

Unit 1 Test Preparation

What the SQA asks for, and how it hands out the marks.

National 5 Engineering Science



LEARNING INTENTION

To prepare for the Unit 1 test by knowing what the SQA asks for, and practising the way it asks for it.

Daily Review

SHOW ME BOARDS

- 1 State what is meant by a sub-system.
- 2 State the type of control that uses feedback.
- 3 A motor takes 500 W and gives 400 W useful. Calculate the efficiency.
- 4 Name one positive social impact of installing a lift.
- 5 Which branch of engineering checks that a bridge can carry its load?

By the end of this lesson...

- 1 I know exactly which topics the Unit 1 test can ask about.
- 2 I know how many marks each topic is usually worth.
- 3 I can set out a calculation so it collects all of its marks.
- 4 I can answer an “explain” question with a cause and an effect.

What Is on the Test

Every Unit 1 question in the specimen paper and 2021-2025, counted.

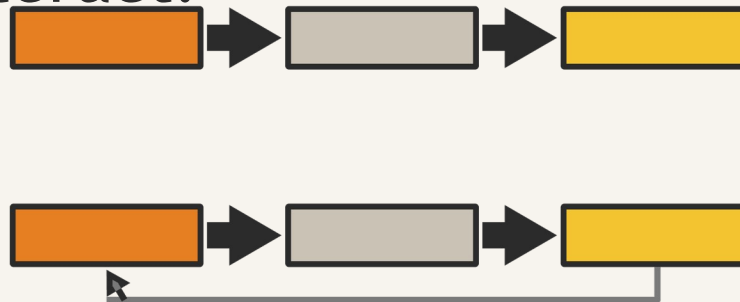
Strand	Marks in SQP + 2021-2025	Per paper
Energy and efficiency	59	about 10
Impacts of engineering	46	about 8
Engineering roles and disciplines	38	about 6
The systems approach	33	about 6
Unit 1 total	176	about 29 of 110

A quarter of every paper, every year. This is the cheapest revision you will ever do.

What You Need to Know – Systems

The SQA's own words, from the course specification.

- Systems and sub-system diagrams.
- Input – process – output, and feedback loops.
- Open-loop and closed-loop control.
- How sub-systems interact.



What You Need to Know – Energy

The SQA's own words, plus the formula set you are given in the data booklet.

- Applying the law of conservation of energy.
- Calculations for kinetic, potential, electrical and heat.
- Energy transfers, losses and transformations in a system.
- Energy audits and the overall efficiency of a system.

The six relationships, and efficiency

$$E_w = F d \cdot E_k = \frac{1}{2} m v^2 \cdot E_p = m g h \cdot E_e = V I t \cdot E_h = c m \Delta T \cdot P = E \div t \cdot \eta = E_{\text{out}} \div E_{\text{in}}$$

What You Need to Know – Roles

Naming the right branch is a one-mark question in every single paper.

Branch	Mainly works on
Civil	infrastructure – roads, bridges, drainage
Structural	strength and stability of structures
Mechanical	machines, mechanisms and moving parts
Electrical	power, wiring, motors and large systems
Electronic	circuits, sensors and signals
Chemical	materials, fuels and chemical processes
Environmental	reducing damage, improving sustainability

What You Need to Know – Impacts

Positive AND negative. A one-sided answer loses marks.

- Social impacts – people, communities, quality of life.
- Economic impacts – money, jobs, businesses, costs.
- Environmental impacts – nature, resources, pollution.
- How a solution helps tackle climate change.
- How an emerging technology could improve a solution.

Where the Marks Are in a Calculation

Three marks, three separate things — and one of them is the unit.

1. SUBSTITUTION

Write the relationship, then put the numbers in. This mark is for showing the numbers.

2. TRANSPOSITION

Only when the unknown is not the subject. Rearrange on its own line, before you divide.

3. ANSWER + UNIT

The final answer, underlined, with its unit. No unit, no mark.

Follow-through is applied: a wrong answer carried correctly into the next part still scores. Never leave a follow-on part blank.

Worked Example – Collecting All Three Marks

A motor supplies 36 000 J of energy at 200 V, drawing 3 A.
Calculate how long the motor ran for.

$$E_e = 36\,000\text{ J}$$

$$V = 200\text{ V}$$

$$I = 3\text{ A}$$

$$t = ?$$

$$E_e = V I t$$

$$t = E_e \div (V I)$$

$$t = 36\,000 \div (200 \times 3)$$

$$\underline{t = 60\text{ s}}$$

substitution · transposition · answer with its unit – one mark each

“Explain” Means Cause and Effect

Two marks: one for the cause, one for the effect. The marking instructions say so, every time.

THIS SCORES ONE MARK

- “Electric buses produce no exhaust fumes.”
- “Solar panels reduce carbon dioxide.”
- “The motor wastes energy as heat.”

ADD THE EFFECT FOR THE SECOND

- “...so local air quality improves.”
- “...so less heat is trapped in the atmosphere.”
- “...so its useful output is lower than its input.”

“Describe” Means a Sentence

“State” may be one word. “Describe” never is — the marking instructions reject single words.

TOO SHORT TO SCORE

- “Lubricate.”
- “Feedback.”
- “Cheaper.”

A DESCRIBE ANSWER

- “Lubricate the moving parts to reduce friction.”
- “A sensor sends the actual value back to the control unit.”
- “Fewer components makes the circuit cheaper to build.”

Watch Out – Three Answers That Score Zero

WHAT PUPILS WRITE

- “Solar panels are greener.”
- “An emerging technology could improve it.”
- “The answer is 26 400.”

WHY IT SCORES NOTHING

- Climate answers must say carbon dioxide.
- You must name the technology yourself.
- No unit, no mark. Write 26 400 J.

Show Me — Systems and Roles

SHOW ME BOARDS

- 1 State the type of control that does not use feedback.
- 2 Name the three parts of a universal system diagram.
- 3 Which branch designs the sensor circuit on a wind turbine?
- 4 Which branch monitors the impact on the land during construction?
- 5 State what is meant by a sub-system.

Show Me — Systems and Roles Again

SHOW ME BOARDS

EXTRA PRACTICE

- 1 State the type of control that uses feedback.
- 2 What is sent back to the control unit in a closed-loop system?
- 3 Which branch designs a gearbox?
- 4 Which branch checks a tower can carry its load?
- 5 Give one example of manual control.

Show Me — Energy and Impacts

SHOW ME BOARDS

- 1 Write the formula for percentage efficiency.
- 2 Input 800 J, useful 600 J — calculate the efficiency.
- 3 Name one negative economic impact of building a new bridge.
- 4 How do solar panels help tackle climate change?
- 5 Name one form of energy lost to friction.

Show Me — Energy and Impacts Again

SHOW ME BOARDS

EXTRA PRACTICE

- 1 A 250 W motor runs for 40 s. Calculate the energy transferred.
- 2 Input 60 J, useful 6 J — calculate the efficiency.
- 3 Name one positive social impact of a new footbridge.
- 4 Why must a climate change answer mention carbon dioxide?
- 5 State the law of conservation of energy.

Checkpoint – Technique

- 1 An “explain” question is worth two marks. What are the two marks for?
- 2 You get a calculation wrong in part (a). Should you attempt part (b)?
- 3 What + why: why is “it is better for the environment” worth no marks?

PERIOD 2 STARTS HERE

Past Paper Practice

Real questions, real marking instructions, real conditions.

How This Practice Works

You will need the paper, the data booklet and your jotter.

- The papers are on your desk. Do not write on them.
- The relationships are in the data booklet. Find them there.
- Set every calculation out the SQA way, in your jotter.
- Mark your own work against the marking instructions after.

Exam Practice – The Systems Approach

Work from the papers themselves. Mark it with the matching marking instructions.

Paper	Questions	Marks
SQP	Q1	2
2021	Q7(a), Q8(a)-(b)	5
2022	Q2, Q14(a)	5
2023	Q1, Q12(a)-(b)	6
2024	Q5(c), Q11(a)	5
2025	Q6, Q12(c)	6

Exam Practice – Energy and Efficiency

Work from the papers themselves. Mark it with the matching marking instructions.

Paper	Questions	Marks
SQP	Q11(b), Q17(b)	10
2021	Q10(a)-(b), Q11(e)	10
2022	Q3, Q11(c), Q13(c), Q14(d)	10
2023	Q6(a), Q11(b), Q12(e)	9
2024	Q5(b), Q7(b), Q9(c), Q12(b), Q13(b)	10
2025	Q10(c)-(d), Q12(b)	10

Exam Practice – Roles and Disciplines

Work from the papers themselves. Mark it with the matching marking instructions.

Paper	Questions	Marks
SQP	Q11(a), Q12(c), Q18(a)-(b)	7
2021	Q6(b), Q9(e), Q11(d)	5
2022	Q6, Q12(c)	6
2023	Q10(a), Q11(a), Q14(e)	5
2024	Q3(b), Q5(a), Q8(d), Q13(a)	8
2025	Q3, Q10(a)-(b), Q13(f)	7

Exam Practice – Impacts of Engineering

Work from the papers themselves. Mark it with the matching marking instructions.

Paper	Questions	Marks
SQP	Q6, Q11(c), Q17(c), Q18(e)-(f)	11
2021	Q9(c)-(d), Q13(a), Q13(c)	6
2022	Q8, Q11(b), Q13(d), Q14(e)	9
2023	Q10(b)-(c), Q12(d), Q13(d)	7
2024	Q9(d)-(f), Q10(e), Q12(a)	7
2025	Q7, Q12(a), Q12(f)	6

Show Me — Exam Technique Drill

SHOW ME BOARDS

- 1 How many marks is the unit on a final answer worth?
- 2 What are the two marks in an “explain” question for?
- 3 Where do you find the relationships during the exam?
- 4 What must a climate change answer mention?
- 5 What must an emerging technology answer include?

Show Me — More Technique

SHOW ME BOARDS

EXTRA PRACTICE

- 1 When do you need a transposition line?
- 2 Is a single word ever enough for a “describe” question?
- 3 You made an error in part (a). What should you do in part (b)?
- 4 How many significant figures should your answer have?
- 5 Name one thing that costs a mark on almost every calculation.

Task 1 – Booklet 1 Section Practice

All five Section Practice sets, in your jotter.
Booklet 1 prints no marks – do not hunt for them.
Answer in full sentences. Every “explain” gets a cause
and effect.

Booklet 1 – Section Practice

Task 2 – Booklet 2 Self-Check

The ten mixed questions, with full working.
Marks are printed beside each question – use them.
Six of the ten are calculations. Set them out the SQA way.

Booklet 2 – “Mixed Self-Check Questions”

Task 3 — Rate Yourself Honestly

Booklet 2's Confidence Checklist first.
Then update the Success Criteria tables at the front.
Booklet 1 has two tables. Booklet 2 has one. Do all three.
Anything red is what you revise tonight.

Both booklets — front pages

Checkpoint

- 1 A lift motor is 80 % efficient and takes in 5 000 J. Find the useful output.
- 2 Name one economic and one environmental impact of fitting that lift.
- 3 What + why: the lift takes longer than the calculation predicts. Why?

LOOKING AHEAD

Electronics

Booklet 3: circuits, sensors and the components that control them.

Plenary – Prove You Are Ready

SHOW ME BOARDS

- 1 Which strand is worth the most marks in the test?
- 2 Write the formula for percentage efficiency.
- 3 What are the three marks in a calculation for?
- 4 What does an “explain” answer need?
- 5 Name three branches of engineering.

Plenary – More Quick Checks

SHOW ME BOARDS

EXTRA PRACTICE

- 1 State the difference between open-loop and closed-loop control.
- 2 Input 400 J, wasted 100 J – calculate the efficiency.
- 3 Name one positive and one negative impact of a new wind farm.
- 4 Where do the relationships come from in the exam?
- 5 Why must you write the unit on a final answer?

Extension – The Longest Chains

EXTRA PRACTICE

- 1 2021 Q10 – slow cooker: heat energy, then electrical energy, then efficiency (9)
- 2 SQP Q17(b) – lift: potential energy, then time, then explain the loss (7)
- 3 2025 Q10(c)-(d) – lifeboat: height, then kinetic energy from efficiency (8)