Edexcel Physics 2015:
Developing Practical Skills in Physics

17BAS04

Aims and Objectives

1 An overview of practical work at A level

2 Moulding the Core Practicals in your teaching to address the practical skills and competencies

3 The assessment of practical work

4 Developing your curriculum to give your students the investigative skills to work towards a practical mastery

5 Evidence and the visit

Developing Practical Skills
Session Agenda

10.00	Introductions and announcements
10.10	An overview of practical work and skills at A level
10.40	Using the Core Practicals
11.50	The assessment of practical work – the 2017 examination papers…
12.30	Lunch
1.15	…and the Practical Endorsement
2.45	Developing your curriculum to give your students the investigative skills to work towards a practical mastery
3.35	Evidence and the visit
3.45	Course completes

An overview of practical work at A level

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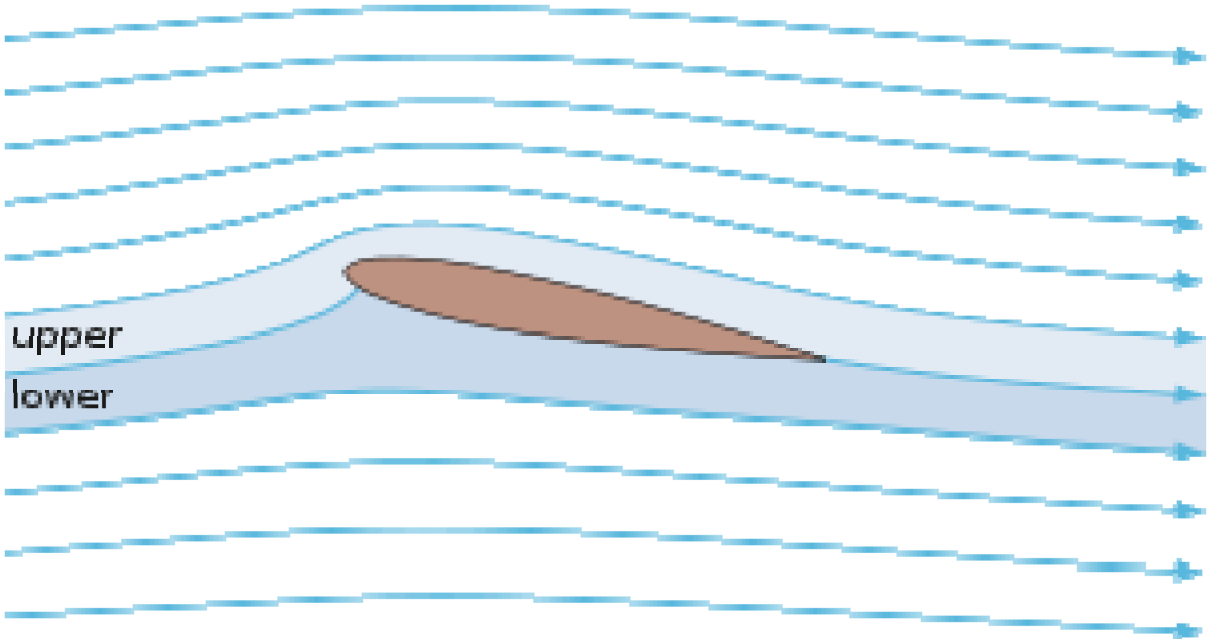
An overview of practical work at A level

- Why do practical work at all?
- What skills?
- Assessment
- Using the Core Practicals

Airflow and lift

As you can see…



…or as you can do?

What skills?

From the specification

- Transferable skills – see Appendix 1, supported by the Extended Project
- Mathematical skills – see Appendix 6
- Practical skills – see Appendix 5 titled 'Working Scientifically'

5(a) and 5(b)

a) Independent thinking

b) Use and application of scientific methods and practices

c) Numeracy and the application of mathematical concepts in a practical context (papers) **Or** Research and referencing (teacher)

d) Instruments and equipment – Know & understand **Or** use

Investigative methods

- ‘I wonder’ and ‘What if…’ – this is all very well but what do we expect students to actually do?
- **Independent thinking**, about a physics phenomenon and how its effects might be studied – eg momentum conservation
- **Planning** – choice of variables, measurement strategy, analytical methods, expected outcome and indicator of success
- **Measurement** – choice of appropriate measuring instruments, appropriate use of those instruments without guidance.
- CPAC 2c & 2d but also 2a, 4a & 4b and *working without instructions*

Assessment of skills and competences

Appendix 5a – Indirect assessment - on examination papers

AS papers 1 & 2

A level paper 3

Appendix 5b – Direct assessment - by teachers using CPAC while carrying out practical work…

…which must include all those Apparatus and Techniques listed in Appendix 5c

Practical Endorsement (PE) – is awarded by teachers for the last two. Routinely and consistently competent in the demands of 5c, all of which must be carried out by candidates

Core Practicals

These are chosen so that

- all the requirements of Appendix 5c are covered

- sufficient opportunity is given to assess students against CPAC

- they feature in the specification

They are flexible, better called practical activities, and can be carried out to suit your centre's apparatus and also adapted when you wish your students to be more investigative

Using the Core Practicals

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How do you use practical work?

As a way of introducing a topic, such as the concept of internal resistance?

As you complete a topic, such as momentum in 2D and CP10?

As a revision exercise, such as the thermodynamics practicals?

Core Practical 16 makes quite a good revision of practical work and can be used to assess almost any criterion.

Using the Core Practical Activities

These need to provide coverage of Appendix 5c. Some of these, such as 1 & 2, have a number of requirements.

They can provide opportunities for CPAC assessment.

In Year 13 you might want to be more flexible which CPAC you use, especially if some students have been absent or are not quite getting the competence.

Using the Core Practical Activities

For each of the core practicals we shall:

- identify possible CPAC opportunities
- consider variations in apparatus and method
- consider apparatus problems & solutions

It is important to remember that the practicals are only there to enable 5c coverage and provide opportunities for CPAC assessment. How you use them is your own choice.

We shall also look at other practical opportunities

Which CPAC?

Year 12	Year13
g by free fall	Force & acceleration
Resistivity	2D Momentum
Cell emf & *r*	Capacitor charging
Viscosity	Thermistor as thermometer
Young Mod	Latent heat
Speed of sound	Boyle's law
Vibrating wire – *T*, *f* & *λ*	Gamma absorption
Laser *λ* diff grating	Oscillating mass

Extra Practical Work

There is a list of 30 practical activities, the 16 core practicals and an additional 14, making 15 for Y12 and 15 for Y13

There are details where all the practicals can be used

Assessing Practical Work using Examination papers

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Indirect Assessment – Marks for Practical Work on the Written Papers

AS Paper 1

Q10 – 4

Q12(b) – 5

Q16 Graph & gradient – 7

16/80 marks = 20%

AS Paper 2

Q13b)(ii) – 2

Q14 b)(i)(ii)&(iv) – 1+2+2

Q16a) - 2

Fewer marks but more on core practicals Q2, 3, 10, 13 &14.

Note also questions set on non core practical work

– how do we prepare for this?

NB 6 mark questions 14 on P1 then 15 on P2

Indirect Assessment – Marks for Practical Work on the Written Papers

A Level Paper 3

Q1 – 4, 2 – 5, 4b – 2 & c – 4, 6 – 8, 7a – 2, 8a – 1, 9 – 11, 10b(ii) – 2 & c – 1+4 & d – 2,

11a – 2, 12b(i) – 3 & (ii) – 4

Context for questions

Core practicals Q6 resistivity, Q10 γ rays & Q12 grating

Non core practicals Q7 speed of sound in metals,

Q8 V-I for diode, Q11 resonance of inducting magnets

Note also the amount of marks for the use of graphs and for using numerical answers to make judgements – AO3

Additionally

On A level Paper 1 there is one 6 mark question and a graph and on paper 2 there are two 6 mark questions

So, what are the challenges and how do we prepare students for this type of assessment of practical work?

Assessing Practical Work for the Practical Endorsement

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Developing your Practical Assessment

Appendix 5c

What does a pass look like

Using pen portraits

Developing student competencies

What does a Pass look like?

- Instinct and evidence
- Standardising
- Pen portraits

CPAC 1

Correctly follows instructions to carry out the experimental techniques or procedures.

Which practicals – when

What does a pass look like?

CPAC 2

a) Correctly uses appropriate instrumentation, apparatus and materials (including ICT) to carry out investigative activities, experimental techniques and procedures with minimal assistance or prompting.

b) Carries out techniques or procedures methodically, in sequence and in combination, identifying practical issues and making adjustments when necessary.

c) Identifies and controls significant quantitative variables where applicable, and plans approaches to take account of variables that cannot readily be controlled.

d) Selects appropriate equipment and measurement strategies in order to ensure suitably accurate results.

CPAC 3

a) Identifies hazards and assesses risks associated with these hazards, making safety adjustments as necessary, when carrying out experimental techniques and procedures in the lab or field.

b) Uses appropriate safety equipment and approaches to minimise risks with minimal prompting.

Which practicals – when

What does a pass look like?

CPAC 4

a) Makes accurate observations relevant to the experimental or investigative procedure.

b) Obtains accurate, precise and sufficient data for experimental and investigative procedures and records this methodically using appropriate units and conventions.

Which practicals – when

What does a pass look like?

CPAC 5

a) Uses appropriate software and/or tools to process data, carry out research and report findings.

b) Sources of information are cited demonstrating that research has taken place, supporting planning and conclusions.

Which practicals – when

What does a pass look like?

Using pen portraits

These work best when they are short, so their use in the lab is easy and precise.

They can be developed in departmental training time. Once in place they give security across the department and over time.

Developing student competences

Self-tracking

For 5c and for CPAC

Peer assessment

Always very harsh on themselves

Write their own pen portraits

Closing the file

Completing 5c

Completing CPAC

Checking the records

Making up your mind!

Tuning your Scheme of Work towards a practical mastery

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Working towards a practical mastery

- Use of full range of Mathematics in all practical applications
- Routinely and consistently competent in all aspects of Appendix 5c
- Ability to follow instructions in complex techniques
- Ability to formulate a hypothesis and research and plan a practical investigation
- Ability to analyse complex data and form conclusions based on initial hypothesis
- Routinely and consistently satisfies the CPAC in their work

Building a scheme of practical work

- Adding it on to the published SoW and placing the practicals
- Linking practical skill development to progress through the specification – write down the 5c requirement satisfied by each core practical
- Assessing routine and consistent competence – write down which CPAC you will use with each core practical
- An overall view – does your SoPW give you enough opportunities to enable your students to achieve a Pass?

Evidence and the Visit

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The monitoring visit

Evidence

Centre planning, centre records, student records

Practical observation

Discussion with staff and students

Does the visit do enough to ensure compliance?

Pearson can help in many ways

Support

Stephen Nugus is our Science Subject Adviser
Tel: 020 7010 2190
Email: TeachingScience@pearson.com

Or try the Pearson Science Community at
http://community.edexcel.com/science/

For particular enquiries try our ‘Ask the Expert’ service and to stay in touch sign up for science emails.

All these details and more at our website
Qualifications.pearson.com

Notes run here in Arial Regular 6 pt

Pearson Paid-For Published Resources

Teacher Resource Packs for both Concept and context (Salters Horner) approaches

Student Books 1 + 2, one for each year again for both approaches – these include Active book subscriptions and Active Teach can come with this.

Homework, practice and support

AS/A Level Physics Revision Workbook

AS/A Level Physics Revision Guide

Other useful links

1. **Grade Boundaries**

   This page shows the minimum marks needed to achieve a certain grade for all UK and international examinations. Also refer to the examiners report which is available for download with other documents.

2. **Examination Results Statistics**

   Results statistics summarise the overall grade outcomes of candidates sitting Edexcel examinations.

3. **Results Plus**
   - Edexcel's free online service giving instant and detailed analysis of your students' exam and mock performance.
   - See your students' scores for every exam question.
   - Understand how your students' performance compares with Edexcel national averages.

Any questions?

Thank you for attending this event.

How did we do?
Please fill in the ***evaluation form*** *that you'll receive via e-mail in a few minutes.*

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http://qualifications.pearson.com/training

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