Summary

The Science Education Policy Alliance (SEPA), comprising the organisations above, calls on the independent Curriculum and Assessment Review to recommend reforms to the science curriculum and education structure that will better prepare students, reduce inequities in the system that currently limit opportunity and ensure that the Review itself considers science education to age 18. SEPA members are well versed in the principles underpinning science curriculum content and assessment, and seek to engage constructively with the Review Group and the Department for Education on these matters at the earliest opportunity.

Background

Science and technology underpin modern life, drive innovation and offer solutions to global challenges. As such, the sciences are vital components of a well-rounded education and provide the foundations for achieving the government's key missions: fostering sustained economic growth, advancing the transition to clean energy, delivering a modern and efficient health service, and breaking down barriers to opportunity to ensure all individuals can thrive and contribute to these national priorities.

The education system must therefore equip all young people with the opportunity to acquire the scientific knowledge, understanding, and technical skills needed for fulfilling careers, whilst also fostering broader scientific and data literacy to enable confident and informed participation in contemporary society.

Recommendations

Having submitted individual institutional responses to the Curriculum and Assessment Review call for evidence, SEPA sets out below the following three overarching recommendations for consideration in the next phase of the review process:

1. Ensure equitable access to education and progression pathways in the sciences
2. Take a principled approach to choosing content, drawing on the principles set out in the guidance documents produced by the relevant SEPA members:
    - Developing a Primary Science Curriculum
    - Evolving 5-19 Biology
    - The Elements of a Successful Chemistry Curriculum
    - The Fundamentals of 11-to-19 Physics
3. Offer all students who are studying at GCSE level a single route through the sciences at GCSE, worth approximately two GCSEs of timetable time, and in which each of biology, chemistry and physics is specified, taught and graded separately.

The importance of a good education in the sciences

A good education in the sciences offers unique knowledge and skills that have enduring value to all young people. It can achieve two important goals: to support all students to become well-informed, scientifically literate citizens with an enduring interest and confidence in scientific ideas; and to encourage and prepare sufficient numbers to follow science-related pathways beyond 16, feeling that the sciences can be for them and that they can contribute to addressing global problems and developing an innovation-based economy. The five SEPA organisations are well-positioned to provide advice and evidence to the panel to support the following:

Desired outcomes of a reformed science education:

- **Understanding science for addressing global challenges**: Develop knowledge of significant scientific ideas and how these can be applied to tackle global issues through

informed decisions, both personally and in society.
- **Confidence and critical thinking**: Cultivate confidence in discussing scientific concepts, using scientific language effectively, and being able to distinguish well-supported scientific claims from unevidenced opinion or misinformation.
- **Transferable skills**: Equip students with versatile skills and capabilities that are useful within sciences, other areas of study and in their personal lives.

Reforming curriculum and assessment in the sciences

1. **What should the reformed science curriculum include?**
    - **Focus on big ideas**: Organise each subject around core scientific concepts of 'big ideas' to foster a deep, lasting understanding of those ideas.
    - **Embed scientific practices**: Define the practices and ways of thinking in each science, emphasising 'minds on' as well as 'hands on' and going beyond procedural knowledge.
    - **Emphasis on depth over volume**: Choose an amount of content that allows for deep, contextual study of the big ideas.
    - **Value practical skills**: Increase focus on hands-on scientific work to build both practical abilities and the importance of the disciplinary ways of thinking.
    - **Inclusive contextual learning**: Use local, personal, and familiar cultural and historical examples to ensure all students feel represented and connected to the course content and underpinning ideas.
    - **Balance the value of memorisation with understanding**: Reduce the emphasis on content and assessment that predominantly relies on short-term memorisation, focusing instead on deeper understanding.

2. **How should science education be structured?**
    - **Unified core route**: All students taking GCSEs should follow a common core pathway in sciences up to age 16. There will be some students for whom GCSEs are not an appropriate pathway to 16.
    - **Qualifications should be tiered**: Students' GCSE qualification route in the sciences should not differ based on their prior achievements; all students should have access to the same core qualifications with different tiers.
    - **Distinct science subjects**: Maintain the unique identities of biology, chemistry, and physics, with each subject having its own assessments and grades, while highlighting connections across them.
    - **Separate subject identity**: Each of biology, chemistry and physics should have separate, dedicated sessions, with at least two weekly lessons taught by specialist teachers.
    - **Balanced study hours**: Guided learning hours should be close to the expectations for studying two GCSEs if the above conditions are met.

About the Science Education Policy Alliance (SEPA)

The Science Education Policy Alliance (SEPA) comprises the five professional bodies representing the sciences: Association for Science Education, Institute of Physics, The Royal Society, Royal Society of Biology and Royal Society of Chemistry, working together since 2008 to influence national science education policy. Our Chair is Professor Dame Athene Donald DBE FRS.

SEPA's mission is to bring about systemic improvement, by influencing policy and therefore funding and practice so that all students experience a high-quality, inclusive, accessible and contemporary 5-19 education in the sciences, that unlocks individual opportunity, supports economic growth and benefits our society. Our organisations represent the interests of our communities by drawing on research, expertise of our membership, and advocating for the sciences.