

Secondary Science PGCE at the University of Roehampton

Useful information to build your pedagogical content knowledge before starting the course



Congratulations on your offer to study PGCE Science at Roehampton. We very much look forward to welcoming you in September on what will be an exciting and busy year. If you have any questions, please feel free to contact the subject tutors: steve.abrams@roehampton.ac.uk beverley.ballie@roehampton.ac.uk

Use your subject knowledge audit (completed prior to interview but a blank one is attached here) to help you identify key and address key gaps in order to get ready for the course. Here are some suggestions:

1. Look at the national curriculum KS2, 3 and 4 across the science to get a better idea of what you will be teaching:
<https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study/national-curriculum-in-england-science-programmes-of-study>
2. Use these online resources to revisit, revise key and test yourself:
<https://mathsmadeeasy.co.uk/gcse-science-revision/>
<https://braingenie.ck12.org/courses/6>
<https://app.senecalearning.com/courses?Price=Free&text=science>
3. Familiarise yourself with the latest science exam board specs and past papers:
AQA GCSE and A level: <https://www.aqa.org.uk/subjects/science>
Edexcel: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/gcse-combinedscience-spec.pdf>
4. Visit the professional association for your specialism to find out the latest news and resources:
<https://www.rsb.org.uk/>
<https://www.rsc.org/>
<https://www.iop.org/>
5. Listen to some science podcasts such as the infinite monkey cage or others here:
<http://www.bbc.co.uk/podcasts/category/scienceandnature>
6. Build your awareness of science current affairs by reading online magazines such as:
<https://science.sciencemag.org/content/368/6495/twis>

Science Pre-Course Reading

Read the highlighted texts and in addition choose one or two from each list. A wider reading list will be provided once the course begins. All these works are available on Amazon and/or in the library at Roehampton. There will be a library orientation tour towards the start of the course to familiarise you with the facilities and services available.

Subject knowledge:

Bryson, B. (2004) *A Short History of Nearly Everything*, London, Black Swan

Bryson, B. (2019) *The Body: A Guide for Occupants*, London, Doubleday

Dawkins, R. (ed) (2008) *The Oxford Book of Modern Science Writing*, Oxford, OUP

Driver, R. (1989) Students' conceptions and the learning of science, *International Journal of Science Education*, 11(5), 481-490

Goldacre, B. (2008) *Bad Science*, London, Fourth Estate

Gribbin, J. (2002) *Science a History*, London, Penguin

McComas, W. (2017) Understanding how science work: The nature of science as they foundation for science teaching and learning, *School Science Review*, 98(365) 71-76

Podcast: Infinite Monkey Cage - What makes science a science?

<https://www.bbc.co.uk/programmes/b036tw5>

Teaching and learning:

Dweck, C. (2012) *Mindset: How you can fulfil your potential* London, Robinson

Harlen, W (2010 and 2015) *Principles and big ideas of science education*:

<https://www.ase.org.uk/bigideas>

Hetherington, L., Graham, L. and Moore, D. (2024) *Learning to teach science in the secondary school: a companion to school experience*. 5th Edition. Routledge: London

Kirschner, P. A. and Hendrick, C. (2020) *How learning Happens: Seminal Works in Educational Psychology and What They Mean in Practice*, London: Routledge

Rogers, B. (2009) *How to manage children's challenging behaviour*. London, Sage

William, D. (2011) *Embedded formative assessment* Bloomington: Solution Tree

Willingham, D. (2010) *Why don't students like school?* London, Jossey Bass

Wright, T. (2017) *How to be a Brilliant Trainee Teacher* Abingdon, Routledge

Science Subject Knowledge Audit

You will use this form throughout the PGCE course as you develop your subject and pedagogical knowledge.

Topic	At what level and where did you study this topic	Tick if additional work required
Biology Using a light microscope to observe cells and the role played by the electron microscope		
Cell structures in both animal and plant cells		
Role of diffusion, osmosis and active transport in cell biology		
Hierarchical organisation of multicellular organisms		
Biomechanics and muscle structure and function		

Skelton and functions of bone		
Balanced diet and consequences of poor diet		
Tissues, organs and function of the human digestive system		
Enzymes as biological catalysts Understand the kinetics and rate calculations of enzyme reactions		
Plant nutrition		

Photosynthesis – to include its role in atmosphere composition and adaptations in plants to facilitate it. Understand the role of limiting factors in determining the rate of photosynthesis and the process of transpiration.		
Human reproduction (including reproductive systems, hormonal control of		

the menstrual cycle, gametes, fertilisation, gestation & birth)		
Plant reproduction (including pollination, fertilisation, dispersal and germination). Plant structure including xylem and phloem. Understanding of plant hormones		
Effects of recreational drugs		
Aerobic and anaerobic respiration in multi-cellular organisms		
Fermentation in microorganisms		
Interdependence of organisms in ecosystems, the importance of biodiversity and biological factors affecting food security.		

Importance of insect pollination to food security		
The work of Watson, Crick. Wilkins and Franklin on DNA		

structure. The role played by DNA in protein synthesis.		
Simple heredity including mitosis and meiosis, the work of Mendel, genetic disorders and the Human Genome Project		
The significance of differences between species and within species		
The work of Darwin and Wallace and natural selection, including and understanding of human evolution		
The significance of biodiversity and how our understanding of genetics has led to the suggestions of three domains rather than the five kingdoms		
Demonstrate an understanding of the relationships between quantitative units in relation to cells, including milli (10^{-3}),		
micro(10^{-4}), nano (10^{-5}) and pico(10^{-6})		

Explain structure and function of nervous system including reflex arc. and the eye		
An understanding of the basics of genetic engineering and the role played by GM organisms		
To understand the principles of health, disease (in humans and plants) and the development of medicines		
Describe the production and use of monoclonal antibodies.		
Have a good understanding of animal coordination, control and homeostasis including the principal human hormones.		
The water, carbon, nitrogen cycles.		

Chemistry Explanations of changes in states of matter using the particle model		
The Dalton atomic model		
Chemical symbols and formulae for elements and compounds Transition metals and alloys		

Techniques for separating mixtures. Methods of purification		
Representing chemical reactions using formulae and equations Overarching concepts of chemistry types of Bonding		
Combustion, thermal decomposition, oxidation & displacement reactions Dynamic Equilibria and calculations involving gases		

Chemistry of acids and alkalis including the properties of metal and nonmetal oxides Quantitative Analysis :tests for ions		
Catalysts Rates of Reaction.		
Energetics in chemical reactions Heat energy changes /Fuels		
The development of use of the Mendeleev Periodic Table Groups 1,7,0		
The order and implications of metals and carbon in the reactivity series		

ceramics, polymers and composites (qualitative) Hydrocarbons, Alcohols and Carboxylic acid		
The composition and structure of the Earth and its atmosphere Atmospheric Science		
The carbon cycle Surface properties of matter including Nanoparticles		

PHYSICS Calculation of fuel uses and costs in the domestic context		
Fuels and energy resources Conservation of Energy		
Energy changes and transfers in simple machines		
Heating and thermal equilibrium		
Energy changes within a system		
Quantitative relationship between speed, distance and time		

Interaction of and representation of forces between objects		
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Moments		
Measuring forces Forces and Matter		
Hooke's Law		
Work done and energy changes		
Non-contact forces		
Pressure in fluids		
Newton's laws of motion		
Transverse waves Sound		
Electromagnetic Induction		
Ultrasound		
Light waves travelling through a vacuum Light and the EM Spectrum		
Reflection and refraction of light: The Human Eye: Coloured Light		
Magnetism and the motor effect		
Particle Model- 1.The Kinetic theory model		
Current electricity and simple circuits		

The definition and measurement of current, potential difference and resistance and the relationship between them.		
Static electricity		
Particle Model-2 Explaining the Gas Laws		
DC motors		
Melting, freezing, evaporation, sublimation, condensation, dissolving		
Brownian motion		

Gravity, weight and mass		
Energy in matter		
Seasons Structures in the universe Astronomy		
Radioactivity Types, Uses Dangers		