testable cluster is **strength architecture**: Maximum (100%, single rep, weight-lifting/shot-put), Explosive (70–80%, high speed, jumping/sprinting/boxing/throws), and Strength Endurance (50–60%, sustained against fatigue, cross-country/cycling/swimming). The progression is from intensity-dominant to duration-dominant, with the explosive band as the speed-power middle. Examiners frequently provide a sport and ask which strength sub-type it primarily demands — pair the sport with the duration of a single effort to deduce the answer.

Next come the **factors liberating force**: neural control (motor unit recruitment, nerve impulse intensity), muscle cross-section (the larger the section, the higher the force), fibre type (fast-twitch white = anaerobic, more force; slow-twitch red = aerobic, less force), energy supply (ATP/CP/glycolysis hierarchy) and psychological drive (anger, aggression, motivation). The fibre-colour mapping is a perennial NTA target — students must remember "fast = white = anaerobic = power" and "slow = red = aerobic = endurance".

Endurance is then carved into Basic (aerobic, slow-pace baseline), General (variable pattern, longer duration) and Specific (task-aligned, highly trainable, aerobic + anaerobic). The energy-system table — phosphogen (8–10 sec), anaerobic glycolysis (with lactic-acid buffering), and aerobic — is essential. The four methods of improvement are arranged on a recovery axis: **continuous** (no rest), **interval** (incomplete recovery, HR-monitored), **repetition** (complete recovery), and **competition** (full event simulation). Fartlek is a continuous sub-type with unplanned pace changes.

Flexibility divides on a help axis (passive vs active) and a movement axis (static vs dynamic, within active). The counter-intuitive note that **passive flexibility yields greater ROM** is a CUET favourite. The three training methods — ballistic (gymnastics,

rhythmic swing), stretch-and-hold (limit-and-hold), and PNF (8–10 s isometric contraction then stretch) — each have a typical-use context.

Body composition is tested mainly through the direct/indirect method dichotomy: hydrostatic weighing (direct, lab-based, displacement of water by submerged body) vs skin-fold caliper (indirect, measures subcutaneous fat at specified sites). **Cardiovascular endurance** is measured through the **12-minute run/walk test** — note that this is a chapter-specified test that is NOT the same as Cooper's standard 1.5-mile test or the Harvard step test (these come up in chapter 109).

Finally, the **endurance training benefits table** (Table 1, p. 282) is one of the densest one-shot recall items in the syllabus. Cardio-respiratory increases (heart size, blood volume, haemoglobin, stroke volume, cardiac output, VO_2max, lung volume) pair with cardio-respiratory decreases (resting HR, BP). Muscular-skeletal increases (mitochondria, myoglobin, triglyceride storage, oxidative phosphorylation) pair with decreases (injury risk). System-wide changes include rising HDL, heat acclimatisation, dropping body weight, body fat, total cholesterol and LDL. Memorise this table as a single block and you will answer almost every endurance-related CUET item from this chapter.

🎯 Practice MCQs

📊 PYQ Alignment

> This chapter is one of the highest-yielding chapters for CUET (UG) Physical Education — definitions of fitness components, effort percentages of strength types, methods of endurance improvement (Fartlek, Interval, Repetition), types of flexibility, and PNF appear almost every year as direct one-liners or match-the-following items. Expect 6–8 MCQs in the 2026 paper drawn from this chapter, with a strong tilt toward statement-based and matching questions on strength sub-types and endurance training benefits (Table 1).