Year 11 ATAR Physics 2020 Mid Year Examiners Comments
Average = 69.5 %

Note to all students:

1. After returning your examination papers you will be given an opportunity to read through your paper and the marks scheme.
2. Your teacher will go through the marks scheme and the information contained within these notes with you.
3. Your teacher will then be happy to discuss any concerns you may have about your individual paper.
4. You will also receive a slip before the end of week 1 Term 4 showing you your recorded marks for the year. Please check and report any discrepancy immediately bringing in any assessment for rechecking.

Please note;

- It is expected that you will approach your teacher in a respectful manner. Please think carefully about how you will word your queries and the tone of voice you use.
- If there has been an oversight in the provision or summing of marks, it will be rectified, however, your teachers do not intend to haggle over marks with you.
- Please check the marking key and markers notes carefully. Important opportunities for improvement can be gained by carefully reading your response and assessing **why** you were not awarded full marks, rather than just assuming that what you had written was sufficient, but incorrectly marked. Your teacher will be happy to help you reach this understanding.
- Choice of words, particularly in definitions is important. One incorrect/inappropriate word can completely change the meaning of a definition or a statement and will mean full marks cannot be awarded.
- If a marker was unable to read handwriting or make sense of the logic the candidate has used in answering a question, marks will not be awarded upon further explanation as would be the case in your WACE Exam. **Make your writing and working out legible**

All queries regarding marks must be finalised by:

3.10 pm Wednesday 24th June.

Please do not approach your teachers during tutorial time, if there is not time in a lesson to address your concerns, you will need to make an appointment out of class time to see your teacher. Throughout the paper;

- Make sure you read the questions carefully and ensure your answer matches the question asked. Be especially careful if the question asks for something specific to be shown in your answer.
- You must ensure that you work is well set out so that the examiner can follow your thinking/reasoning when answering questions. Poor setting out make it difficult to mark to see where you are entitled to marks.
- Your handwriting needs to be legible; Small, cursive handwriting poses a problem. If it can't be read it can't be marked - no excuses.
- Always check that you have included units with any calculation (including part calculations used in the next step).
- Remember that the fundamental units are metre (m) for length, kilogram (kg) for mass and seconds (s) for time. Other units should not be used unless you are asked for answers to be specified as such eg. How many hours etc.
- Vector quantities should always have a direction unless you are asked only for the magnitude of the quantity.
- You must use the correct symbols for quantities and for prefixes. For example, Mega is 'M' and milli is 'm', there is a significant difference between the two! Similarly, 'Q' is the quantity of energy in heat equations whereas 'q' is charge, 'F' is force and 'f' is frequency. Check your data and formulae sheet for the correct symbols and prefixes. If you do not use the appropriate symbols you are incorrect, or being careless and will be penalised.
- For graphs, the variables are written as "y vs x". Ensure that they are placed on the correct axis, as the determined gradient will be inversed. Remember all graphs need a title.

Section 1 – Short Answer

Q1 (a) A variety of incorrect responses were received for this. The most common issue was failing to realise that you must express your answer to one more decimal place than what the scale shows, i.e. for this question you should express the height to 2 d.p. There were also several students misreading the ruler and specificying their height without units.

Q1(b) Very few people lost the mark on this question.

Q2 Most students were able to answer this correctly, or at least receive the majority of marks. The common error was forgetting to include the glass as the third substance.

Q3 While the majority found this question easy, an alarming number of students are still making very basic errors, particularly with part (b). The sum of both Atomic numbers and Mass numbers must be equal on both sides of the arrow. Students who did not get this correct should have approached their teachers for help on this subject many moons ago.

Q4 The question exposed a complete lack of understanding of electrical theory, and the meaning of voltage and current, for many students whose explanations were non – sensical. Most students who did have an understanding of theory did not score full marks however, as they failed to explain that placing an ammeter in parallel allows for an alternative path through which current can flow, which therefore allows for a short circuit to occur (a path of effectively no resistance). They merely explained the relationship between resistance and current. Using the term “short circuit” without any explanation of what that meant, was not sufficient.

Q5 This question was generally well answered by most. The most common error was some students forgot to include the mass of electrons when calculating the mass defect. The atomic mass given includes electrons (it is not the mass of the nucleus on its own), hence you needed to include electrons in the mass of components. A few students are still expressing answers to too many significant figures. To calculate binding energy, you multiply by the rounded figure of 931, hence your number must be rounded to 3 s.f.

Q6 It was disappointing to see many students appeared to be guessing in this question and it showed a distinct lack of understanding of the various types of radiation.

Q7 Again, well answered by the majority. Most students were able to correctly calculate the number of half lives, but several fell short of then using the decay equation to find the remaining percentage of sample. As no initial quantity was given, you are either solving for N/N_0 as a ratio, or simply enter $N_0 = 100$.

Q8 (a) Poorly answered by many and very little working was shown either as evidence of problem solving. This was an example of simple dimensional analysis. Rather than guessing at an answer, you need to break down the units given. [mA] is current, [h] is time. Hence [mAh] refers to current x time. By cross referencing with your data sheet, you can easily work out what quantity it is refering to.

Q8 (b) Many students were not able to solve this one. There were 3 possible pathways to a solution, proving that problem solving is an important skill in Physics! List the quantities known and work your way from there deciding which equation to use. Do not make up equations. Efficiency can be a ratio of Input/Output Energy or Input/Output Power. For most students solving for Energy, the two routes of solving were E=qV where q = I*t or E=P*t where P=VI. Surprisingly a large number of students solved for q (charge) and then set this equal to energy which is dimensionally absurd. Perhaps a confusion between q used in Electrical Physics and Q used in Thermal Physics.

Q9 (a) For the coconut oil to melt from its initial state, you needed to look at the energy used up in the first and second (flat) section of the graph. Some students interpreted this as the melting phase (i.e. flat section) only. This was not penalised as the question could have been clearer.

Q9 (b) What was disappointing in this question was how few students actually showed full working including lines on their graph to allow for their work to be followed. You should be doing this as a matter of course. Many students have now mastered the art of analysing gradients and equating

them to solve for variables. Some of you still need to do some work in this area (refer to SIS revision resources). You should have been analysing the third section of graph here which represents the liquid state. Any two points would have allowed for the calculation of gradient.

Q10 This question has a lot to it for 3 marks. Many responses had some great physics in them but failed to address all parts of the question. The marking key breaks down the required components of the answer in detail. All 3 parts needed to be addressed for full marks, however there were different ways of addressing this. As long as it was sound physics and relevant, marks were awarded. The level of detail required was not particularly high however, owing to the amount of content covered (i.e. there was no expectations of detailed definitions etc)

Section 2 – Problem Solving

Question11(a):
Most students calculated the answer properly but were only awarded 1.5 marks as they had provided the answer to 2SF. All values in the question are provided to 3SF and therefore the answer should be provided to 3SF

Question 11(b)
A number of students calculated the charge incorrectly by finding the total charge of the battery which is 5000C. The question asked for the electrons per second rather than the total number of electrons. However, students were awarded follow through marks if this were the case. Again, the answer needed to be provided to 3SF and a number of students lost half a mark for providing 1SF only.

Question 11(c)
This question was generally well done. There were several methods but the majority of students received full marks.

Question 11(d)
There were several ways to solve this question. A number of students used their incorrect answer from part (b) but were awarded full marks as their method was correct. Remember to include euqations in working as several students failed to do so.

Question 12(a)
Generally well done. A common mistake was to consider the 1 ohm and 3.3. ohm resistors as parallel to each other rather than add them together as per a series circuit. In general, 1 mistake meant 1 mark off.

Question 12(b)
If the working was correct but the resistance was wrong from part (a) then full marks were awarded. 2.09A or 2.10A were accepted because of rounding from part (a). 3SF was needed for full marks.

Question 12(c)
At lot of students have misconceptions here and the language used was often not accurate. Regarding the second point in the marking key, any reasonable explanation was accepted but it should have referenced the resistance and current or voltage. Many students mis-interpretted the question and answered it with reference to part (b)

Question 12(d)
There were many different ways to answer this question. If incorrect figures were used from mistakes made previously then full marks were awarded. Marks were commonly deducted for not showing formulas or working. Furthermore, the current reading needed to be provided to 3SF. A number of students used working different to that shown in the solution which was awarded full marks if it was correct.

Question 13(a)
Most students who lost marks here did so for incorrect SF or incorrect scientific notation.

Question 13(b)
This expression must have included the worded terms to be awarded the mark.

Question 13(c)
A common mistake here was for students to use a SHC of 2100 rather than 4180 or not convert grams to Kg correctly. Each mistake was therefore worth a mark. Students also were often deducted a mark for not including full working which was often the first line shown in the marking key. Some students also used the incorrect units ($Jkg^{-1}K^{-1}$) which was a half mark deduction.

Question 13 (d)
Students need to remember how to calculate the percentage error beause a large proportion continue to get this wrong. The equation and working must be included as well as the answer to be provided with full marks. If the wrong values were used from previous questions but the working was correct, full marks were awarded.

Question 13 (e)
There were many reasonable answers here and the language varied between answer. However, students needed to be clear about what they meant and how the latent heat would be affected.

Question 14 (a)
The line of best fit was not entirely linear. The first part was linear where the filament was acting as an ohmic resistor. After that it became a curve. Students were awarded half a mark if the linear section was completed correctly.

Question 14 (c)
The question asked students to use the gradient and so you therefore need to calculate the gradient, show the relationship between gradient and resistance and then calculate resistance. Gradient also has units which needed to be included. There were a range of answers shown but as long as the working was correct, full marks were awarded.

Question 14 (d)
Students often did not provided the equation. The marker accepted either 1 or 2 or 3 SF depending on which values were used.

Question 14 (e)
Generally well done.

Question 15 (a)
Common mistakes included provided values to the incorrect precision.

Question 15 (b)
A large proportion of students did not include a title for their table. Furthermore, a number of students did not plot all of the data points and therefore lost marks.

Question 15 (c)
The half life needed to be determined using the graph rather than using the equation. A number of students missed the mark associated with the lines drawn on the graph.

Question 15 (d)
Students lost marks for not including the equation, not putting the information in their calculator correctly or not converting their prefix properly.

Question 15 (e)
A number students showed an alpha decay rather than a beta minus decay and therefore lost the marks. Students who did not put an anti-neutrino were deducted half a mark.

Question 15 (f)
A common mistake was to use the energy per event rather than multiply that value with the total number of events.

Question 15 (g)
A mark was associated with the equation in this question so a number students did not receive this mark as their failed to provide the equation. Those who lost marks for an alpha decay in part (e) were awarded full marks for using a quality factor of 20. A number of students lost marks for an incorrect number of SF.

Section 3 - Comprehension

Q16(a) Generally done very well, marks were lost for missing either the neutrinos (minus 0.5marks each) or missing charges on the Beta (minus 0.5 marks each)

Q16(b) Almost everyone got this right, marks were generally only lost for incorrect significant figures (minus 0.5 marks). No marks taken off if in/not int scientific notation.

Q16(c) Done poorly with many students believing that the differnence in mass is due to mass defect/E=MC^2. Students needed to mention decay series and Np239 decaying into Pu-239 for marks

Q16(d) Mostly done well with marks lost for incorrect significant figures (minus 0.5 marks). If a studet used correct formula DH=P/M but used incorrect value for with Power or Mass, they still received 1 mark.

Q16(e) Some students used correct formula but an incorrect value (usually energy/event), this received 2 marks. Some students had answer as 9.50 not 9.49. This was awarded full marks as has correct significant figures but a minor error in rounding. Finally, significan figure mistakes were minus 0.5 marks

Q16(f) Follow on marks (full marks) awarded to wrong answer due to using an incorrect Decay Heat form 16d. If value of Decay Heat used was altogether wrong but calculations correct then 2 marks. 80,300 accepted for full marks, significant error -0.5 marks.

Q16(g) Students had to mention Criticality for 1 mark otherwise one mark each awarded (up to total marks) for

- Capturing fast neitrons
- Too mark energy oer event
- Rarity/cost of Pu-239
- Too many neutrons emitted

Q16(h) Done well although many students did not mention Surface Area/Volume ratio – needed for one mark.