AQA · GCSE · Biology

Syllabus Checklist · 大纲自查表

Tick one box per statement: ☐ not yet ☐ nearly ☐ confident. 每条打一个勾：尚未掌握 / 快会了 / 有把握。

1. Cell biology 细胞生物学

1.1 Cell structure, specialisation and microscopy (4.1.1) 细胞结构、特化与显微镜技术（4.1.1）

- ☐☐☐ Describe plant, animal and bacterial cells, naming structures and their functions.
- ☐☐☐ Relate specialised cells' structures to their functions.
- ☐☐☐ Explain the importance of cell differentiation.
- ☐☐☐ Calculate magnification, real size and image size, with standard form and prefixes.
- ☐☐☐ Describe aseptic technique with reasons, bacterial division counts and zone areas (biology only).

1.2 Cell division and stem cells (4.1.2) 细胞分裂与干细胞（4.1.2）

- ☐☐☐ Describe chromosomes and their pairing in body cells.
- ☐☐☐ Describe the cell cycle including the three overall stages and mitosis.
- ☐☐☐ Describe stem cell function in embryos, adult animals and plant meristems.
- ☐☐☐ Evaluate stem cell use in medicine and plant cloning, including risks and ethical objections.

1.3 Transport in cells – diffusion, osmosis, active transport (4.1.3, RP2) 细胞内的物质运输 — 扩散、渗透与主动运输（4.1.3, RP2）

- ☐☐☐ Define diffusion, osmosis and active transport with examples and the energy distinction.
- ☐☐☐ Explain factors affecting the rate of diffusion.
- ☐☐☐ Calculate and compare surface area to volume ratios; explain exchange-surface adaptations.
- ☐☐☐ Investigate the effect of solute concentration on plant tissue mass and calculate percentage change (RP3).

2. Organisation 组织结构

2.1 Principles of organisation and digestion (4.2.1–4.2.2.1, RP4) 组织原则与消化原理（4.2.1–4.2.2.1, RP4）

- ☐☐☐ Order cells, tissues, organs, organ systems and organisms.
- ☐☐☐ Describe enzyme nature and lock-and-key action; relate activity to temperature and pH.
- ☐☐☐ Recall sites and actions of amylase, proteases and lipases, with word equations.
- ☐☐☐ Explain bile's two functions; test foods (RP4) and investigate pH on amylase (RP5).

2.2 Heart, blood and CHD (4.2.2.2–4.2.2.4) 心脏、血液与冠心病（CHD）（4.2.2.2–4.2.2.4）

- ☐☐☐ Describe the heart and double circulation with the five named vessels and the pacemaker cells.
- ☐☐☐ Relate artery, vein and capillary structure to function.
- ☐☐☐ Know plasma, red cells, white cells and platelets with their adaptations.
- ☐☐☐ Explain CHD and evaluate stents, statins, valves, transplants and artificial hearts.

2.3 Health, lifestyle and cancer (4.2.2.5–4.2.2.7) 健康、生活方式与癌症（4.2.2.5–4.2.2.7）

- ☐☐☐ Define health and describe interactions between diseases and other factors.

- ☐☐☐ State risk factors with proven causal mechanisms for non-communicable diseases.
- ☐☐☐ Distinguish benign and malignant tumours and describe secondary tumours.
- ☐☐☐ Interpret risk-factor data, distinguishing correlation from causation.

2.4 Plant tissues and organ systems (4.2.3, RP5) 植物组织与器官系统（4.2.3, RP5）

- ☐☐☐ Relate plant tissues (epidermis, palisade, spongy, xylem, phloem, meristem, guard cells) to functions.
- ☐☐☐ Explain root hair, xylem and phloem adaptations and the processes of transpiration and translocation.
- ☐☐☐ Explain the effects of temperature, humidity, air movement and light intensity on transpiration rate.

3. Infection and response 感染与免疫反应

3.1 Communicable diseases and pathogens (4.3.1.1–4.3.1.5) 传染性疾病与病原体（4.3.1.1–4.3.1.5）

- ☐☐☐ Explain how viruses, bacteria, protists and fungi spread in animals and plants, and how spread is reduced.
- ☐☐☐ Recall measles, HIV, TMV, Salmonella, gonorrhoea, rose black spot and malaria with pathogen type, spread, symptoms and control.

3.2 Defence systems, vaccination and drugs (4.3.1.6–4.3.1.9, RP2 antiseptics) 防御系统、疫苗接种与药物（4.3.1.6–4.3.1.9, RP2 消毒剂）

- ☐☐☐ Describe the non-specific defence systems and the three white blood cell actions.
- ☐☐☐ Explain vaccination in the individual and its population effect.
- ☐☐☐ Distinguish antibiotics from painkillers; explain why antibiotics cannot treat viruses; describe resistance.
- ☐☐☐ Describe drug discovery sources and the preclinical/clinical testing stages including double-blind trials.

3.3 Monoclonal antibodies – biology only, HT (4.3.2) 单克隆抗体 – 仅限生物学，HT（4.3.2）

- ☐☐☐ Describe hybridoma production of monoclonal antibodies.
- ☐☐☐ Describe uses in diagnosis, measurement, research and cancer treatment.

3.4 Plant disease – biology only (4.3.3) 植物病害 – 仅限生物学（4.3.3）

- ☐☐☐ Detect plant disease from signs and identify it by manual, laboratory or monoclonal tests.
- ☐☐☐ Explain nitrate and magnesium ion deficiencies.
- ☐☐☐ Describe physical, chemical and mechanical plant defence responses.

4. Bioenergetics 生物能量学

4.1 Photosynthesis and limiting factors (4.4.1, RP6) 光合作用与限制因素（4.4.1, RP6）

- ☐☐☐ Write the photosynthesis word and symbol equations, and describe it as endothermic.
- ☐☐☐ Explain how light intensity, CO2 concentration and temperature limit the rate of photosynthesis, including interpreting limiting-factor graphs.
- ☐☐☐ (HT) Use the inverse-square relation between light intensity and distance, and reasons for greenhouse economics.

☐☐☐ Describe RP6: light intensity and the rate of photosynthesis with pondweed, its controls and the rate calculation.

4.2 Respiration and exercise (4.4.2) 呼吸作用与运动（4.4.2）

☐☐☐ Name five uses of glucose from photosynthesis.

☐☐☐ Compare aerobic and anaerobic respiration in muscle and yeast, with word equations, and fermentation's economic importance.

☐☐☐ Explain the body's response to exercise and (HT) oxygen debt and the liver's role.

☐☐☐ Define metabolism and list the reactions it includes.

5. Homeostasis and response 稳态与响应

5.1 Homeostasis and the nervous system (4.5.1–4.5.2, RP7 reaction time) 稳态与神经系统（4.5.1–4.5.2, RP7 反应时间）

☐☐☐ Define homeostasis and name the three conditions the body controls.

☐☐☐ Describe receptors, coordination centres and effectors, and the stimulus-receptor-coordinator-effector-response pathway.

☐☐☐ Explain the reflex arc, including sensory neurone, synapse, relay neurone and motor neurone, and why reflexes are automatic and rapid.

☐☐☐ Describe RP7: the effect of a factor on human reaction time, with controls and data handling.

5.2 The brain, eye and temperature – biology only (4.5.2.2–4.5.2.4) 大脑、眼睛与体温调节 – 仅限生物学（4.5.2.2–4.5.2.4）

☐☐☐ Identify cerebral cortex, cerebellum and medulla with their functions, and (HT) difficulties of investigating and treating the brain.

☐☐☐ Relate eye structures to functions and explain accommodation for near and distant objects.

☐☐☐ Explain myopia and hyperopia and their correction with lenses and new technologies.

☐☐☐ Explain how vasodilation, sweating, vasoconstriction and shivering control body temperature (HT in context).

5.3 Hormonal coordination (4.5.3) 激素协调（4.5.3）

☐☐☐ Describe the endocrine system: glands, hormones, target organs, and the six named glands.

☐☐☐ Explain insulin control of blood glucose, (HT) glucagon and negative feedback, and compare Type 1 and Type 2 diabetes.

☐☐☐ (Bio) Describe water and nitrogen balance: kidneys, filtration and selective reabsorption, (HT) ADH, and dialysis vs transplant.

☐☐☐ (HT) Explain FSH, LH, oestrogen and progesterone interactions in the menstrual cycle, contraception methods and IVF.

☐☐☐ (HT) Explain adrenaline and thyroxine, with negative feedback.

5.4 Plant hormones – biology only (4.5.4) 植物激素 – 仅限生物学（4.5.4）

☐☐☐ Explain phototropism and gravitropism by unequal auxin distribution in shoots and roots.

☐☐☐ Describe RP8: the effect of light or gravity on newly germinated seedlings, with length measurements and labelled drawings.

☐☐☐ (HT) Describe uses of auxins, gibberellins and ethene in agriculture, horticulture and the food industry.

6. Inheritance, variation and evolution 遗传、变异与进化

6.1 Reproduction, DNA and genomes (4.6.1.1–4.6.1.5) 生殖、DNA 与基因组（4.6.1.1–4.6.1.5）

- ☐☐☐ Compare sexual and asexual reproduction, with the named organisms that use both.
- ☐☐☐ Explain how meiosis halves the chromosome number and fertilisation restores it, and trace embryo development.
- ☐☐☐ Describe DNA, genes and the genome, and discuss the importance of the human genome.
- ☐☐☐ (Bio) Describe DNA's nucleotide structure and the base code; (HT) protein synthesis and the effect of mutations.

6.2 Genetic inheritance, disorders and sex determination (4.6.1.6–4.6.1.8) 遗传、疾病与性别决定（4.6.1.6–4.6.1.8）

- ☐☐☐ Define gamete, chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype and phenotype.
- ☐☐☐ Complete and interpret Punnett squares and family trees, with ratios and probabilities.
- ☐☐☐ Explain polydactyly and cystic fibrosis inheritance and judge embryo screening issues.
- ☐☐☐ Determine sex with the XX/XY cross, including ratios.

6.3 Variation, selective breeding, genetic engineering and cloning (4.6.2) 变异、选择性育种、基因工程与克隆（4.6.2）

- ☐☐☐ Describe the genome-environment interaction and the three causes of variation, and the role of mutation.
- ☐☐☐ Explain evolution by natural selection and the formation of new species.
- ☐☐☐ Describe selective breeding, its uses and the inbreeding risk.
- ☐☐☐ Describe genetic engineering with (HT) its main steps, benefits, risks and objections.
- ☐☐☐ (Bio) Describe tissue culture, cuttings, embryo transplants and adult cell cloning.

6.4 Evolution, genetics and evidence (4.6.3) 进化、遗传与证据（4.6.3）

- ☐☐☐ Describe Darwin's theory, why it was accepted only gradually, and Lamarck's theory.
- ☐☐☐ Describe Wallace's and Mendel's contributions and the growth of genetics.
- ☐☐☐ Explain fossils and their formation, why the record is incomplete, extinction causes and evolutionary trees.
- ☐☐☐ Explain antibiotic-resistant bacteria and how to slow resistance.

6.5 Classification of living organisms (4.6.4) 生物分类（4.6.4）

- ☐☐☐ Describe the Linnaean system and binomial naming.
- ☐☐☐ Describe the three-domain system of Woese and what drove it.
- ☐☐☐ Interpret evolutionary trees using classification and fossil data.

7. Ecology 生态学

7.1 Adaptations, interdependence and competition (4.7.1) 适应性、相互依存与竞争（4.7.1）

- ☐☐☐ Describe the levels of organisation in an ecosystem and define ecosystem, community, biotic and abiotic.
- ☐☐☐ Suggest the factors for which plants and animals compete, and explain interdependence.

☐☐☐ Explain how given abiotic and biotic factor changes affect a community.

☐☐☐ Explain structural, behavioural and functional adaptations, and extremophiles.

7.2 Organisation of an ecosystem and material cycles (4.7.2, RP9/RP10) 生态系统组织与物质循环（4.7.2, RP9/RP10）

☐☐☐ Use food-chain vocabulary from producer to tertiary consumer and interpret predator-prey cycles.

☐☐☐ Describe RP9 sampling with transects and quadrats, with mean, mode and median.

☐☐☐ Explain the carbon and water cycles and the role of microorganisms.

☐☐☐ (Bio) Explain how temperature, water and oxygen affect decay rate, with RP10 and biogas.

7.3 Biodiversity and human interactions (4.7.3) 生物多样性与人类互动（4.7.3）

☐☐☐ Define biodiversity and explain why it stabilises ecosystems.

☐☐☐ Explain how waste, land use, deforestation and global warming reduce biodiversity.

☐☐☐ Describe programmes that maintain biodiversity.

7.4 Trophic levels and food security – biology only (4.7.4–4.7.5) 营养级与粮食安全 – 仅限生物学（4.7.4–4.7.5）

☐☐☐ Name the trophic levels, describe decomposers and construct pyramids of biomass.

☐☐☐ Explain biomass loss between levels and calculate transfer efficiency.

☐☐☐ Describe the biological factors threatening food security.

☐☐☐ Evaluate farming techniques, sustainable fisheries and the role of biotechnology.