GCSE EXAMINERS' REPORTS

GCSE (NEW)
PHYSICS

SUMMER 2018

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PHYSICS

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PHYSICS UNIT 1 FOUNDATION

No section of the paper was attempted by 100 % of the candidates. Questions which demanded recall of specification content proved challenging to many candidates. It was also disappointing that candidates often did not perform well in questions based around practical work, even the specified practical work that candidates should have undertaken. Questions involving calculations proved to be amongst the best answered sections of the paper.

Q1. (a) and (b) Mean mark 1.6

(a) Many candidates were able to correctly identify these regions of the em spectrum but not many got both parts correct, perhaps because the answers were the same.

(b) The em spectrum is a familiar context and this was correctly answered by many candidates.

(c) Mean mark 1.1

The majority of candidates attained a mark here, usually for identifying microwaves as transverse.

(d) Mean mark 2.5

(i) This simple calculation was well-done by most foundation candidates.

(ii) Those candidates who read the information given carefully and referred back to the table often gave credit-worthy responses but it was common to see candidates attempt to explain this without considering the information and not, therefore, attain a mark.

Q2. (a) Mean mark 2.2

(i) Very few candidates correctly identified all 3 wires in the ring main. A small number of candidates did not use the labels given, perhaps because they did not read the question.

(ii) Knowledge of the ring main was often poor, even in this simple question where they had to underline the correct response.

(b) Mean mark 3.1

This was a relatively straight forward calculation and candidates generally coped well making this the second highest scoring section of the paper. There was no requirement to convert any units in this calculation but it was fairly common to see candidates convert the unit cost into pounds leading to incorrect answers.

Q3. (a) Mean mark 1.0

This QER demanded knowledge of a specified practical and it was very worrying to see from many candidate responses that they clearly had no idea how to determine density. It is worth noting that only 76.9% of students attempted this question, a far lower rate than any other question. For those who did attempt it the methods often lacked clarity and it was common to see descriptions of how to determine the density of a regular shape.

(b) Mean mark 1.7

(i) Many candidates correctly identified iron as the unknown metal but poor expression often meant that candidates were unable to attain the second mark as they could not explain that the measured density was closest to the value given for iron.

(ii) Many good responses here.

(iii) The understanding of the term accuracy was very poor. Most candidates suggested to take repeat readings. Very few recognised that the resolution of the apparatus used should be increased.

(c) Mean mark 2.8

The calculation work was again well-done by the majority of candidates.

Q4. (a) and (b) Mean mark 1.7

(a) The magnetic field pattern around a current-carrying wire was not recognised by many candidates.

(b) (i) This was not well-done with few clearly explaining how to achieve a reversal in the direction of spin.

(b) (ii) Many candidates attained 1 mark here but poor expression again let many down with statements such as use a bigger magnet attaining no credit.

(c) Mean mark 1.9

These two calculations were well-done by many candidates. Where (i) was incorrect many students attained marks via ecf in (ii) although it is worth noting that where ridiculous answers of greater than 100 % were given candidates were not credited.

Q5. (a) Mean mark 0.8

It was common for candidates to attain the first mark here but very few could describe the nature of the relationship between time and temperature.

(b) and (c) Mean mark 3.4

(b) (i) & (ii) Almost all candidates could identify the temperature at 9 minutes in (i) and most identified the temperature change in (ii).

(b) (iii) Many candidates answered this correctly although the demand of substituting 3 quantities meant it was common to see slips, especially in substituting the specific heat capacity value, even though this was clearly identified in the stem.

Q5. (c) This was very poorly done by almost all candidates. Many simply repeated that the water was boiling as stated in the questions. Another common answer was that the water was evaporating which did not attain a mark as evaporation can happen at any temperature.

Q6. (a) and (b) Mean mark 1.6

(a) This was a simple introduction into this question but it was rare to see candidates attaining both marks. A large number of candidates thought that nuclear power stations emit carbon dioxide gas when used.

(b) This was poorly answered. Most simply referred to coal giving out more of all of the polluting gases identified in the table and did not link its CO_2 emissions with the effect on global warming. Where candidates did identify that coal had the greatest effect because of its CO_2 emissions, clarity of expression often meant that the second mark was lost. Candidates should be encouraged to match the type of language in the stem and use superlatives in their responses.

(c), (d) and (e) Mean mark 2.6

(c) This question invited candidates to interact with graphical data and many made a good attempt to compare the use of coal and gas although few thought to comment on how the percentage use of each changed in comparison to the other.

(d) (i) Many candidates attained a mark here although weaker candidates made no comparison and simply gave a numerical value.

(d) (ii) This was poorly done as it required candidates to go back to the stem and recognise why an increase in the percentage generation from renewable sources should be expected.

(e), (i) and (ii) These parts were well done by most candidates although the 24 hour clock values caused difficulty for candidates who attempted to change the times into a more familiar format although this was not demanded by the question.

Q7. (a) Mean mark 0.1

(i) Along with (ii), this was the worst performing section of the paper and attempted by only 88.8% of candidates, much lower than almost all other question parts. Again, the knowledge of practical methods was very poor and it was rare to see a correctly identified variable in this experiment.

(ii) It was rare to award a mark here, candidates evidently did not understand the idea of validity and could suggest no relevant improvements to this experiment.

(b) Mean mark 2.9

(i) The majority of candidates were able to scale the y axis and plot the points correctly, although they should be encouraged to use neat crosses so that the accuracy of their plots can be checked. Plots which are far too large and thick cannot be judged so no marks can be awarded. The quality of the curves was generally poor and lines which were obviously too thick, disjointed or 'hairy' could not be credited.

(ii) The majority of candidates ignored the unit of kΩ on the y axis and hence did not attain the mark.

(iii) It was rare for candidates to interact with all of the data here in order to determine the extent to which the suggestion was true and this limited their marks in most cases to 1 out of the 3 available.

Q8. (a) Mean mark 1.8

Many students were able to demonstrate good knowledge here.

(b) Mean mark 3.1

(i) Candidates struggled to read the values from the graph despite being told that each small square represented 20 s. Of those who were able to obtain a correct value in I few were able to calculate the time difference in II.

(ii) The majority of candidates struggled to fully interpret this data. Many could determine a correct arrival time for the P waves, but subtracting the times presented in this format was beyond the skill of most and it was rare to see correct answers. Determining the distance from the time delay was not usually answered correctly.

(iii) Very few candidates attained marks here. The majority failed to convert minutes into seconds despite the emboldened parts of the stem acting as a hint. Of those who correctly converted minutes into seconds a surprisingly large proportion did not attain the answer mark as they incorrectly rounded their answer, recording it as 8.8 and not 8.9 or 8.8 recurring. This could be due to their calculator displays giving the answer as 8.8 with a dot above the 8, which candidates ignored.

(iv) It was rare to see correct attempts here, very few candidates realised that the possible locations for the epicentre where were the circles intersected and the crosses were randomly distributed around the diagram.

(v) Many candidates did not attempt this and it was very rare to see any correct answers.

PHYSICS

GCSE (NEW)

Summer 2018

PHYSICS UNIT 1 HIGHER

There were just over 6 800 entries for this tier paper and it was apparent that most candidates had been entered appropriately. However there were some candidates who found the paper challenging. These candidates may have been better suited to the foundation tier paper. The vast majority of candidates attempted every question, but not every question part.

Candidates coped well with graphs and seismic waves. Topics that proved challenging in the context given in the paper included circuitry, household electricity, molecular theory, satellites and transformers. Some candidates do not consider units when substituting values into an equation e.g. 2.8 V refers to voltage and yet it was substituted as a value for power into an equation. Manipulation of equations causes problems for a minority of candidates. Conversion of units was often ignored. Candidates need to spend time in reading questions carefully. Candidates often perform better when completing calculations than when writing out descriptions or explanations.

Some question parts require a judgement to be made about the validity of a suggestion or claim. If this is not given then full marks are not given. For example, see q 1biii and 7a.

Q1. (a) Mean mark (MM) – 0.4

(i) Many candidates ignored the bold print so included 'use the same components' as one of their answers. In fact, some named a different component on each of the answer lines. Others made vague references to controlling light but it was not clear where this light was coming from.

(ii) It was expected that candidates would recognise the need to control ambient light either by completing the practical in a dark room or by placing the lamp and LDR in a container. A minority of candidates explained why this was an improvement. As usual, there were many references to take repeat readings. Other responses seen included:
- Connect both circuits together either in series or parallel
- Add an ammeter or voltmeter to the second circuit
- Use the same type of lamp in each circuit (did they know the symbol for an LDR?)

(b) MM - 4.1

(i) Most candidates were able to construct an acceptable scale on the y-axis. A non-linear scale consisting of resistance values from the table at regular intervals scored 0 for the graph. Most candidates also plotted correctly but many failed to draw an acceptable smooth curve. On this occasion the curve was only assessed between 4 W and 24 W and was allowed to deviate from one point by more than the usual tolerance of < 1 small square. This was usually for the point relating to a power of 8 or 12 W.

(ii) Despite the unit of kΩ appearing in the table and on the graph, very few candidates took this into account when stating their answer for the resistance at 10 W. So answers such as 2.4 etc were usually seen.

(iii) The question asked for values from the table to be considered. If none were included in the answer then no marks were awarded. It also asked '…to what extent…..' so both sides of the argument needed to be presented otherwise a maximum of 1 mark was possible. Many candidates achieved one mark. A minority of candidates achieved full marks and some even recognised that the suggestion was only true once powers exceeded 8 W. This was not demanded by the marking scheme but pleasing to see none the less. A concluding statement about the validity of the suggestion is required if full marks is to be awarded.

(c) MM – 1.7
This was a straightforward calculation. Few candidates scored all 3 marks. Nearly all candidates selected the correct equation but some manipulated incorrectly, so equations such as R = VI or R = I/V were seen. There were also errors in conversion of 0.35 mA into A, incorrect substitution, and some decided to use $P = I^2R$. No values of power were given in the question so

2.8 V was substituted instead. Candidates need to take notice of units of values they substitute into equations. There was even use of $R_T = R_1 + R_2$.

Q2. (a) MM – 2.5
Candidates scored well on this question. However a common distractor selected was 'Surface waves travel the fastest'.

(b)(i) and (ii) MM – 3.8

(i) Given the odd nature of the scale then information about the value of each small square on the y-axis was given to candidates in bold print. They obviously took notice of this and most candidates earned both marks here. However not all candidates appear to know that a minute consists of 60 seconds. Answers of 6 min 87 s and 6 min 66 s were seen. Also in part II, sometimes workings were shown and the following error was seen;

15 min – 8 min 20 s = 7 min 40 s

(ii) Candidates had a lot of information to deal with here. Once they had worked out the time difference they had to relate back to the graph to find the corresponding distance. This was not a straightforward task. However many earned the full 3 marks on offer. Occasionally, the arrival time of P waves was stated as later than the given arrival time of S waves and in this instance neither of the first 2 marks were awarded.

(iii) MM – 2.0
It is pleasing to note that nearly all candidates used a compass to answer this question. They were required to extract information from the table on the previous page, then use the scale to draw circles around each of the 3 seismic monitoring stations. Many candidates produced superb diagrams with 3 circles drawn, identifying the location of the epicentre with great accuracy. Others used 2 circles only, namely centred around MC and BH, but failed to identify which crossing point was the epicentre so lost a mark.

Q3. (a) MM – 2.4

Many candidates used the data to arrive at a correct answer.

Somecandidatesmanaged to select the right equation from page 2 but then wrote it down as D = V/M. Other errors were substituting a volume of 40 or 48 cm^3 into the equation. Sometimes a volume of 88 cm^3 was substituted, obtained by adding 40 and 48.

(a) MM – 0.4

A majority of candidates achieved a mark here for describing a method of submerging the floating object. However few went on to successfully describe how the volume of the item used to sink the object was taken into account.

Some candidates just described a method that would be used for an object that didn't float. Others stated measure length, breadth and height, and then calculate the volume.

Some of the suggested methods were; burn it, add acid to it, cut it up, hammer it into shape, bury it in sand, melt it, use a different less dense liquid, place it in gas, make a model out of clay which will sink in water, fill the shape with water and measure how much is needed, change the density of the solid.

(b) MM – 0.6

A minority of candidates gained any credit here. This was mainly for stating that particles in a solid are closer than those in a liquid. Area was confused with volume so statements such as 'there are more particles in an area in a solid' were evident. Some candidates described how the density difference was due to free electrons in solids.

Q4. (a) MM – 0.5

A minority of candidates gave credit worthy responses. There was confusion between ring mains and lighting circuits. Many references to safety e.g a circuit breaker can switch circuit off or there is an earth wire.

(b) MM – 1.0

The most credit awarded was due to stating the name of one or other of the safety devices. Both devices were named buy a minority of candidates and even less could provide an explanation for their choices.

(c) MM – 0.6

Answers were expected to refer to both metal and plastic cased appliances. This was too often not the case. Some candidates spoke about conduction of heat.

Q5. (a) MM – 1.1

(i) A minority of candidates added two or more satellites and extra base station(s). Most candidates added one satellite to the diagram. Their signals predictably passed through the Earth. Others added signals leaving A that followed a curved path around the Earth to arrive at B. Then there were examples of two satellites in orbit that sent signals from one to the other.

(ii) Few candidates could provide an explanation. There were lots of references to a geostationary satellite remaining in one place rather than above one place. This may be due to poor expression or a lack of understanding.

(b) MM – 1.6

Only a small minority arrived at the correct answer. Others made one or more of the following errors:

- Incorrect conversions
- Incorrect manipulation (time = distance x speed)
- Use of 2.8 cm
- Use of the wave equation
- Failure to double the distance between Earth and the satellite.

Depending on the error(s) made, candidates were still able to obtain 2 or 3 marks.

Q6. (a) MM – 1.5

The question asked to explain changes in temperature and state in terms of the behaviour of molecules. A minority of candidates explained about how molecular KE increases with temperature and that bonds are broken when the state changes. Some even explained that the line DE was longer than BC because more bonds needed to be broken to change from water to steam so requiring more energy. However for the majority this was not the case. The question was ignored and descriptions of the graph were given which referred to temperature changes and state changes without any reference to molecules.

Misconceptions included:

- Point A was absolute zero
- Ice started to melt at C
- Ice continues to melt along CD
- Water boils along EF

(b) MM – 2.5

(i) Few candidates gave a full explanation. Often, a reference to constant temperature was omitted.

(ii) Correct answers were in evidence but unfortunately in a minority of cases.

This multi-stage calculation meant that errors cropped up in all stages. These were allowed for in the marking scheme. Common errors were:

- Confusion between when to use *c* or *L*
- Failure to convert 800 g to 0.8 kg
- Using a change in temperature other than 23 K
- Completing one stage of the calculation only
- Subtracting rather than adding both their answers for energy values.

Q7. (a) MM – 0.6

The vast majority of candidates wrote at length but only a small minority of candidates interacted with the information successfully to earn credit. Some excellent responses were seen which linked information from both graphs to interrogate the claim. A concluding statement regarding the validity of the claim was required for full marks.

The following errors were evident:

- The graphs were ignored and references to people getting up in the morning and returning from work in the evening requiring extra supply of electrical power. It was even claimed that wind speed increased because people were getting up.
- Failure to make a connection between wind speed in graph 2 with power output in graph 1

- Stating that graph 1 shows that wind power takes time to start up
- Stating that graph 1 did not support the claim because it did not show times
- Assumption that any wind speed shown in graph 2 would provide the required the back up
- Descriptions of wind speeds outside the times stated in the question
- Interpreting graph 1 incorrectly and concluding that wind speed is greater than power demand.

(b) MM – 2.0
A minority of candidates completed both calculations correctly.
There were errors in:

- manipulation of equations, in particular the transformer equation
- converting between units
- substitution into equations, again in particular with the transformer equation
- use of an incorrect equation. Some candidates decided to use I=V/R. They continued to substitute a power value (24 MW) for voltage and a voltage value (192 kV) for resistance. This failed to gain a mark even though the correct answer would have been the outcome.

(c) (i) MM – 1.5
The majority of candidates scored well here with many of them gaining 3 marks. However candidates were often prevented from gaining credit by carelessness. For example, they referred to transformers increasing or decreasing voltage without using the term step up and step down. Also misconceptions were present and included the idea that a step up transformer increases current, and that transformers prevent energy loss rather than reduce it.

(ii) MM – 0.4
Some excellent responses were in evidence but these were in the minority.

Most candidates failed to earn a mark because of statements such as:

- the iron passes voltage (or current) from the primary to the secondary coil
- the iron core produces a magnetic field (rather than strengthens it)
- the iron core is laminated to prevent electric shock
- it is laminated to stop heat loss

PHYSICS

GCSE (NEW)

Summer 2018

PHYSICS UNIT 2 FOUNDATION

The candidature for this paper is from those who choose to study physics as an option in most cases and should represent the lesser able of a group of motivated students. The outcomes suggest otherwise with a mean for the paper that is approaching the 50% mark. The performance on any one question was never good, as borne out by the facility factor never achieving 70% but it was the questions in the middle of the paper that proved to be most accessible. There were many examples of glaring errors and more still of candidates just not reading the questions carefully. Having said that, sterling work is being done on basic mathematics and graph drawing in particular but command of language in examples where extended written responses are required demonstrate the need for greater work to be done. Candidates do not like QER questions still but there are many other instances where language is used in answering questions and evidence shows that candidates do not keep to the subject of the question in many cases.

Question 1
This was about as straightforward as any question can get on the topic of spectra and red shift, demanding the choice of 3 correct statements out of 6. It is remarkable that some manage to choose all three wrong answers, but more frustrating that so many do not tick three boxes as per the instruction.

Question 2
Part (a) was usually well done but (b)(i) threw up answers ranging from 1 to 236 with the majority of answers being wrong. Confusion continues over the role of control rods and of the moderator in nuclear reactors.

Question 3
"Alpha particles don't have a shell" –or the converse were common unacceptable answers to part (i).

Many candidates failed to correctly subtract 4 from 210 and 2 from 84 to get 2 marks in part (ii) but in part (iii) many knew why a particular isotope is radioactive.

In answer to part (iv) – as has often happened in the past, candidates fail to clarify whether they are referring to the properties of alpha particles or the source in their answer and sadly the implication is often that it is the source that ionises atoms etc.

Question 4
It is pleasing to see that virtually all candidates now have access to a ruler in examinations and that they use them to draw straight lines. The graph was usually well constructed though too many included the anomalous point the construction of their line. Part (b) was generally well answered but that was not the case in part (c).

Question 5
The disappointing answers in this question generally centred around the poor use of language in answer to (a)(iii) in which examples of overwriting created contradictions. Part (b) was very well answered (for just 2 marks)

Question 6
Kinetic was the accepted answer to (a)(i) in a variety of spellings.

Regrettably for (a)(ii) many candidates wanted to manipulate and perform some mathematical calculation based on 127 500 to give their answer, on occasion that which was required for part (b)(i) despite the lack of space for working to be carried out. Virtually all candidates could answer (b)(ii)I correctly but very few could state the physical principles behind the feature. Meaningless phrases such as: “To absorb the impact” abounded.

Question 7
There were many good answers to 7(a) along with many of those who thought that it was a distance – time graph. Even the best answers failed to identify the finer aspects of the curved line or the differences in slopes of the straight lines.

The change in momentum was often calculated correctly in (b)(i) but for their answer to (b)(ii), many reverted to calculating the acceleration as a means of getting the force rather than from the rate of change of momentum principle.

Part (b)(iii) was often poorly answered because of the failure to identify the time interval between points B and C on the graph correctly. The answers to (b)(iv) usually referred to aspects of motion rather than to the effects that they would have **on the line on the graph**. Part (c) was poorly answered.

Question 8
In part (a), candidates demonstrated their confusion between reproducibility and repeatable. Part (b) was invariably correct but when answering part (c), many candidates failed to exclude their identified anomalous value from their calculation of the mean but still picked up one mark.

There was less than a 50% pass rate on part (d) which should have not been seen as a problem for those who have carried out a lot of exercises on equations of motion.

Question 9
A disappointingly small number of candidates could interrogate the data in the table to correctly choose the two correct statements from the list and in (a)(ii) again there was a lot of contradiction and misinterpretation of the data in answering the question. “The star is at the same temperature **as Earth**” was seen more than once for example. The exoplanet was referred to as the star in too many answers to (b(i) but (b)(ii)I was often answered correctly. inaccurate use of language was often the reason for not picking up the mark in (b)(ii)II and answers to the last part of (b)(ii) were invariably poor.

Part (c)(i) showed up many candidates as not knowing that Venus is not the nearest planet to the Sun and many more failed to clearly demonstrate that a comparison was being made. In the past part there was plenty of evidence of candidates taking a graph reading from the abscissa value at about 7 units squares past the 40 value instead of interpolating correctly between the 40 and 60 unit values on the scale.

PHYSICS

GCSE (NEW)

Summer 2018

PHYSICS UNIT 2 HIGHER

General comments:
This was the first examination of the new specification. The higher paper attracted an entry of just under 85% of the total entry for Physics Unit 2. This shows an increase in numbers when compared with the equivalent higher entry for Physics Unit 1 that candidates would have completed the previous year.

Traditionally high ability students would have opted for this separate award in Physics, however it was clear that students of varying ability had elected to study this qualification. The statistics show that most of the questions were attempted by a high percentage of candidates. The only questions to fall below a 95% attempt rate were Q6 and Q7. Their attempt rate was 91% and 93% respectively.

There was an obvious trend that the last parts of each question was most likely not to be attempted. This may be due to candidates believing that the more demanding or difficult parts of a question always features at the end. This was not necessarily true and many accessible marks may have been missed. Understandably, the performance of candidates varied from question to question. It was evident that questions 4(b), 5(a) and 7(b) were the least accessible sections on the paper. However, there were many candidates who performed very well on these questions. They displayed high levels of knowledge, were confident applying their problem solving skills and were numerically competent. Unfortunately, in some numerical questions there were candidates who failed to show their workings or incorrectly rounded up or down their final answer.

The question paper examined all sections of the specification. It was pleasing to observe candidates accessing all of the questions and evidence suggested that the materials had been delivered thoroughly by schools.

Specific comments:

Q1. (a) Generally well answered. Quite a few candidates failed to explain how the data would be identified as being reproducible.

(b) The majority of candidates gained the mark for identifying the anomaly. However, a small minority missed out the question. It was assumed that they had not seen it.

(c) Completed to a high standard by candidates. It was most pleasing to note that the majority of candidates ignored the anomaly in their mean calculation.

(d) Well answered by the majority of candidates. The initial velocity of 0m/s was successfully identified and correctly substituted into the equation

Q2. (a) (i) Occasionally candidates used more or less than two ticks.

(ii) Candidates selected and used data from the table to successfully answer this question. However, some candidates failed to include two reasons as instructed.

Q2. (b) (i) Well answered by the majority of candidates.

(ii) (I) Candidates interacted with the graph well and identified the orbit time of the exoplanet.

(II) The anomaly was identified correctly by the majority of candidates. However, some struggled with describing its position on the graph.

(III) Many candidates found this part difficult. Very few candidates gained full marks.

Many showed confusion between absorption and emission spectra.

(c) (i) The majority of candidates identified a correct trend but failed to interact with the question effectively as they failed to compare as instructed.

(ii) Well answered. It was encouraging to see some candidates using construction lines on the graph to help the process of reading from the orbit radius axis. There was a small minority who neglected to complete the missing section in the table. Candidates should be encouraged to use any spare time in the examination to check that they haven't missed out parts of a question.

Q3. (a) Well answered. A minority of candidates lacked detail in their answer by saying "less electrons" in the alpha particle. This answer was not worthy of credit.

(b) (i) A minority of students failed to obtain marks on this question part as they had confused nucleon and proton number. It was generally well answered.

(ii) Usually correctly identified.

Q4. (a) Some candidates failed to attempt an acceleration calculation and frequently quoted acceleration values of 25, 30 or 190. These numbers were clearly extracted from the graph and were incorrect. If there was not any evidence that candidates were attempting to calculate an acceleration then zero marks were awarded, even if they then went on to use Newton's Second Law. Many candidates showed confidence with this multi-stage calculation and obtained the correct answer.

(b) Candidates struggled with answering this part. They failed to state how the graph would be different.

(c) (i) Candidates lost marks as they neglected to use the word "resultant" in their answer. Many would say that the force was zero. Many didn't state the object moves at constant velocity or is stationary. Both facts were needed for the mark.

(ii) Generally candidates successfully made the link between (i) and (ii), correctly identifying the bus was moving at constant velocity. Not many explained that the resultant force on the bus was zero.

(c) A variety of correct methods were used by candidates to answer this part.

Candidates showed confidence in applying numerical skills to the graph. This was pleasing to observe and should be celebrated by teachers.

(d) Those candidates who attempted this part gained some credit even though they may not have been able to fully complete their answer. Many candidates seemed to enjoy the challenge of the question, obtaining full marks. A very small minority calculated the correct velocity but forgot to add the line to the graph.

Q5. (a) (i) Many candidates failed to mention that radioactive decay is a random process, just like dice throwing. The importance of using a large number of dice to reduce the effect of random variations was rarely mentioned.

(iii) Answered well by candidates. There were a minority of candidates who failed to follow the instruction of ticking three statements. Sometimes there were more than three ticked, sometimes fewer.

(iv) (I) Most candidates failed to identify that the blue cubes could represent the presence of a non-radioactive material.

(II) Many candidates suggested that the gradient would change rather than the line being 20 dice higher.

(b) (i) The majority of candidates showed a secure understanding of half-life and were able to apply their knowledge to correctly calculate the mass remaining. Most candidates were confident quoting their answer to 1 significant figure.

(ii) This part was poorly answered by candidates. Most neglected to identify that the gamma and beta interact differently with the lead. Candidates frequently stated that the lead would completely stop both gamma and beta radiation.

Q6. (a) The QER produced a mean mark of 2.3 out of 6. It was encouraging that the majority of candidates attempted this question and displayed basic knowledge of both fusion and fission. Many candidates lost marks as they failed to compare the two reactions as instructed in the stem of the question.

(b) Many candidates were able to apply their problem-solving skills to this question. Some candidates struggled with converting the ‘multiplier’ or failed to correctly round their final answer.

Q7. (a) (i) Candidates scored highly plotting the data on the graph.

(ii) Only a few candidates incorrectly stated the unstretched length of the spring.

(b) (i) It was pleasing that most candidates linked the area under the graph to the work done stretching the spring. Some then struggled with calculating the area of the triangle. Others decided to ignore the multiplier, linked to extension, in their calculation. Most students correctly stated the units of work done.

(ii) Many candidates failed to make the link between kinetic energy and work done. This limited their attainment in this question. Some candidates correctly calculated the launch velocity and then forgot to state if the design would meet the safety guideline.

(iii) Many candidates mis-interpreted the question and gave answers linked to the plane whilst in flight.

(v) ome candidates realised that momentum accounted for both mass and velocity. Many candidates did not make this link and this limited their attainment.

PHYSICS

GCSE (NEW)

Summer 2018

PHYSICS PRACTICAL

General observations:
It was pleasing that there was a good spread of marks with the vast majority of candidates attempting most questions. Some positive achievement was seen from pupils across all qualifications and abilities

However, the use of correct scientific, descriptive or comparative language was very poor in many answers.

Section A

Risk Assessment

- Nature of the hazard was not clearly identified (*e.g.* Hot apparatus **can burn**)
- Risk often lacked an action (*e.g.* Acid splashes on skin **whilst pouring into beaker**)
- The control measure was often well answered, but candidates did not get credit for this unless the risk was also correct.

Table of results

- Lots of positive achievement seen with the majority of tables well-structured and logically organised.
- Candidates tended to lose marks for incorrect units or putting units in the body of the table.
- Unclear headings or use of vague terms (*e.g.* ***Amount*** of hydrogen peroxide) were another source of marks lost
- Means were generally calculated well. However, pupils should be encouraged to check that values are sensible and not larger than the values that they are calculated from.

Section B

Graphs

- Many candidates were able to plot graphs correctly, although lines of best fit were often poor. However, it was all too common to see poorly chosen scales that resulted in incorrect plotting and incorrect readings from the graph.
- While candidates should be encouraged to use at least half of the graph paper, the scale should be sensible and linear.
- A significant minority of candidates continue to use overly large dots to plot points, which led to the loss of marks in some cases as plotting accuracy, could not be determined.
- Most candidates were able to correctly link the two variables from the graph. However, they were less able to correctly describe the correct numerical pattern. Many candidates assumed that any straight line indicated direct proportionality and did not understand that the line also had to pass through the origin.

Variables

- Generally, candidates are confident in identifying the independent and dependent variables in different investigations indicating that these terms are well understood.
- Control variables were not as well understood and answers often lacked detail in explaining how they were controlled.
- Range - most candidates were able to correctly state the range of either the independent or dependent variable. However a significant minority simply stated all values of the variable.

Instrumentation

- When describing how to control variables or when discussing improvements to the experiment, most candidates failed to correctly name appropriate measuring instruments.
- In most cases, the term resolution was not well understood. Candidates were very poor at stating the resolution of a particular piece of apparatus. They also used vague terms when discussing improvements rather than considering the resolution of apparatus used. Many candidates simply stated, "use more accurate or precise apparatus" and showed no understanding of the meaning of these terms.

Evaluation of quality of data

- Although many candidates seemed to have an understanding of the meaning of repeatability, they were unable to clearly link to their own or given data.
- Similarly, reproducibility was poorly explained.
- The terms accuracy and precision were very poorly understood.

Comments on specific tasks

Investigating the path of light through a glass block

This practical was specific to the separate physics qualification; many candidates demonstrated very good practical skills producing excellent outcomes.

Section A

The hypothesis and results table were almost always well-done. Some candidates failed to identify the hazard in the risk assessment, talking mainly about broken glass.

Section B

Most candidates scored highly in parts (a), (b), (c) and (d) with the exception of identifying a controlled variable.

In part (e), where students had to describe the relationship between the variables it was common to see students not attaining the second mark for the quantitative analysis.

Many candidates produced good answers in (f) although those that merely stated that you should make sure the block does not move did not gain credit. It is worth noting that a generic 'do it better than before' answer is not creditworthy and they should be considering changes to apparatus to improve the accuracy of the method.

With the exception of spotting the anomaly in (ii), (g) was poorly done by most candidates and the consideration of the spread of data was almost always lacking, as was the understanding of direct proportionality. Omitting the anomalous result to calculate an accurate mean was missed by many. Very few candidates attained marks in (iv) with explanations of accuracy and precision lacking any real understanding.

Investigating the resistance of a thermistor

Thermistor task

This proved to be a very popular task for both the Science (double award) and the separate physics qualifications and the method was successfully carried out by the majority of candidates.

Section A

In line with other tasks the risk assessment was often poorly done. Similarly, the table in section A proved challenging and it was common to see 'amps' or 'volts' used as column headings. Many candidates failed to record their measurements to the resolution of the ammeter or voltmeter.

Section B

(a) This considered the variables in the experiment. Identifying the dependent and control variables in this experiment proved problematic and very few candidates were able to demonstrate an understanding of the term resolution.

(b) The data handling was often well-done although a poor understanding of rounding often led to candidates losing a mark in (ii).

(c) The main issue with the graph was the scaling and it was very common to see decreasing values on the x axis. The quality of candidates' curves was very poor.

(d) This was generally well done but the evaluation of the results in part (e) to make a judgement was lost on most candidates and most answers did not reference the non-linear nature of the data.

(f) and (g) These considered improvements to the method and ways to extend the experiment. Neither of these sections was answered well and candidates were often very vague.

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk