Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

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in Physics (4PH1) Paper 2P

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General Comments

As in examinations for previous specification, most students were able to recall the equations and usually they handled the related calculations well. Students who gave the best practical descriptions usually appeared to be writing from first-hand experience. Responses to the longer questions showed that the less able students tend to struggle when assembling a logical description or when asked to offer more than one idea. There was a wide range of responses, and it was good to see that many students could give full and accurate answers.

Question 1

Many candidates scored well on question 1. Those that did not predominantly got the charge on the electron incorrect.

Question 2

Questions regarding the structure of liquids and solids in terms of particles are relatively common. There was a wide variety of styles of answer which required professional judgement to award fairly. Either in words or in diagrams, the structure of a liquid should be clearly more random than that of a solid. Equally, it should be clear that there are no large gaps between particles in a liquid, even though, generally, liquids are less dense than the same substance's solid phase. Candidates generally expressed themselves more clearly when it came to the differences between the motion of particles in a solid and in a liquid.
Candidates completed the specific heat capacity questions successfully, with only minor errors involving conversion of grams to kilograms or an incorrect calculation of the temperature difference. Both errors were taken into account and were examples of 'errors carried forward'.

Question 3

Many candidates selected a correct product of nuclear fission in part (a), such as named isotopes, gamma rays or neutrons. There was no credit given for naming a source of nuclear fission i.e. uranium.
Although most candidates scored at least one mark for making reference to the idea of radioactive products, significantly fewer referred to why that was a problem, namely the increased likelihood of cancer to those exposed to it or that the uranium itself was radioactive and therefore a problem.
Credit was given for the more economic aspects such as uranium is non-renewable and that commissioning costs are significantly higher, although many candidates did not refer to this last point.
Candidates performed the calculation in part (c) well, notwithstanding errors with standard form. Equally, the physics term 'power' is about the rate of energy transfer, rather than any specific formula which might contain it such as electrical power.

Question 4

Even though the investigation itself in this question was perhaps an unfamiliar context, the core points were teased out by the scaffolding in the question. Most candidates remembered that the vertical bounce height for different temperatures should be measured with a ruler or an equivalent measuring device and that the temperature of the squash ball, determined by a thermometer or water bath was central to the investigation. Higher marks were obtained by those candidates that included details of the control variables (i.e. drop height, reduction of force exerted on the ball inadvertently and so on).

Question 5

Candidates remembered the formula for moment well here, with many going on to correctly calculate the clockwise moment of the weight of the block. It was pleasing to see progress on this sort of calculation, with the only significant error being the correct distance of the force F from the pivot point A. Most candidates used the distance of 55 cm, rather than the correct distance of 80 cm. Other candidates inadvertently took moments about the position of the block.

In part (a)(iii), clarity of language was important. There are at least two distances that are changing in this question, so the candidate needed to be clear which distance was increasing (that of the block from point A) or which was decreasing (that of the block from point B) and the effect that had on the relevant moment. Furthermore, the relevant clockwise and anti-clockwise moments change in this context as the blocks move though crucially, they are still the same as each other.

In part (b), candidates recognised that the arrow should be vertically downwards. It is standard practice for that arrow to originate from the centre of mass - there was a small amount of tolerance given here.

Parts (b)(ii) and (b)(iii) were attempted poorly, in general. Some candidates expressed that the tension and weight must be equal yet few explained clearly that those forces are in opposite directions. Those two forces cannot be an example of Newton's third law as they are acting on the same object. Many candidates thought that because this object is stationary, Newton's third law did not apply: Newton's third law is about the interaction between two objects, regardless of whether they are moving or not.

Question 6

In part (a) there was some tolerance on the exact shape of the circular field lines as there was a three-dimensional aspect to the response. Candidates did well with the method to show the shape of the field, whether they referred to multiple plotting compasses, one compass that was moved around or iron filings and tapping the card.

Part (b) saw some excellent attempts to describe an unfamiliar magnetic context with IGCSE level terminology. Most candidates gained some credit for realising that both wires were producing a magnetic field and that somehow these made the wires interact and apply a force to each other.

Question 7

In item 7(b), determining the period of a wave from an oscilloscope trace is one of the named practicals in the specification (3.27P). Encouragingly, learners

appear to have witnessed this or completed the practical themselves. There were many correct responses or responses that a power of ten error by missing the milli-prefix in the settings box. Once the period was calculated, candidates tended to do well on the rest of the item, especially if they explicitly mentioned their calculated frequency in their working. If the candidate calculated a frequency then it was invariably used correctly in part (b)(ii).
Many candidates' mis-interpreted the requirement of part (b)(iii) by stating that the sound wave should be changed. This is not the case here. The sound wave is the same, just that the requirement is that the same frequency wave should take up more horizontal space on the display. A reasonable fraction of candidates realised this was to do with the x-scale or 'timebase' although many thought that increasing the time per division was the way to achieve fewer cycles when in fact the reverse is true.

Question 8

Candidates generally answered part (a)(i) correctly as long as they inferred that there was a difference in the two stars rather than any reference to the changing distance of those stars from the Earth. Many candidates did not recognise that the period of this motion was 31 years, however, with the most popular incorrect answer being 60 years (the length of time shown on the whole time axis) therefore showing that the candidate had not recognised how the period of this unusual waveform was defined. If a candidate produced an answer for part (a)(ii), then the calculation of the orbital radius usually went well, barring an omission of the conversion from years to seconds.

The astrophysics section of the IGCSE Physics course is new to the specification as of 2017. Since then, more candidates have made better reference to how the evidence supports the Big Bang theory rather than merely quoting what that evidence is. The most successful candidates provided a logically sound argument for part (b) relating the larger red-shifts at larger distances to larger recessional speeds which in turn implies expansion from a single point (rather than expansion from the Earth).

Summary Section

Based on the performance shown in this paper, students should:

- Take care when drawing diagrams to add labels and draw accurately.
- Either build or simulate circuits in which the number of components changes and noting the effect on the currents and voltages in or across those components.
- Ensure that they have either seen or performed the practicals named in the specification where possible.
- Take note of the number of marks given for each question and use this as a guide as to the amount of detail expected in the answer.
- Take note of the command word used in each question to determine how the examiner expects the question to be answered, for instance whether to give a description or an explanation.
- Be familiar with the equations listed in the specification and be able to use them confidently.
- Structure multi-step calculations as simply as possible to facilitate checking at each stage.
- Recall the units given in the specification and use them appropriately, for instance frequency.
- Be familiar with the names of standard apparatus used in different branches of physics.
- Practise structuring and sequencing longer extended writing questions.
- Show all working so that some credit can still be given for answers that are only partly correct. This is particularly important when dealing with a prefix in front of an SI unit or when dealing with numbers in standard form.
- Signposting working with words may help with structuring calculations clearly.
- Be ready to comment on data and suggest improvements to experimental methods.
- Take care to follow the instructions in the question, for instance when requested to use particular ideas in the answer.
- Take advantage of opportunities to draw labelled diagrams as well as or instead of written answers.
- Allow time at the end of the examination to check answers carefully and correct basic slips in wording or calculation.

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