

CUET · PHYSICAL EDUCATION · CLASS XI · CODE 321

Safety and Security

CUET unit: Sports Injuries, Safety, and Doping in Sports

By UniDrill · NCERT-grounded study material

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Snapshot

- Establishes the importance of safety and security of children/athletes during sports training and competitions to prevent injuries and avoid emotional/psychological phobia.
- Lays down safety measures for three principal facilities: playgrounds (sports ground, field, instruments, uniforms), gymnasium, and swimming pool.
- Explains preventive and technical measures to prevent sports injuries — warming up, fitness, nutrition, supervision and right equipment.
- Discusses health hazards of alcohol, tobacco and substance abuse during adolescence and use of common medicines.
- Covers Doping in depth — definition (IOC), reasons, classifications (dietary supplements; injectable supplements — hormones and drugs), basic doping drugs (narcotics, steroids, gene doping, blood doping), harms, and testing/control procedures.

Detailed Notes

2.1 Core concepts

- Safety and security of children is very important while playing games/sports; injuries lead to fearful emotional or psychological phobia, so simple safety rules must be applied by PE teachers, trainers, coaches, school administrators and equipment manufacturers (NCERT §Safety Measures in Playgrounds..., p. 251).
- **Sports ground:** must be free of high-tension electric line, barbed wire, bushes, wild grass, close walls with hard surface; surface to be safe, clean, free from stones/broken bricks. Chain link fencing/stairs for spectators and trainers should be at least **6 meters** away from the end lines of the play field (NCERT §Sports ground, p. 252).
- **Field:** separate sitting area for extra players; spectators' sitting area away from playing area; trees/bushes shifted from play field to avoid collision; sufficient warming-up area; broken glass and sharp-edged stones removed (NCERT §Field, p. 252).
- **Safety regarding sports instruments:** manufacturers must give priority to 'concept of safety to sportsperson'; material of high standard; damaged equipment must not be used; playing surfaces for different games to be constructed separately as per official guidelines (NCERT §Safety regarding sports instruments, p. 252).

- **Safety regarding uniforms:** light coloured T-shirt fabric (does not absorb sweat) is better due to weather variations in India; sweat-absorbing fabric may cause allergy/skin problems (NCERT §Safety regarding uniforms, pp. 252–253).
- **Shoes:** objectives of wearing properly manufactured shoes are (i) comfortable feeling (ii) proper ankle support (iii) proper balance (iv) avoiding leg injury due to uncomfortable shoes (NCERT §Selection of the shoe, p. 253).
- **Gymnasium injuries** may occur due to: unsafe keeping of equipment, lack of proper place for exercises, lack of warm-up area, old equipment, unsafe electrical fittings, uncleaned/slippery surface, poor lighting, poor sanitation, not observing safety during lifting weight barbells, lack of knowledge of using equipment (NCERT §Safety measures in relation to Gymnasium, pp. 253–254).
- **Swimming pool safety:** separate pools for beginners and advanced swimmers; trained life-guards equipped with long stick, rope, whistle, life-saving jackets, swimming pads and kicking boards; water treatment plant operational; **chlorination of water** removes accumulated algae; swimming only in presence of life-guards (NCERT §Safety measures in relation to swimming pool, pp. 254–255).
- **Why sports injuries occur:** poor equipment/surface, lack of knowledge of rules, lack of technical/tactical knowledge, lack of fitness, not observing safety in gymnastics/diving/judo/wrestling, lifting heavy weights without helpers (NCERT §Why do sports injuries occur, p. 255).
- **Prevention of injuries (competition):** proper warming up (enhances reflex actions, reduces chances of injury), safety gears/clothing, following rules, thorough equipment check, evaluation of arena by officials (NCERT §Prevention of injury related to competition, p. 256).
- **Technical measures:** working on fitness/conditioning to avoid tiredness; practising difficult movements before active participation; coach guidance; proper nutrition (repairs and builds ruptured muscle fibres); right shoe and uniform (NCERT §Technical measures..., pp. 256–257).
- **Alcohol & tobacco:** adolescents are particularly vulnerable; alcohol and tobacco (pan masala, gutkha, khaini, cigarette, beedi) are the two most misused substances (NCERT §Dealing with Alcohol..., p. 257).
- **Tobacco harms:** nicotine is highly addictive, raises blood pressure; **~4000 chemicals** in cigarette smoke; **carbon monoxide** is highly poisonous; **tar** is similar to coal tar used for roads; smoking causes lung cancer; pan masala, gutkha, khaini cause oral cancer (NCERT §Why is tobacco use unhealthy, pp. 257–258).
- **Effects on women:** smoking causes infertility, delays in conceiving, increases risks of premature delivery, still birth and death, and cancer of the cervix (NCERT §Effect of tobacco abuse among women, pp. 258–259).
- **Doping** (IOC definition): “the use of any method or substance that might harm the athlete, in a quest to gain an unfair advantage over his or her fellow competitors”.

Training at altitude is allowed but using drugs for the same result is unethical (NCERT §Doping, p. 263).

- **Notable case:** Ben Johnson (1988) won 100 m sprint at 9.79s, tested positive for steroids, lost gold and world record (NCERT §Doping, p. 263).
- **WADA** is a foundation created through a collective initiative led by IOC (NCERT §Do You Know box, p. 264).
- **Two principal categories of performance-enhancing substances:** (1) Dietary supplements (2) Injectable supplements — Hormones and Drugs (NCERT §Classifications of Doping, p. 264).
- **Testosterone** is the most commonly used hormone — produces strength and stimulates skeletal muscles with higher energy; hormones stored and employed by athletes are called '**Ergogenic aids**' (NCERT §Hormones, pp. 264–265).
- **Narcotics:** injected, ingested or absorbed; reduce, eliminate and hide pain; examples are morphine and methadone; common in football and hockey (less recovery time). Side effects: decrease heart rate, nausea, vomiting (NCERT §Narcotics, p. 265).
- **Anabolic-androgenic steroids** related to testosterone; developed in 1930s; side effects include heart attacks, strokes, liver/kidney damage, HIV/AIDS, Hepatitis B/C (via needles) (NCERT §Steroids, p. 265).
- **Gene doping** banned by WADA in 2002; almost impossible to detect; side effects include abnormal growth, unwanted hair, heart problems, nervous breakdown, cancer (NCERT §Gene Doping, p. 266).
- **Blood doping:** increases red blood cell mass; common in cross-country, cycling, swimming. **EPO (Erythropoietin)** is a peptide hormone released from kidneys, acts on bone marrow to stimulate red-blood-cell production; misuse leads to heart disease, stroke, embolism. In blood doping 1 to 4 units of blood is taken out (NCERT §Blood doping, p. 266).
- **Doping control tests:** (1) In-Competition Testing (at venue) and (2) Out-of-Competition Testing (no advance notice, any location/time) (NCERT §Testing In-competition and Out-of-competition, p. 268).

2.2 Definitions to memorise

Term	Definition	Page
Doping (IOC)	Use of any method or substance that might harm the athlete in a quest to gain unfair advantage over fellow competitors	263
Ergogenic aids	Hormones produced and secreted by different organs, stored and employed by athletes for performance	265
Narcotics	Drugs that reduce, eliminate and hide pain; e.g., morphine, methadone	265
		265

Term	Definition	Page
Anabolic-androgenic steroids	Group of powerful chemical compounds related to the male sex hormone testosterone, developed in 1930s	
Blood doping	Practice of increasing red blood cell mass to deliver more oxygen to muscles	266
EPO	Erythropoietin — a peptide hormone released from kidneys acting on bone marrow to stimulate RBC production	266
Gene doping	Injecting genes into muscles to prevent muscle-wasting; banned by WADA in 2002	266
WADA	World Anti Doping Agency — a foundation created through a collective initiative led by IOC	264
Tar	A substance resulting from the burning of tobacco leaves; similar to coal tar used for building roads	257
Dietary supplements	Highly refined products that should not be confused with food; may not have positive nutritional value	264
Injectable supplements	Hormones and drugs delivered via injection — the second principal doping category	264
Nicotine	Highly addictive substance in tobacco; raises BP; used as insecticide	257
Carbon monoxide	Highly poisonous gas in cigarette smoke; binds haemoglobin	257
Pictorial warning	Mandatory illustration on Indian cigarette packets warning of cancer	259
Steroids — origin	Anabolic-androgenic compounds related to testosterone; developed 1930s	265
In-Competition Testing	Doping test conducted at the venue of competition	268
Out-of-Competition Testing	Unannounced test at any location/time	268
Inhalants	Volatile substances (kerosene, fuel, paint thinner) misused via inhalation	261
Chlorination	Water-treatment that removes algae in swimming pools	254

2.3 Diagrams / processes to remember

- **Fig. 7.1 (p. 263):** Medicine label showing date of manufacturing (D.O.M.) and expiry date (Exp.) — illustrates the importance of checking both dates before consumption.
- **Table 1 (p. 258):** Constituents of cigarette smoke — Constituents (Toluene, Carbon monoxide, Butane), Cancer-causing chemicals (Vinyl chloride, Benzene, Polonium 210) and Toxic metals (Arsenic, Chromium, Cadmium).

- **Pictorial warnings on cigarette packets — Activity 7.4 (p. 259):** mandatory in India.

2.4 Common confusions / NTA trap points

- **6 meters** is the minimum distance of fencing/stairs from end lines of the play field — not 5 or 10 (p. 252).
- **Light-coloured** T-shirt is recommended (does not absorb sweat) — students often mix it up with the opposite (p. 253).
- **Pan masala / gutkha / khaini cause ORAL cancer**, whereas cigarette smoking is most associated with **LUNG cancer** — both are about cancer, but the organ differs (p. 258).
- **Tar = burning of tobacco leaves**, similar to coal tar of roads; **Nicotine = addictive substance** in tobacco leaves, also used as insecticide/pesticide. Don't swap them (p. 257).
- **WADA was set up by IOC initiative** (not by WHO); **Gene doping was banned by WADA in 2002** (not 2001 — 2001 is when IOC Medical Commission discussed it) (pp. 264, 266).
- **Two categories of performance-enhancing substances** = Dietary supplements + Injectable supplements (Hormones & Drugs). Don't confuse with the wider list of basic doping drugs (narcotics, steroids, etc.) (p. 264).
- **~4000 chemicals** in cigarette smoke — the number is in the thousands, not hundreds. Frequent CUET trap.
- **Carbon monoxide** is the highly poisonous gas inhaled with cigarette smoke (it binds haemoglobin); confusion with carbon dioxide is the usual NTA distractor.
- **Anabolic steroids** developed in the **1930s** — not 1950s or 1960s.
- **Blood doping volume** = 1–4 units of blood removed and re-infused — not 0.5–1 or 5–10 units.
- **Narcotics side effects** = decreased heart rate, nausea, vomiting; **steroid side effects** = heart attacks, strokes, liver/kidney damage, HIV/Hepatitis via needles. NTA frequently swaps these.
- **In-Competition vs Out-of-Competition Testing** — both are conducted; OoC testing is **unannounced** and can happen anywhere/anytime.
- **Ben Johnson** lost his 1988 Seoul Olympic 100 m gold (9.79 s) for steroids — not Carl Lewis or Justin Gatlin.

2.5 Key concepts table — safety standards, harms, doping classes

#	Item / concept	NCERT detail	Page
1	Fencing distance	≥ 6 m from end lines of play field	252
2	T-shirt fabric	Light-coloured, sweat-rejecting	253

#	Item / concept	NCERT detail	Page
3	Shoe objectives	Comfort + ankle support + balance + leg-injury prevention	253
4	Gymnasium safety	Clean surface, lighting, equipment check, weight-lifting safety	253–254
5	Swimming pool	Separate beginner/advanced pools; chlorination; lifeguards	254–255
6	Pool lifeguard kit	Long stick, rope, whistle, jacket, swim pads, kicking boards	254
7	Injury prevention	Warm-up, fitness, nutrition, supervision, right equipment	256–257
8	Cigarette chemicals	~4000 chemicals; carbon monoxide & tar highlighted	257–258
9	Nicotine	Highly addictive; raises BP; used as insecticide	257
10	Tar	Like coal tar of roads; from burning tobacco leaves	257
11	Tobacco cancers	Lung (smoking); Oral (pan masala/gutkha/khaini)	258
12	Tobacco — women	Infertility, premature delivery, still birth, cervical cancer	258–259
13	Doping (IOC)	Substance/method giving unfair advantage and harming athlete	263
14	WADA	Foundation by IOC; created to coordinate anti-doping	264
15	Ben Johnson 1988	Seoul 100 m at 9.79 s; lost gold for steroids	263
16	Doping categories	(1) Dietary supplements (2) Injectable — Hormones/ Drugs	264
17	Ergogenic aids	Hormones stored/used by athletes	265
18	Testosterone	Most commonly used hormone in doping	264–265
19	Narcotics	Morphine, methadone — pain hidiers; common in football/hockey	265
20	Narcotic side effects	↓ HR, nausea, vomiting	265
21	Anabolic steroids	Developed 1930s; related to testosterone	265
22	Steroid side effects	Heart attack, stroke, liver/kidney damage, HIV/ Hepatitis	265
23	Gene doping	Banned by WADA in 2002; nearly undetectable	266
24	Gene doping side effects	Abnormal growth, unwanted hair, heart issues, cancer	266
25	Blood doping	↑ RBC mass; 1–4 units of blood withdrawn	266

#	Item / concept	NCERT detail	Page
26	EPO	Peptide hormone from kidneys → bone marrow → RBCs	266
27	EPO misuse harms	Heart disease, stroke, embolism	266
28	Doping control tests	In-Competition (venue) + Out-of-Competition (no advance notice)	268

2.6 Extended discussion — safety architecture, substance-abuse pathway, doping ecosystem

The logic is **prevention-first, detection-second**. Prevention operates at three concentric rings — environment, equipment and the athlete. Environment-level prevention means safe playgrounds (no high-tension lines, no barbed wire, no broken glass, 6-m fencing setback), safe gymnasiums (lighting, sanitation, weight-lifting protocol) and safe swimming pools (chlorination, separated beginner and advanced lanes, certified lifeguards with the standard rescue kit). Equipment-level prevention means certified material, separately constructed playing surfaces per game, light-colour sweat-rejecting T-shirts and properly manufactured shoes whose four design objectives are comfort, ankle support, balance and leg-injury prevention. Athlete-level prevention means warm-up that primes reflexes, fitness/conditioning that delays fatigue, nutrition that repairs muscle fibres, and rehearsal of difficult movements under coach supervision before competitive load.

Next is the **substance-abuse pathway** specific to adolescence. Two substances dominate: tobacco (nicotine + tar + ~4000 chemicals including carbon monoxide, vinyl chloride, benzene, polonium-210, arsenic, chromium, cadmium) and alcohol. The downstream pathology splits by route — inhaled tobacco smoke causes lung cancer; chewed tobacco (pan masala, gutkha, khaini) causes oral cancer. For women, smoking adds reproductive harms: infertility, delayed conception, premature delivery, stillbirth and cervical cancer. Also note **inhalants** (kerosene, fuel, paint thinners) for their flammability and central-nervous-system toxicity.

The **doping ecosystem** is the most exam-yielding micro-section. The IOC's working definition pivots on two elements — **unfair advantage** and **potential harm**. WADA, set up by IOC initiative, coordinates global anti-doping policy and maintains the Prohibited List. NCERT splits performance-enhancing substances into two principal categories: **(1) Dietary supplements** (refined products masquerading as food) and **(2) Injectable supplements — Hormones and Drugs**. Within the hormone-and-drug class, four sub-types appear repeatedly in CUET: **narcotics** (morphine, methadone — pain suppression in football/hockey; side effects = ↓ HR, nausea, vomiting), **anabolic-androgenic steroids** (1930s, testosterone-related; side effects = cardiovascular failure, liver/kidney damage, HIV/Hepatitis through needles), **gene doping** (banned by WADA in 2002, near-undetectable, causes abnormal growth, heart problems, cancer), and **blood doping** with **EPO** (1–4 units of blood removed and re-infused, or kidney-derived peptide

hormone EPO injected to stimulate marrow RBC production; misuse → heart disease, stroke, embolism).

Detection has two arms — **In-Competition Testing** (at the event venue, immediately after performance) and **Out-of-Competition Testing** (unannounced, at any place and time). **Ben Johnson** at Seoul 1988 (100 m sprint, 9.79 s, gold and world record stripped after a positive steroid test) as the paradigmatic example of detection in action. CUET examiners frequently combine an athlete's name, sport and substance into a single recall question — students should remember at least one named case from each substance class.

Practice MCQs

PYQ Alignment

This chapter is a high-yield CUET topic — Safety, Sports Injuries and Doping appear almost every year in CUET Physical Education (2023–25), with typical questions on doping definition, WADA, classifications/types of doping (blood, gene, steroids, narcotics), side effects of prohibited substances, safety measures in playground/gymnasium/swimming pool, and harms of tobacco/alcohol. Expect a steady ~8 MCQs from this chapter, balanced between factual recall and statement/assertion-based items.