GCE EXAMINERS' REPORTS

WJEC EDUQAS AS PHYSICS

SUMMER 2016

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PHYSICS

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COMPONENT 1 - MOTION, ENERGY AND MATTER

General comments:

Generally it was felt that the paper differentiated well with the mean mark for most of the questions being around 50% of the total mark available. As expected questions 1 and 2 were the best answered questions while question 4 which contained a large practical element was the poorest answered. The definitions and laws were generally well known and the mathematical ability of the majority of candidates was good at this level.

Specific comments:

Q.1 (a) The conditions for equilibrium were well known.

(b) (i) The diagram was well labelled. However a few candidates used 'floating' arrows which did not touch the diagram so they lost a mark and a few others forgot to label the arrows.

(ii) This was generally well done with a large number of candidates gaining all 4 marks.

(iii)&(iv) Generally well done again.

Q.2 (a) The definition of vector and scalar quantities was well known and the examples given were almost always correct.

(b) (i) Most calculated the constant velocity correctly and also determined the final time, it was a bit disappointing that a few candidates then plotted this information using a very poor scale on the axes which, in some cases, were not titled.

(ii) The distance the skier travelled was generally well answered with candidates either using the equation for the area of a trapezium or splitting the area up to find the total.

(c) This was the most problematic part of the question, with very few candidates gaining more than 1/3 marks. Some candidates obtained a mark for realising there was zero resultant force when the skier was travelling at constant velocity but very few stated there was a *constant* forward force between 0 and 8 seconds and a *constant* backward force between 28 and 40 seconds.

Q.3 (a) The recoil velocity of the gun was well done using conservation of momentum.

(b) These parts differentiated well with only the better candidates managing to determine the angle in part (ii).

(c) These parts caused a number of candidates problems. In part (i) many candidates realised the velocity would change due to air resistance but didn't specify that the horizontal velocity was the important component. There were a number of different ways to answer part (ii) with many using the work – energy theorem and others equations of motion.

Q.4 This was the most poorly answered question on the paper with a number of the candidates seemingly unprepared for a practical question of this type. In fact many candidates were unable to calculate percentage uncertainty never mind convert a percentage uncertainty to an absolute uncertainty. Part (d) was very poorly answered with few candidates realising there was a very large uncertainty in the resistance and also few attempted to determine the percentage uncertainties in the readings given.

Q.5 This question was generally well done with the majority of candidates having learnt the terminology used in this section of the specification. Some candidates had problems in identifying the particle in (b)(ii) and also lost method marks by not clearly showing whether they were attempting to conserve charge or lepton number. The candidates who scored well on this clearly labelled which law they were using followed by a series of numbers to represent the charges / lepton numbers.

Q.6 (a) The vast majority correctly used Wien's law to determine the wavelength but then lost a relatively easy mark by not including the unit. In addition, whilst the majority drew a skewed normal distribution for the intensity many forgot to label the peak wavelength so losing another fairly simple mark.

(b) Electron volts are new to the specification and some candidates had problems with part (ii) as a result of this.

(c) This part was intended to be difficult and provided a range of marks.

Q.7 (a) The definition of the Young modulus was well known.

(b) The QER question was rather disappointing with many candidates confusing the force-extension graph of rubber with that of a crystalline material and so talked about grain boundaries and dislocations. Candidates who realised this was a polymer still had problems in correctly describing the three stages of change in Young modulus at a molecular level.

(c) The line for unloading and the explanation of hysteresis was well done.

(d) This was also well answered.

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COMPONENT 2 - ELECTRICITY AND LIGHT

General comments:

All the candidates were able to gain marks on every question and as a consequence were able to demonstrate at least some knowledge of the principles learnt during the course. The mathematical skills of the candidates were applied very well with some questions clearly discriminating the more able candidates e.g. question 7 in determining the number of photons. This was the first time that a QER question had been set in question 6(a). Nearly all candidates scored marks on this part with some very good examples gaining full marks. Also an ethical question was set for the first time in question 7(c). Whilst some provided answers without a clear structure; the more able candidates were able to use the data and provide a clear conclusion.

Specific comments:

Q.1 (a) A significant number of candidates did not recall the law correctly or quoted the definition of resistance $R = \frac{V}{I}$.

(b) (i) For this part, many candidates used the diameter incorrectly for radius and omitted the unit of resistivity.

(ii) Candidates often did not attempt a numerical evaluation and this scored no marks and they also did not justify their conclusion.

Q.2 (a) Many confused phase and path difference or gave answers such as ½ and failed to convert their answer to a phase angle.

(b) (i) Many did not recognise this as a standing wave and commented vaguely in terms of phase and path difference. Candidates need to be familiar with standing waves formed by two wave sources or by reflection.

(ii) Marks were awarded if the equation $v = f\lambda$ was used correctly. However many candidates were not able to determine the wavelength from the node-node distance.

Q.3 (a) This part was answered well by all the candidates.

(b) (i) Some candidates did not make three clear points in their explanation and hence dropped a mark. Some candidates ignored the effect of the thermistor and commented on the increasing resistance of the resistor.

(ii) The common mistake in this part was that candidates did not realise that the units of the graph were in kΩ.

(iii) This was answered poorly by all candidates with only the very able gaining full marks. Most candidates gave an answer in terms of the lamp receiving a smaller share of current or that the temperature of the lamp had an effect.

Q.4 (a) A number did not mention diffraction and many candidates commented on both bright and dark fringes whilst the question asked for bright fringes only.

(b) (i) The graph was plotted well although some candidates inverted the x and y-axes and lost a mark as the instructions were clear. Some candidates did not plot a best fit line and some forgot the power of ten on the y-axis.

(ii) This was generally answered well but some candidates took a data point from the table rather than from the best fit line. Many candidates either took a data point from the line or calculated the gradient but did not indicate on the line the data points used or drew a triangle for the gradient calculation.

Q.5 (a) A surprising number of candidates attempted to answer this using the double slit formula. Also many candidates were not able to calculate d from the lines per mm value.

(b) A large number of candidates could not convert mm^{-2} to m^{-2} to make any valid comparisons. Indeed, some candidates thought you could look directly at the sun without glasses!

(c) (i) A significant number of answers described the entire process from ground state to ground state instead of mentioning the pertinent points. Often candidates described an excitation to U, spontaneous emission and then this photon stimulating another emission. Many did not comment that the two resulting photons are identical.

(ii) The calculation of the energy of the photon was answered very well but many candidates failed to add on the energy of level L.

Q.6 (a) The QER was answered well and nearly all candidates made at least two valid points. Many did not draw a labelled diagram or a poor diagram without clearly indicating refraction or the angles involved. Also a common emission was to forget to mention a suitable range of angles. A number of candidates did not choose to mention a graph and simply used a mean. A few tried to answer in terms of critical angle.

(b) (i) Most candidates who lost a mark did not draw on the normal to the hypotenuse and showed the ray bending upwards at the second face.

(ii) Many did not know how to use Snell's law and tried to find the critical angle.

(iii) Candidates calculated the critical angle well. Many candidates did not mention what happened after the hypotenuse, and omitted to continue the ray until it left the bottom face.

Q.7 (a) (i) This was answered well though some candidates confused this with ionisation.

(ii) Many candidates did not recognise that the $E_{k\,\max}$ would be zero with the longest wavelength of emission.

(b) (i) This was either answered very well or very poorly. A good number of candidates were able to determine the number of photons.

(ii) This was a very discriminating question with only the very able candidates able to determine the pressure.

(c) The more able candidates were able to use the data and make relevant points about the spending from different countries. Many did not comment on the data or made very vague arguments about 'big' or 'rich countries'. Candidates need to read the data and comment appropriately.

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