MA99 EDUCATION

Non-infectious Disease and Disorders: Summary

08

NSW BIOLOGY STAGE 6 SYLLABUS 2017 FOR HSC 2027

1. Homeostasis

Every number here is sourced and dated. Learn it with its source and year, the way you will write it.

Homeostasis in four lines

Negative feedback: stimulus → receptor → control centre → effector → response that reverses the change. **Temperature:** normal 36.5 to 37 °C, fever 38 °C or more (healthdirect). Hypothalamus; sweat glands and skin arterioles (vasodilation) to lose heat; shivering and vasoconstriction to keep it. **Glucose:** 4.0 to 7.8 mmol/L without diabetes (Diabetes Australia, 2024). Beta cells, insulin, glucose stored as glycogen; alpha cells, glucagon, glycogen broken down. **Coordination:** nerves are fast and brief; hormones are slower and last longer. The hypothalamus links both.

ADAPTATION	ENDOTHERM EXAMPLE	PLANT WATER BALANCE
Behavioural or physiological	Red kangaroo: saliva on forelimbs, more forelimb blood flow (Needham et al., 1974)	Guard cells and abscisic acid close stomata
Structural	Large ears in hot climates; fur, fat, blubber in cold	Waxy cuticle; sunken stomata in crypts (Santrucek, 2022)
Special case	Brown fat, shivering, sweating	Salt glands in the mangrove Avicennia marina

2. Numbers to know

2.1 Deaths and burden

FACT	NUMBER	SOURCE
Global non-communicable disease deaths, 2021	At least 43 million, 75% of non-pandemic deaths	WHO, 2025
Australian deaths registered, 2024	187,268	ABS, Causes of Death 2024
Leading cause, 2024	Dementia 17,550 (9.4%); ischaemic heart disease 16,326	ABS
Six leading causes, 2024	All non-infectious: 67,380 deaths, 36.0%	ABS (calculated)
COVID-19	3rd in 2022 (9,859); 12th in 2024 (4,029)	ABS
Cardiovascular disease deaths, 2024	42,300, 23% of deaths; rate down about 80% since 1980	AIHW, 2026
Disease burden, 2024	5.8 million DALYs; 36% from modifiable risks	AIHW, ABDS 2024
Health spending on disease, 2022 to 23	AUD 172.3 billion; cancer AUD 18.9 billion	AIHW

2.2 Diseases by cause

DISEASE	CAUSE	NUMBER TO QUOTE	SOURCE
Cystic fibrosis	Recessive CFTR mutations	1 in 25 carriers; over 3,730 living with CF	CF Australia, 2026
Sickle cell disease	GAG to GTG, codon 7 (position 6 of the mature chain), HBB	300,000 to 400,000 births a year worldwide	Biomedicines, 2026
Spinal muscular atrophy	Inherited motor neurone loss	9 genetically confirmed in 103,903 newborns, NSW and ACT, year 1	Genet Med, 2020
All cancers	Mutations in cell cycle genes	169,759 cases, 53,545 deaths (2025 est.)	AIHW, 2026
Lung cancer	Tobacco: 73% of burden	9,122 deaths, 2024	ABS; AIHW
Melanoma	UV radiation	17,443 cases, 1,455 deaths (2025 est.)	AIHW, 2026
Mesothelioma	Asbestos (94% exposed)	627 cases, 2025; latency 52 years	AIHW, 2026
Lead exposure	Broken Hill mining	Over 70% of Aboriginal children screened above 5 micrograms per dL	PHRP, 2026
Vitamin D deficiency	Diet, low sun	20.6% of adults, 2022 to 24	ABS, NHMS
Diabetes	Insulin failure or resistance	About 1.3 million adults; 3.2 times as likely in First Nations adults	AIHW, 2026
Chronic kidney disease	Diabetes, blood pressure	14.2% of adults show signs; 7.4% report it	AIHW; ABS

Rates, in one box

Incidence = new cases ÷ population × 100,000 (risk). **Prevalence** = people living with it ÷ population (burden). **Mortality rate** = deaths ÷ population × 100,000. **Relative risk** = incidence in exposed ÷ incidence in unexposed. Mesothelioma: 627 ÷ 27,614,411 × 100,000 = 2.3 per 100,000 crude; AIHW's 2.6 is age standardised. Australia's population: 27,614,411 at 30 June 2025 (ABS).

3. Studies

STUDY	DESIGN	KEY FINDING	LIMIT
Wynder and Graham, JAMA, 1950	Case control, USA, 684 cases	96.5% of lung cancer patients heavy smokers	Recall bias
Doll and Hill, BMJ, 1950	Case control, UK	Over 25 a day: 25 times the risk	Recall bias
British Doctors Study, 1951 to 2001	Prospective cohort, 34,439 male doctors	Lung cancer deaths, heaviest smokers (35+ a day), 3.15 against 0.07 per 1,000: RR 45; smokers die about 10 years sooner	Men, doctors only; self report
Framingham, 1948	Prospective cohort, 5,209 adults	Blood pressure, cholesterol (1957), smoking (1960); "risk factor" (1961)	One mostly white town
45 and Up, NSW, 2005 to 2009	Prospective cohort, 267,357 aged 45 and over	Smokers 2.96 times the mortality	17.9% response
Busselton, WA, 1966	Repeated cross sectional surveys	Heart and lung disease trends	Over 90% Anglo Celtic
ABS NHMS, 2022 to 24	Cross sectional, blood and urine tests	Prevalence of diabetes, CKD, deficiencies	No time order

Cohort starts from exposure and follows forward: incidence, relative risk, time order. **Case control** starts from disease and looks back: fast, suits rare diseases, but open to recall bias. **Cross sectional** is a snapshot: prevalence only.

4. Programs

PROGRAM	STARTED	EVIDENCE	LIMIT
SunSmart	Victoria, 1988	AUD 2.30 saved per AUD 1; under 40 melanoma 10.2 to 7.2 per 100,000 (1982 to 2025)	40 and over rose 48 to 124
Tobacco control	Quit; plain packs 1 Dec 2012	Daily smoking 24.3% (1991) to 5.6% (2025); plain packs about a quarter of a 2.2 point fall	Vaping 7.0% (2022 to 23)
BreastScreen	1991	Mortality 50 to 74: 74 to 37 per 100,000	52% participation
Cervical screening	1991; HPV test 2017	Incidence 12.7 (1982) to 6.8 (2025)	Projected 4.2 in 2035, target under 4
Bowel screening	August 2006	17,378 cancers detected	42% participation
Lung screening	July 2025	About 930,000 eligible	Too new to judge
Folate fortification	2009	NTDs down 14.4%; 74.2% in Aboriginal and Torres Strait Islander women	Cannot target
SMA newborn screening	NSW and ACT pilot, 2018	21 confirmed of 252,081; modelled AUD 3.69 saved per AUD 1	Needs follow up care
Casgevy (CRISPR)	MHRA, 16 Nov 2023	28 of 29 (interim) free of severe crises for 12 months	Not germline; cost

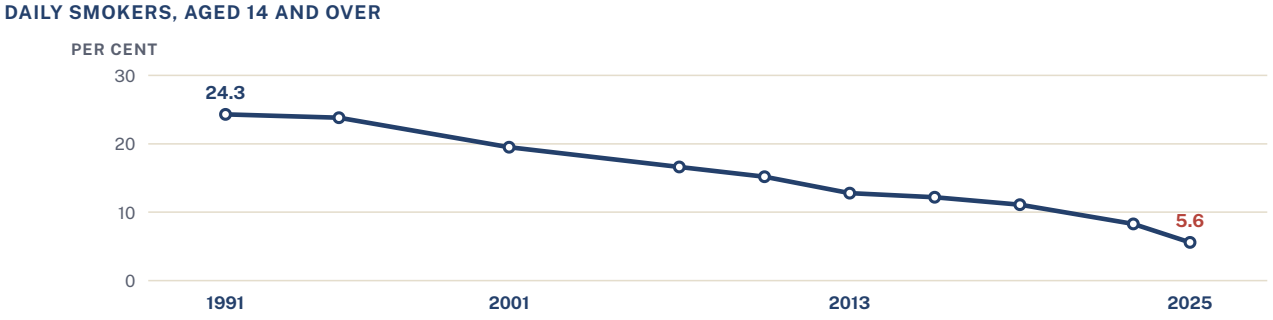


Figure 1 · Daily smoking, aged 14 and over. Source: AIHW, Tobacco smoking, 1 July 2026; AIHW, NDSHS, 20 August 2026.

5. Technologies

TECHNOLOGY	DISORDER	HOW IT WORKS	LIMIT
Hearing aid	Mild to severe loss	Amplifies sound into the ear canal	Needs working hair cells
Bone conduction implant	Conductive, mixed, single sided	Titanium in skull vibrates bone to the cochlea (from 1977)	Surgery; needs a cochlea
Cochlear implant	Severe to profound sensorineural	Electrodes stimulate the auditory nerve (FDA: adults 1985, children 1990)	Surgery; rehabilitation; needs the nerve
Spectacles	Myopia 28.1%; hyperopia 30.4% (2022)	Concave or convex lens	Must be worn
Laser surgery	Myopia, hyperopia	Excimer laser reshapes cornea (1983; LASIK 1990)	Permanent; not presbyopia

TECHNOLOGY	DISORDER	HOW IT WORKS	LIMIT
Cataract surgery	Cloudy lens	Lens replaced; about 87,000 admitted from lists, 2024 to 25	Waiting time
Bionic eye	Retinitis pigmentosa	Retinal electrodes; trials of 3 (2014) and 4 people (2025)	Trials only
Dialysis	Kidney failure	Diffusion across a membrane; 16,011 on dialysis, 2025	Part time; no hormones
Transplant	Kidney failure	1,093 operations in 2025, 228 living donors	Donor shortage; immunosuppression

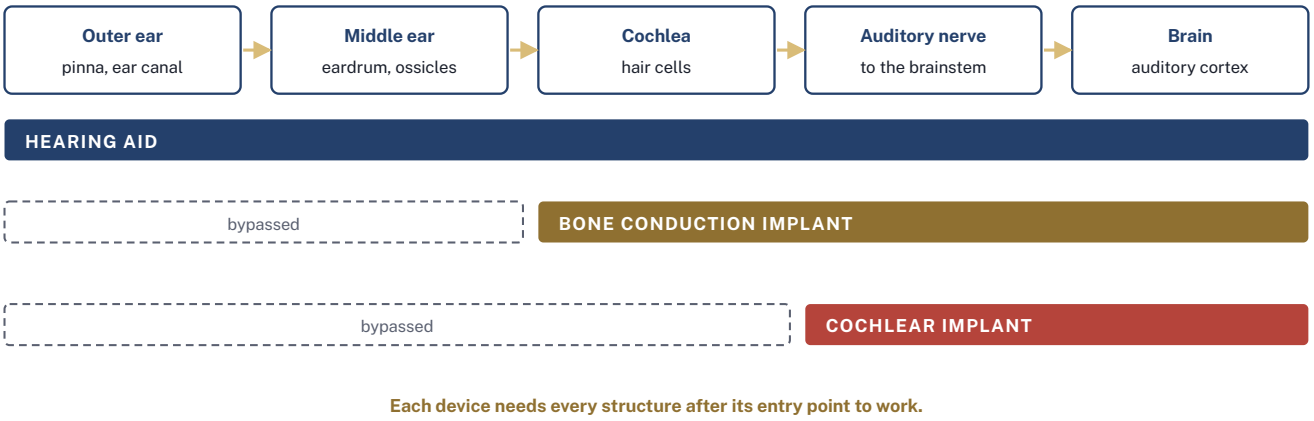


Figure 2 · Where each hearing technology enters the pathway. Source: Clark, Hearing Research, 2015; The Laryngoscope, 2004.

6. If the question says … use …

IF THE QUESTION SAYS	USE
Construct a negative feedback loop	Temperature or glucose, with receptor, control centre, effector and real values
Do non-infectious diseases cause more deaths	ABS 2024: top six all non-infectious, 36.0%; WHO: 75% of non-pandemic deaths
Genetic disease	CF (1 in 25 carriers) or sickle cell (codon 7, HBB)
Disease caused by environmental exposure	Melanoma and UV, or mesothelioma and asbestos (52 year latency)
Nutritional disease	Vitamin D deficiency 20.6%, NTDs and folate, scurvy and Lind 1747
Incidence and prevalence	Mesothelioma 2.3 per 100,000 crude; CKD 14.2% of adults
Evaluate the method of a study	British Doctors Study: prospective, RR 45, but male doctors only
Benefits of epidemiological studies	Causes found (smoking), local evidence (45 and Up), programs evaluated
Treatment and future research	Melanoma: survival 100% if 1 mm or less, 66% if over 4 mm; immunotherapy
Evaluate a prevention program	SunSmart (AUD 2.30 per AUD 1) or tobacco (24.3% to 5.6%), each with a limit
Genetic engineering	Casgevy (CRISPR, 2023); CAR-T; SMA screening and gene therapy
Cause of a disorder from structure	Hair cells, cornea or lens shape, nephron damage by diabetes (37% of new dialysis)
Evaluate a technology	Cochlear implant against hearing aid; dialysis against transplant

> Name it, number it, date it, then judge it.

About this resource

MA99 EDUCATION

Scope

NSW Biology, Year 12. Written to the NSW Biology Stage 6 Syllabus (2017), Module 8, for students sitting the HSC in 2027. A new Biology syllabus is first examined in HSC 2028. Every worked context uses real, named diseases, studies, programs and technologies, with each figure sourced and dated; any practice data that is not real is labelled as hypothetical, and all calculations have been checked.

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