Pearson Edexcel

# Examiners' Report
# Principal Examiner Feedback

November 2020

Pearson Edexcel GCSE

In Combined Science (1SC0) Paper 2PH

**Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

**Pearson: helping people progress, everywhere**

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

November 2020
Publications Code xxxxxxxx*

Paper Introduction

This was the third examination of the combined science, physics, paper 2, at higher level, for the new specification. It was taken in the extenuating circumstances, that followed on from the cancellation of GCSE exams that occurred in summer 2020. Questions were set to test candidates' knowledge, application and understanding from nine topics in the specification:

● Topic 1 – Key concepts of physics

● Topic 8 – Energy – forces doing work

● Topic 9 – Forces and their effects

● Topic 10 – Electricity and circuits

● Topic 11 – Static electricity

● Topic 12 – Magnetism and the motor effect

● Topic 13 – Electromagnetic induction

● Topic 14 – Particle model

● Topic 15 – Forces and matter

It was intended that the examination paper would allow every candidate to show what they knew, understood and were able to do. Within the question paper, a variety of question types were included, such as objective questions, short answer questions worth one or two marks each and longer questions worth three or four marks each. The inclusion of questions designed at targeting candidates' knowledge and understanding of practical work continued. This included assessing their fundamental knowledge of practicals specified in the specification, together with further application, especially where they were asked to propose improvements to a procedure. The six-mark question 6(c) asked candidates to analyse the forces acting on a wooden block being pulled by a string. Candidates in this examination found this question quite demanding.

Candidates coped well with most questions and did particularly well in the questions asking for calculations using equations. Candidates' knowledge of practical work, in response to 'how would you' questions remains insecure.

Successful candidates were:

- well-acquainted with the content of the specification
- skilled as a result of having been engaged with practical work during their course
- competent in quantitative work, especially in using equations
- well-focused in their comprehension of the question-at-hand
- willing to apply physics principles to the novel situations presented to them

Less successful candidates:

- had gaps in their conceptual knowledge of the topics of this paper

- had gaps in their procedural knowledge, relating to their practical work
- misread and / or misunderstood the symbols used in equations
- did not focus sufficiently on what the question was asking
- found difficulty in applying their knowledge to new situations

This report is based on a limited number of candidates and the fact of a small sample size needs to be born in mind when making any generalisations.

Question 1 from Topic 14, the particle model

1(a) (i) Some students showed knowledge of doing practicals, where the density of solids was investigated. They showed familiarity with the use of Eureka cans and measuring cylinders. Others only focused on measuring some volume, with a limited outcome. Others did not address the 'how would you measure' issue at all and tried to use the density formula in vain to address this question

1(a) (ii) Most were able to correctly recall and substitute in to the density equation, handling the power of ten involved. Some had trouble with that power of ten, scoring an intermediate mark.

1(b) (i) There were some good answers here but many found mathematical rearrangement of the equation too demanding. A number of them managed to achieve an intermediate mark if they demonstrated understanding via a 100 – 22 = 78$^{o}$C simple calculation.

1(b) (ii) The most popular suggestion here was adding a lid or insulation to the beaker, both under the same marking point. Some did see benefit in using of a larger piece of copper. A few gained a mark from suggesting transferring the hot copper and a very few suggested measuring the temperature of the boiling water, which was also credited for a mark. Many students suggested the ubiquitous 'take repeats' not realising that, of itself, could not lead to 'a value that is closer to the correct value'.

Question 2  from Topic 8, energy – forces doing work

2(a) Questions requiring graphical interpretations like this have figured in past examination questions. They often have yielded two marks from an observation of the basic trend and then taking note of the non-linearity, as shown by curvature on the graph. Most students only gained the first of those two marks available.

2(b) (i) Many correct calculations were seen here with direct substitutions into the recalled equation gpe = m x g x h.

2(b) (ii) Many did not appreciate that the change in gravitational potential energy equated to the amount of useful work done in this case.

2(b) (iii)There were a good number of correct answers seen here, substituting into power = work done / time.  Many were wrong though, putting power = work done x time or taking wrong numbers into their work.

Question 3 from Topic 12, magnetism and the motor effect

3(a) Many correct answers seen.

3(b) There were some good answers here, with good easy-to-follow drawing. Circular field line were often drawn, showing wrong direction of arrows though. Some drew bar magnet field patterns inappropriately.

3(c) (i) Most got this correct, substituting the three values from above into $F = B \times I \times l$, which was given. A few introduced erroneous powers of ten mistakes, which spoilt their work, since simple straight substitutions of the numbers given was required.

3(c) (ii) Some good attempts at depicting fingers at right angles were seen. Many correctly made associations between the fingers and the three aspects of motion, field and current. A number of candidates wrongly associated the first finger with ‘force’.

3(c) (iii) Few candidates were able to use Fleming’s left hand rule correctly.

Question 4 from Topic 15, forces and matter

4(a) (i) Nearly all the candidates made a good estimation of the reading from the diagram.

4(a) (ii) Some students gave a straightforward answer, measuring the original length, followed by subtracting from a final length. A number of students just repeated the stem of the question in saying ‘measure how much the spring has reduced in size’ to no avail.

4(a) (iii) Some did see the need to have scales with finer division marks on and others alluded to using interim values of weights. A few wanted to move the ruler closer and a very small number suggested the use of some kind of pointer.

4(a) (iv) A good number realised a limit was reached when the spring ended up fully compressed. Some mistakenly talked of reaching elastic limits, referring to stretching. Others thought a ‘can’t go back to its original length’ was somehow involved in an explanation.

4(b) Many good answers were seen here. The rearrangement of the equation left some candidates faltering. Two marks were still possible when mm as $10^{-3}$ m was not realised.

4(c) Many were able to get to the correct answer here. There was opportunity to gain intermediate marks even when mistakes were made, such as a failure to take the square root at the end of the calculation.

Question 5 from Topic 10, electricity and circuits

5(a) (i) There was some correct positioning of an added resistor and voltmeter. Many put both in wrong series arrangements however.

5(a) (ii) Most candidates understood that voltmeter and ammeter readings were needed in order to conclude about overall resistance.

5(a) (iii) Nearly all candidates correctly read the resistance of a single resistor from the graph.

5(a) (iv) A basic trend often yielded one mark. However many say the two variables as being proportional to one another. Full interpretation of curved graphs, i.e. with a non-linearity allusion, eluded most candidates.

5(b) (i) Many correct answers were seen here. An intermediate mark was achieved by some with a '7 V' answer. These candidates had not focused sufficiently on the 'across the 15 Ω resistor' aspect in the question.

5(b) (ii) Many correct answers were seen here, using the equation, which was given to candidates.

Question 6 from Topic 9, forces and their effects

6(a) Many students chose the correct multiple choice answer, showing a balance of forces, with zero acceleration.

6(b) Most candidates were able to score marks on this test of vector diagrams. Drawing two lines at right angles with equal size vectors gave 2 marks. The resultant diagonal direction gave a third mark and many made measurements to obtain size of the resultant force. Some students used Pythagoras, obtaining full marks. A number of students only achieved the first two marks because their answer was incorrect and they completed a wrong triangle and so were unable to get the third marking point.

6(c) Most students obtained some marks in the extended open response question about identifying and explaining forces. Level 1 attainment was often made through a simple reference to friction. For level 2 more detail was needed about friction (in the horizontal direction) or about the weight of the block (in the vertical direction). A lack of clarity and coherence in explaining meant many students scored an intermediate mark at level 2. There was insufficient physics understanding shown for the vast majority of candidates to reach level 3 e.g. which would be achieved through explaining a more detailed balance of particular forces in the horizontal and/or vertical directions

## Summary

Candidates did well on questions involving calculations. They were able to recall equations, where called upon (1(a) (ii) 2(b) (i) 2(b(iii) and 4(b)), and use with facility. Many did not achieve correct rearrangements of equations though. When equations were give many students were able to use them to effect as in 3(c) (i) but again when rearrangement was needed (1(b) (i) and 4 (c)) candidates did less well.

Candidates did well when it came to a basic conventional graphical interpretation (2(a) and 5(a) (iv)). However, most did not grasp the implications of the relationship involved when the outcome has a clear curve, as opposed to a straight line graph.

Candidates’ procedural knowledge was again tested. In Qu1(a) (i), an 'explain how' question, which required an experimental description, the responses seen were of variable quality, reflecting some exposure to this experiment in the school laboratory. A lack of understanding of the procedural aspect was revealed some when candidates explained how they might calculate a volume. The other ‘describe how’ question was Qu4(a) (ii), which was not addressed by most candidates in the straightforward direct way expected..

The ‘state the measurements’ Qu5(a) (ii) was better done, with many identifying the need for ammeter and voltmeter readings.

In the ‘explain improvements’ Qu4(a) (iii), many scored a mark by proposing using a lid or insulation, but not many scored the full two marks through adding a separate other improvement.

The extended open response question (6 (c) ) elicited some basic knowledge of some forces. However detailed knowledge, and the ability to convey it clearly and coherently, was lacking.

There were few blank responses seen in the candidates’ papers and detailed answers were seen all the way through the paper giving some indication that time was not an issue. Candidates were able to demonstrate their knowledge and understanding, giving many good answers. The responses to practically based questions are still lacking.