GCSE EXAMINERS' REPORTS

GCSE
APPLIED SCIENCE (SINGLE AWARD)

SUMMER 2018

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APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2018

UNIT 1: SCIENCE IN THE MODERN WORLD: FOUNDATION TIER

There were approximately 500 entries for this tier paper. The majority of candidates attempted every question, however there was not a single question with a 100% attempt rate. Within attempted questions some sections were left blank. It was disappointing that so many attempted questions resulted in zero marks.

There is more information provided on the exam paper but there is an additional 15 minutes allowed for reading time. There is plenty of evidence to suggest that not all candidates use this to their advantage. Further development is needed to ensure candidates' scientific literacy. Candidates need to be able to evaluate which information is required for a question part.

Some questions ask candidates to evaluate whether a suggestion or claim is correct e.g. 4(d), 5(b)(v), 8(b)(i). A concluding statement about the validity of the claim is required for full marks.

Many candidates demonstrated gaps in their knowledge and understanding.

They have difficulty in:

- applying knowledge and understanding in novel situations.
- using equations and substituting values into them correctly.
- reading questions carefully and, consequently, missing information contained within the question. In some instances responses were irrelevant and earned no credit.
- interpreting data.
- giving clear explanations.

To address these issues, brief topic summaries should be provided up front supplemented by short, regular progress assessments that could be peer- marked. It is suggested that selected exam questions are incorporated into the teaching programme. These can be used to teach candidates how to read questions and how to identify key words, for example. Candidates should be encouraged to annotate the question paper, e.g. circle or underline key points in a question. It is advisable to practice questions requiring the skill of extracting numerical quantities for the given equations. Candidates would benefit from an emphasis on comparing the units of values with the property in an equation that they substitute into. It is advised that teachers use 'anonymous' past student papers for peer assessment or modelling answers, with references to the OER section of the WJEC website.

Questions

1. Mean mark – 1.1/5
   - (a) Hardly any candidates gained a mark here. The products from these reactions were not known.
   - (b) (i) Most candidates gave a correct answer here.
     (ii) Correct substitution was seen regularly but a significant minority of candidates calculated an incorrect answer. The mark was for the answer so these candidates scored zero.

2. Mean mark – 1.1/3

Despite this question having the highest facility factor, many candidates scored zero. The numbered statements need to be read and considered carefully before attempts are made at arranging them in order.

3. Mean mark – 3.3/11

(a) Knowledge of the Steady State theory was very poor.

(b) A minority of candidates correctly connected all features with their causes. It's not possible to describe the misconceptions of candidates since all possible combinations were seen.

(c) (i) Recall of the contents of, and order within the em spectrum was not very good. For example, X-rays appeared next to radio waves. A number of candidates thought sound waves and cosmic rays are regions of the em spectrum.

(ii) Again, as in (b), all possible combinations of underlining appeared. Candidates did not realise that whatever they chose in the second sentence, the opposite would apply in the third. It was rare to see more than a mark being awarded.

4. Mean mark – 2.1/11

About 3% of candidates did not attempt the question. It is unusual to note that these candidates made no attempt to tick a box in part (b).

(a) (i) Many candidates did not know the circuit symbol for a variable resistor.

(ii) Completion of the circuit diagram proved difficult for most. It was rare to award a mark. All the circuit symbols required were given in part (i). Some candidates redrew the same diagram.

(b) It was very rare for the correct selection of all three statements to be made. However most candidates gained 1 or 2 marks.

(c) (i) Most candidates calculated the correct value of resistance. However some thought R_2 meant R^2 and added 12 and 144.

(ii) Even when a correct answer of 24 Ω was obtained in (i) candidates still divided 6 by 12.

(d) Rare to see a correct response.

5. Mean mark – 3.3/10

(a) Responses covered the full range of marks. At the bottom of the range of marks some of the living things already in the food web were added to other boxes.

(b) (i) Many thought pondweed or algae was the energy source.

(ii)(iii)(iv) Just about all the animals listed in the table made appearances here. A minority of candidates earned more than a mark.

(iv) There was a mixed response. A minority of candidates answered correctly but the remainder thought the perch would be unaffected because they could still eat pike, otters or herons. These candidates obviously did not understand the significance of the arrows and ignored information in the table.

6. Mean mark – 1.0/9

About 11% of candidates did not attempt the question..

(a) Few marks were awarded here.

(b) Whenever a mark was awarded, it was usually in the bottom band and usually for describing trends. Some candidates thought that all three methods were decreasing over time because the total height of the bars was

decreasing. They appear not to have understood the significance of the coloured sections of each bar. Few candidates explained any environmental or economic benefits. Candidates often wrote at length, but lacked appropriate literacy skills.

7. Mean mark – 1.3/7

About 7% of candidates did not attempt the question.

(a) (i)(ii)(iii) Most candidates identified one or two compounds correctly.
(iv) Few candidates could state a suitable reason.

(b) Very poor responses here. Candidates demonstrated no knowledge of the method. There was confusion with hard/soft water so candidates suggested adding soap solution.

8. Mean mark – 2.3/19

About 7% of candidates did not attempt the question.

(a) (i) Most candidates correctly calculated the value of power.
(ii) The majority of candidates could add suitable scales. However there were examples where the y-axis scale increased from 0 to 1.8 then continued upwards decreasing to 0.6. This approach severely limited the marks awarded. Generally candidates failed to plot all the points accurately within tolerance. A smooth curve joining the points was rarely seen.
(iii) I. Most candidates could take an appropriate value from their graph.
II. A minority of candidates described that as the tilt angle increased the power increased and decreased but less stated the angle that coincided with peak power.

(b) (i) The value of actual power output was available in the table on page 16 and it was expected that the maximum value would be used. Few candidates did this. It was common to see a concluding statement about the validity of the claim without any calculations. This does not gain credit.
(ii) Very few successfully completed this calculation. Some candidates multiplied their previous answer by 5.

(c) Candidates could not suggest a suitable method.

(d) It was rare for a mark to be awarded in this part. Knowledge of reduction was very poor. It was disappointing that candidates failed to recall the symbol for carbon and the formula for carbon monoxide.

APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2018

UNIT 1: SCIENCE IN THE MODERN WORLD: HIGHER TIER

There were only 20 entries for this tier paper.
There was a 100% attempt rate for all questions except on question 3. Overall impressions were that performance on this paper was better than last year. However a few candidates found the demands of the paper too difficult and hence scored low total marks. These may have been better suited to the foundation tier paper.

There is more information provided on the exam paper but there is an additional 15 minutes allowed for reading time. Further development is needed to ensure candidates' scientific literacy Candidates need to be able to evaluate which information is required for a question part e.g. 2(a).

Many candidates demonstrated gaps in their knowledge and understanding.
e.g. question 3, 4(a)(ii).

Some questions ask candidates to evaluate whether a suggestion or claim is correct e.g. 1(b)(i) and 7(c). A concluding statement about the validity of the claim is required for full marks.

Questions

1. Mean mark – 9.7/19
    (a) Candidates responded well to this section of questions.
        (i) Nearly all candidates correctly calculated the value of power.
        (ii) Most candidates could add suitable scales. Generally candidates plotted all the points accurately within tolerance. A smooth curve of best fit joining the points was rarely seen.
        (iii) I. Most candidates could take an appropriate value from their graph.
        II Most candidates described that as the tilt angle increased the power increased and decreased but less stated the angle that coincided with peak power.
    (b) (i) The value of actual power output was available in the table on page 16 and it was expected that the maximum value would be used. A majority of candidates did this as well as including a concluding statement about the validity of the claim.
        (ii) A minority successfully completed this calculation.
    (c) Candidates could not suggest a suitable method.
    (d) It was rare for a mark to be awarded in this part. Knowledge of reduction was very poor. Candidates failed to complete this equation. Frequently C appeared in the left hand box when this was intended for a number.

2. Mean mark – 3.4/8
    (a) Most candidates described how the colouring helped to camouflage each type of frog from its predators. When done well, this enabled a mark in the middle band to be awarded. Few candidates explained this was due to natural

selection that was required for a top band mark. Some candidates described food sources at some length, which was irrelevant here.

(b) Most candidates earned credit here.

3. Mean mark – 1.0/10

This was the least-well answered question on the paper.

Candidates were able to recall little, or in most cases, any detail about Steady State theory, CMBR and absorption spectra.

4. Mean mark – 3.2/11

(a) (i) Most candidates recognised that the pike population would increase but few could explain why in a logical sequence of events.

(ii) The recall question set on the topic of eutrophication was not answered well by many candidates.

(b) Few candidates correctly identified the compound and hardly anyone wrote the chemical formula.

5. Mean mark – 2.0/5

(a) Few candidates earned any credit here. This was often due to incorrect state symbols i.e.

$$ZnSO_4(s) + H_2O\ (aq)$$

(b) The majority of candidates earned full marks for this calculation. However, the number of weeks in a year was not universally known, it ranged from 48 to 56.

6. Mean mark – 4.8/12

(a) (i) Most candidates identified the water sample correctly but could not always explain their choice.

(ii) Mostly correct answers seen.

(iii) It is doubtful that candidates knew that 1 dm^3 is equivalent to 1 000 cm^3. As a result they failed to arrive at a correct answer.

(b) Candidates generally interacted well with the number of solubility curves given in the graph.

(i) Candidates were required to relate information in the stem to the solubility curves. Most candidates did this successfully.

(ii) Again mostly correct answers seen.

(iii) Nearly all candidates recognised that solubility increases with temperature but few added at an increasing rate.

(iv) The mark was awarded for the reason and not just stating ‘No’. A minority of candidates could reason why.

(v) Again, a minority achieved credit. However some well laid out answers were evident which earned full marks.

7. Mean mark – 2.0

Circuitry is a topic that proving challenging for candidates from year to year. This is the case across all specifications.

(a) The properties of series and parallel circuits were not well known. Candidates also lacked the literacy skills to express themselves clearly. This sometimes prevented access to any marks.

(b) A minority of candidates added a voltmeter in parallel with R_2.

(c) Usually the only mark awarded was for calculating the total resistance in series. Sometimes the parallel resistance was also calculated but very few made attempts at calculating any values of current.

APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2018

UNIT 2: SCIENCE TO SUPPORT OUR LIFESTYLES: FOUNDATION TIER

This was the first sitting of this examination paper. The majority of candidates appeared to be appropriately entered for this tier. Although there was a significant minority who could not access and extract information from the longer question stems and more 'PISA-like' approach of the new style examination. Questions on topics common to the old specification seem to have been more accessible to candidates. This could be due to the availability of past questions.

Some general points that teachers need to be aware of when preparing candidates for these exams are:

- Candidates need to be aware of the different command words used in questions. Particularly the difference in what is expected by *'describe', 'compare'* and *'explain'.*
- Candidates need to be aware of the difference between the terms *'repeatability'* and 'r*eproducibility'* and that comments such as ‘do the experiment again’ does not gain credit without stating who does it again.
- QER: Punctuation, spelling and grammar caused problems for many candidates.

1. Mean mark - 1.3/4

Candidates commonly identified the elbow as a ball and socket joint and did not know that the skull was a fixed joint.

2. Mean mark - 5.9/10

Candidates found this the most accessible question on the paper. Candidates found the mathematical part of the question where they were asked to square a number the most challenging. It was common here for candidates to double the number rather than multiplying it by itself, or to leave it blank.

3. Mean mark - 3.2/6

Candidates again found this question accessible being on a topic that has been on the previous generation of science papers. Candidates scored well on part (a), with the most common error being to identify welsh speaking as being determined by genes. Part (b) was either answered very well or very badly.

4. Mean mark - 2.4/8

This question was based on one of the specified practicals. Most candidates could correctly identify the most effective antibiotic but very few could identify the anomalous result. They

also did not realise that repeatability is when a person who carries out the experiment does it again.

5. Mean mark - 1.2/7

Candidates found this the most challenging of the lower demand questions on the paper. The best answered parts were recognising the correct definition of half-life and the correct beta-decay equation. Very few could work out the half-life from the graph and subsequent calculation. In (c)(ii) candidates commonly answered that it would be 'poisonous' rather than the ionising/beta radiation present in the fish would be damaging to cells/DNA.

6. Mean mark- 2.0/8

Most candidates scored their marks from the graph although having one point off the perfect curve should not have prevented candidates attempting a best fit curve. Few candidates attempted (a)(iii) and (b).

7. Mean mark - 2.5/13

Parts (a) and (b) were badly answered with candidates failing to describe or extract values from what is a standard velocity:time graph. The QER was a compare and explain. The vast majority described the graphs and made some comparison, but only a very small minority used scientific knowledge to explain the differences.

8. Mean mark - 1.2/11

This was a common question with the higher tier paper. Candidates found this the most challenging question on the paper. It involved knowledge of catalysts and extracting information from text and tables. 20% of candidates made no attempt at any part of this question.

9. Mean mark 1.2/8

This question was also common with the higher tier paper. It again required candidates to extract information from tables and to draw conclusions. Approximately 14% of candidates did not attempt any part of this question. No candidate could state the difference of how a CAT scan is produced compared to a X-ray.

APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2018

UNIT 2: SCIENCE TO SUPPORT OUR LIFESTYLES: HIGHER TIER

This was the first sitting of this examination paper. 26 candidates were entered for this tier but the majority of candidates appeared to be appropriately entered. All candidates attempted every question.

Candidates need to be aware of the difference between the terms *'repeatability'* and 'r*eproducibility'* and that comments such as 'do the experiment again' does not gain credit without stating who does it again.

1. Mean mark - 4.3/11

This question was common with the foundation tier. Candidates could define what was meant by the term '*catalyst'* and identify the most effective catalyst, but had difficulty in identifying inaccuracies in the experimental procedure.

2. Mean mark - 3.2/8

This was the second question on the paper that was common with the foundation tier. The question required candidates to extract information from tables and to draw conclusions. Candidates generally could make correct conclusions but lost marks in their explanations. However, no candidate could state the difference in how a CAT scan is produced compared to a X-ray.

3. Mean mark - 4.0/8

Candidates generally answered this question well. It was pleasing to see that the vast majority made good attempts at the multi-stage calculation. A common problem was that candidates did not know the importance of the correct level of salt in the diet.

4. Mean mark - 2.8/5

This question had the highest facility factor. Candidates were generally able to carry out a genetic cross and many showed a good understanding of the ethical problems of a positive screen result.

5. Mean mark - 1.7/8

Candidates found this the most challenging question on the paper. Part (a) required the use of the definition of half-life to work out the number of half-lives and then convert to the number of years passed. Very few candidates were able to score any marks here. In part (b) candidates could correctly complete the left hand side of the equation but found it difficult to balance the equation. Part (c) was based on recall from the specification content and was disappointingly answered by most candidates.

6. Mean mark - 2.0/8

This question involved making calculations of acceleration and distance travelled from a velocity: time graph. In part (a) several candidates over-complicated calculating the mean acceleration by trying to work out the acceleration for the different slopes rather than just realising it was the change in velocity divided by time over the whole 10 s. In part (b) most candidates realised that they needed to work out the area under the graph but some tried to break it down into too many trapezoid strips (e.g. every 2 s) rather than into just the four regions which was the easiest approach. Part (c) involved taking their total distance from part (b) and dividing it by the total time. Again, candidates over-complicated the physics in their attempt to answer and this resulted in lost marks.

7. Mean mark - 4.3/15

Candidate's found the calculations in part (b) difficult although they were just based on proportion and percentages. Only a minority knew the reason that 'cases per 100 000' was used.

All candidates attempted the QER question, with the majority tending to be in the lower band. Very few candidates correctly explained antibody production from lymphocytes or the role of memory cells in providing immunity.

8. Mean mark - 3.3/12

Part (a) and (b) were generally well attempted but part (c) was poorly answered. Candidates did not know how to draw a tangent. The few candidates who attempted the tangent either did so incorrectly or did not know how to calculate of gradient from their line. Part (c)(ii) was generally well answered.

APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2018

UNIT 3: TASK BASED ASSESSMENT: FOUNDATION TIER

This was the first time that Unit 3, the task based assessment was available. There were 520 entries for this paper. The best facility factors were seen in the collecting and recording sections (Activity 1 – Task B), with a mean mark of 10.1/13. The lowest facility factors were seen in the evaluation section of Activity 2, with the mean mark being 1.2/5.

Pack A

Pack A Activity 1 Task A

Only a minority of candidates were able to state the independent variable as 'the type of LDR', and a significant minority were confused between all three types of variable. Generally, of those candidates who stated controlled variables, the 'same apparatus' was the most common correct response. Only a few candidates identified two controlled variables, with the 'same background light' being the most popular choice. Please note that 'amount' is not an acceptable term for any measured quantity.

The dependent variable in this case was the 'resistance of the LDR', which was given in the guidance to the candidates. Many candidates managed to identify this.

The vast majority of candidates were able to produce an equipment list and a simple method. The quality of the Methods produced by candidates was extremely variable. The examining team were particularly looking to see if the candidates were identifying a suitable way of measuring the dependent variable (the resistance), and that the suggested method would actually work in practice. This is where a significant number of candidates lost marks.

The quality of candidates' writing was assessed here. We were particularly looking for the correct use of the key terminology (keywords) for this method, and SPaG was assessed. Examiners were looking for the correct spelling of the scientific keywords and the correct, consistent use of capital letters and full stops. Centres are encouraged to remind candidates about this.

The risk assessment was the least successful part of the examination across all the packs, both higher and foundation and single and double award. Very few candidates at foundation tier level identified the nature of the hazards, such as 'the lamp is hot'; or risks with actions. For example, whilst many candidates could identify that the lamp is a hazard, they did not state that it is hot; and although they identified that it could produce a burn, very few identified that the burn would occur during handling the raybox. This ensures parity with the risk assessment elements of the other GCSE sciences.

Please note that when suggesting suitable protective equipment for handling hot objects 'heat proof' gloves are required, not just 'gloves'.

Candidates did have more success with identifying suitable control measures. Centres are strongly recommended to revisit this with their candidates.

Pack A Activity 1 Task B

The vast majority of candidates managed to take a decent set of repeatable results on this experiment. Most candidates were able to produce their own table, and tested both LDRs, repeated twice. Most candidates managed to include V or volts as the unit of voltage in the column header, but a significant proportion included the units as V in the rows of the table as well, which is not accepted.

Most candidates at foundation level did not include any units for resistance at all. The majority of candidates recorded their voltages and resistances with an inconsistent number of decimal places.

Pack A Activity 1 Task C

Most candidates were able to plot some form of graph, but many struggled to get a suitable (linear) scale covering more than half of the available plotting area. The majority were able to plot their points with an accuracy <1 small square, but few drew suitable (curved) best-fit lines, with most 'joining the dots'.

Many candidates were unable to complete the table identifying the mean lowest and highest resistances and then determine the range – considerable error carried forward was used here by the examining team.

Most candidates were able to suggest a 'best' LDR and many then gave a reason for this usually based on the highest or lowest resistances. Only some used the resistance ranges they had just calculated, despite the qualifier in the stem of the previous question. Very few candidates related the reason to the use. Most candidates were able to identify the resistance of B at 3 V.

Pack A Activity 1 Task D

Candidates have found the evaluation tasks quite hard, and it is clear that they need more support from centres prior to the exams.

Candidates were first asked to comment on the suitability of their method. This requires an answer (suitable or unsuitable) plus a plausible reason why. Many candidates were unable to give an answer, let alone a plausible reason.

Many candidates were unable to identify a source of inaccuracy, with most opting to suggest that the lamp would heat up and change brightness. Only a very few candidates identified the changing background ambient light as an inaccuracy.

The suggested improvements did not need to link to the suggested source of inaccuracy. Most candidates suggested more repeats as a possibility. Any sensible suggestions were given credit. Some candidates were able to discuss the repeatability of their results, although no credit was given to candidates who simply stated that their results were or were not repeatable, a qualification was needed as well.

Very few candidates discussed the suitability of the experiment to answer the question, with most candidates simply stating which LDR was best again.

Pack A Activity 2 Task A

(a) The vast majority of candidates were able to identify the three invertebrates correctly.

(b) Most candidates were able to recognise that there was a pattern in the change in the number of bristleworms, but fewer candidates were able to describe the change in terms of the sample points. Some credit was given to candidates who simply stated that the numbers went up and then down.

(c) The majority of candidates identified the source of pollution as the sewage works, but a significant minority were able to give a good reason for their choice in terms of the distribution of pollution tolerant and pollution intolerant species, upstream and downstream of the sewage works.

(d) (i) Almost all candidates were able to identify August as the peak month.

(ii) There were many possible correct descriptions of the difference between the distribution of all three species, and most candidates were able to give at least one pattern, although only a minority were able to give two correct descriptions.

Pack A Activity 2 Task B

Approximately half of all candidates identified the method as valid, although few then managed to give a correct reason for this based on the positive nature of the test – identifying only pollution intolerant invertebrates in clean water (and vice versa).

Many candidates managed to suggest a suitable improvement, with ‘repeating the tests‘ being the most common suggestion.

A majority of candidates could state that the method was unsuitable for determining the exact source of pollution, but few could give an explanation based of the sample points being too far apart.

Pack B

Pack B Activity 1 Task A

Most candidates were able to state the independent variable as ‘the type of material’, although a significant minority were confused between all three types of variable. Generally, of those candidates who stated controlled variables, the mass of the pellets was the most common correct response. A few candidates identified two controlled variables, with the temperature or colour of the flame being the most popular choice. Please note that ‘amount’ is not an acceptable term for volume or mass (or weight) and ‘temp’ is not an acceptable abbreviation of temperature anywhere in the papers.

The dependent variable in this case is the burn time of the pellets, which was given in the guidance to the candidates. Some candidates identified burn time per gram as the dependent variable and the examiners were sympathetic to this variation.

The vast majority of candidates were able to produce an equipment list and a simple method. The quality of the methods produced by candidates was extremely variable. The examining team were particularly looking to see if the candidates were identifying a suitable way of measuring the dependent variable (the burn time), and that the suggested method would actually work in practice. This is where a significant number of candidates lost marks. The quality of candidates writing was assessed here. We were particularly looking for the correct use of the key terminology (keywords) for this method, and SPaG was assessed. Examiners were looking for the correct spelling of the scientific keywords and the correct,

consistent use of capital letters and full stops. Centres are encouraged to remind candidates about this.

The Risk Assessment was the least successful part of the examination across all the Packs, both on higher and foundation and single and double award.

Very few candidates at foundation level identified the nature of the hazards, such as a Bunsen burner flame is hot; or risks with actions. For example, whilst many candidates could identify that the Bunsen burner flame is a hazard, they did not state that it is hot; and although they identified that it could produce a burn, very few identified that the burn would occur during ignition of the samples. This ensures parity with the risk assessment elements of the other GCSE Sciences.
Please note that when suggesting suitable protective equipment for handling hot objects 'heat proof' gloves are required, not just ‘gloves’.
Candidates did have more success with identifying suitable control measures. Centres are strongly recommended to revisit this with their candidates.

Pack B Activity 1 Task B

The vast majority of candidates managed to take a decent set of repeatable results on this experiment. Most candidates were able to produce their own table, and tested three materials, repeated twice. A significant minority of candidates failed to record the mass (or weight) of the materials. The better candidates managed to record an initial mass/weight and a final mass/weight and then subtracted one from the other to produce the change in mass/weight of the packaging materials. Most candidates managed to include s or seconds as the unit of burn time in the column header, but a significant proportion included the units as ‘secs’ in the rows of the table, which is not accepted, and ‘secs’ is not accepted as an alternative to seconds or s. Some candidates also confused units when the burn time extended past 1 minute. A minority of candidates recorded their times with an inconsistent number of decimal places.

Pack B Activity 1 Task C

An erratum was issued for this Task. Candidates were asked to remove the word mean from the equations at the start of the task. Candidates that did not use the erratum version WERE NOT PENALISED in any way, and the mark scheme was altered to take this into account.
For candidates who received the erratum:
Some candidates were able to calculate the burn time per mass for both repeats for each packaging material, and were then able to calculate the mean of the two values for each material. Error carried forward was used for the mean results.
For candidates that did not receive the erratum:
Some candidates were able to calculate the mean burn time or the mean mass of each type of material, and were then able to calculate the mean burn time per gram. The most common error, apart from simple arithmetic errors, was transposing burn times into the table and calculating the mean burn time rather than mean burn time per gram.
Most candidates were able to suggest a ‘best’ packaging material and many then gave a reason for this usually based on the burn time per mass of the burn time. Very few candidates gave a second reason, although some did reference ‘flammability’ or ease of ignition. Even fewer candidates related the reason to the use.

Pack B Activity 1 Task D

Candidates have found the evaluation tasks quite hard, and it is clear that they need more support from centres prior to the exams.
Candidates were first asked to comment on the suitability of their method. This requires an answer (suitable or unsuitable) plus a plausible reason why. Many candidates were unable to give an answer, let alone a plausible reason.
Many candidates were able to identify a source of inaccuracy, with most opting to suggest difficulties deciding when to start or stop the stopwatch; or using materials with different masses. The suggested improvements did not need to link to the suggested source of inaccuracy. Most candidates suggested more repeats; or made comments about similar shapes. Any sensible suggestions were given credit. Some candidates were able to discuss the repeatability of their results, although no credit was given to candidates who simply stated that their results were or were not repeatable, a qualification was needed as well.
Very few candidates discussed the suitability of the experiment to answer the question, with most candidates simply restating problems with the method.

Pack B Activity 2 Task A

(a) (i) The majority of candidates were able to calculate the missing mean value.
(ii) Candidates at foundation level found it quite difficult to identify the anomalous value in the table.

(b) (i) Only a minority of candidates were able to identify the line correctly as C.
(ii) There was considerable error carried forward for determining the maximum resistance.

(c) Most candidates were able to calculate the resistance of OptoT4 at 0.006 A, although many did not write down their method. Centres are advised to encourage their candidates to do this.

(d) Most candidates were able to compare the graphs of A and C, and state one similarity or difference. Few candidates were able to state more than one of these.

Pack B Activity 2 Task B

Most candidates were able to give a comment about the suitability or not of the method, but then struggled to qualify this with a relevant, correct, explanation. Many candidates managed to suggest a suitable improvement, with ‘using a lamp' being the most common suggestion. Few candidates were able to state more than one improvement.

A majority of candidates could state that the method was unsuitable for judging if the LDR could be used in the toy phone, but most were unable to explain it, particularly in terms of not measuring high light intensities.

APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2018

UNIT 3: TASK BASED ASSESSMENT: HIGHER TIER

This was the first time that Unit 3, the task based assessment was available. There were 31 entries for the higher tier paper. The best facility factors were seen in the collecting and recording sections (Activity 1 – Task B), with a mean mark of 10.6/13. The lowest facility factors were seen in the evaluation section of Activity 2, with the mean mark being 1.2/5.

Pack A

Pack A Activity 1 Task A

Only a minority of candidates were able to state the independent variable as 'the type of LDR', although a significant minority were confused between all three types of variable. Generally, of those candidates who stated controlled variables, the 'same apparatus' was the most common correct response. Only a few candidates identified two controlled variables, with the 'same background light' being the most popular choice. Please note that 'amount' is not an acceptable term for any measured quantity. The dependent variable in this case is the 'resistance of the LDR', which was given in the guidance to the candidates. Many candidates managed to identify this.

The vast majority of candidates were able to produce an equipment list and a simple method. The quality of the methods produced by candidates was extremely variable. The examining team were particularly looking to see if the candidates were identifying a suitable way of measuring the dependent variable (the resistance), and that the suggested method would actually work in practice. This is where a significant number of candidates lost marks. The quality of candidates writing was assessed here. We were particularly looking for the correct use of the key terminology (keywords) for this method, and SPaG was assessed. Examiners were looking for the correct spelling of the scientific keywords and the correct, consistent use of capital letters and full stops. Centres are encouraged to remind candidates about this.

The Risk Assessment was the least successful part of the examination across all the packs, both higher and foundation and single and double award. Very few candidates at higher tier level identified the nature of the hazards, such as the lamp is hot; or risks with actions. For example, whilst many candidates could identify that the lamp is a hazard, they did not state that it is hot; and although they identified that it could produce a burn, very few identified that the burn would occur during handling the raybox. This ensures parity with the risk assessment elements of the other GCSE sciences. Please note that when suggesting suitable protective equipment for handling hot objects 'heat proof' gloves are required, not just 'gloves'. Candidates did have more success with identifying suitable control measures. Centres are strongly recommended to revisit this with their candidates.

Pack A Activity 1 Task B

The vast majority of candidates managed to take a decent set of repeatable results on this experiment. Most candidates were able to produce their own table, and tested both LDRs, repeated twice. Most candidates managed to include V or volts as the unit of voltage in the column header, but a significant proportion included the units as V in the rows of the table as

well, which is not accepted. The majority of candidates recorded their voltages and resistances with an inconsistent number of decimal places.

Pack A Activity 1 Task C

Most candidates were able to plot some form of graph, but many struggled to get a suitable (linear) scale covering more than half of the available plotting area. The majority were able to plot their points with an accuracy <1 small square, but few drew suitable (curved) best-fit lines, with most 'joining the dots'. Many candidates only drew one set of results (either A or B).

Most candidates were able to suggest a 'best' LDR and many then gave a reason for this usually based on the highest or lowest resistances. Only some used the resistance ranges. Very few candidates related the reason to the use. Most candidates that plotted both graphs were able to identify the resistance of both LDRs at 3 V.

Pack A Activity 1 Task D

Candidates have found the evaluation tasks quite hard, and it is clear that they need more support from centres prior to the exams.

Candidates were first asked to comment on the suitability of their method. This requires an answer (suitable or unsuitable) plus a plausible reason why. Many candidates were unable to give an answer, let alone a plausible reason.

Many candidates were unable to identify a source of inaccuracy, with most opting to suggest that the lamp would heat up and change brightness. Only a very few candidates identified the changing background ambient light as an inaccuracy. Some candidates were able to discuss the repeatability of their results, although no credit was given to candidates who simply stated that their results were or were not repeatable, a qualification was needed as well.

The suggested improvements did not need to link to the suggested source of inaccuracy. Most candidates suggested more repeats as a possibility. Any sensible suggestions were given credit.

Very few candidates discussed the suitability of the experiment to answer the question, with most candidates simply stating which LDR was best again.

Pack A Activity 2 Task A

(a) (i) The vast majority of candidates were able to identify the invertebrates correctly.

(ii) Most candidates were able to spot the anomaly, but a significant minority ignored this question.

(b) The majority of candidates identified the source of pollution as being either the sewage works or the industrial estate, or 'between sample points 2 and 3', and a majority were able to give a good reason for their choice in terms of the distribution of pollution tolerant and pollution intolerant species, upstream and downstream of the sewage works.

(c) There were many possible correct descriptions of the difference between the distribution of all three species, and most candidates were able to give at least one or two patterns, although only a minority were able to give three correct descriptions.

Pack A Activity 2 Task B

Most higher tier candidates identified the method as valid, although few then managed to give a correct reason for this based on the positive nature of the test – identifying only pollution intolerant invertebrates in clean water (and vice versa).

Most candidates managed to suggest a suitable improvement, with ‘repeating the tests' being the most common suggestion.

A majority of candidates could state that the method was unsuitable for determining the exact source of pollution, but only a minority could give an explanation based of the sample points being too far apart.

Pack B

Pack B Activity 1 Task A

Most candidates were able to state the independent variable as ‘the type of material’, although a significant minority were confused between all three types of variable. Generally, of those candidates who stated controlled variables, the mass of the pellets was the most common correct response. A minority of candidates identified two controlled variables, with the temperature or colour of the flame being the most popular choice. Please note that ‘amount’ is not an acceptable term for volume or mass (or weight) and ‘temp’ is not an acceptable abbreviation of temperature anywhere in the papers.

The dependent variable in this case is the burn time of the pellets, which was given in the guidance to the candidates, and this was stated by most higher tier candidates. Some candidates identified burn time per gram as the dependent variable and the examiners were sympathetic to this variation.

The vast majority of candidates were able to produce an equipment list and a simple method. The quality of the methods produced by candidates was extremely variable. The examining team were particularly looking to see if the candidates were identifying a suitable way of measuring the dependent variable (the burn time), and that the suggested method would actually work in practice. This is where a significant number of candidates lost marks. The quality of candidates writing was assessed here. We were particularly looking for the correct use of the key terminology (keywords) for this method, and SPaG was assessed. Examiners were looking for the correct spelling of the scientific keywords and the correct, consistent use of capital letters and full stops. Centres are encouraged to remind candidates about this.

The Risk Assessment was the least successful part of the examination across all the packs, both higher and foundation and single and double award. Very few candidates at even the higher tier level identified the nature of the hazards, such as a Bunsen burner flame is hot; or risks with actions. For example, whilst many candidates could identify that the Bunsen burner flame is a hazard, they did not state that it is hot; and although they identified that it could produce a burn, very few identified that the burn would occur during ignition of the samples. This ensures parity with the risk assessment elements of the other GCSE sciences. Please note that when suggesting suitable protective equipment for handling hot objects 'heat proof gloves' are required, not just ‘gloves’. Candidates did have more success with identifying suitable control measures. Centres are strongly recommended to revisit this with their candidates.

Pack B Activity 1 Task B

The vast majority of candidates managed to take a decent set of repeatable results on this experiment. Most candidates were able to produce their own table, and tested three materials, repeated twice. A significant minority of candidates failed to record the mass (or weight) of the materials. The better candidates managed to record an initial mass/weight and a final mass/weight and then subtracted one from the other to produce the change in mass/weight of the packaging materials.

Most candidates managed to include s or seconds as the unit of burn time in the column header, but a significant proportion included the units as 'secs' in the rows of the table, which is not accepted, and 'secs' is not accepted as an alternative to seconds or s. Some candidates also confused units when the burn time extended past 1 minute. A minority of candidates recorded their times with an inconsistent number of decimal places.

Pack B Activity 1 Task C

An erratum was issued for this Task. Candidates were asked to remove the word mean from the equations at the start of the task. Candidates that did not use the erratum version WERE NOT PENALISED in any way, and the mark scheme was altered to take this into account.

For candidates who received the erratum:
Many candidates were able to calculate the burn time per mass for both repeats for each packaging material, and were then able to calculate the mean of the two values for each material. Error carried forward was used for the mean results.

For candidates that did not receive the erratum:
Many candidates were able to calculate the mean burn time or the mean mass of each type of material, and were then able to calculate the mean burn time per gram. The most common error, apart from simple arithmetic errors, was transposing burn times into the table and calculating the mean burn time rather than mean burn time per gram.

Most candidates were able to suggest a 'best' packaging material and many then gave a reason for this usually based on the burn time per mass. Very few candidates gave a second reason, although some did reference 'flammability' or ease of ignition. Even fewer candidates related the reason to the use.

Pack B Activity 1 Task D

Candidates have found the evaluation tasks quite hard, and it is clear that they need more support from centres prior to the exams.

Candidates were first asked to comment on the suitability of their method. This requires an answer (suitable or unsuitable) plus a plausible reason why. A few candidates were unable to give an answer, let alone a plausible reason.

Most candidates were able to identify a source of inaccuracy, with the majority opting to suggest difficulties deciding when to start or stop the stopwatch; or using materials with different masses.

Some candidates were able to discuss the repeatability of their results, although no credit was given to candidates who simply stated that their results were or were not repeatable, a qualification was needed as well.

The suggested improvements did not need to link to the suggested source of inaccuracy. Most candidates suggested more repeats; or made comments about similar shapes. Any sensible suggestions were given credit.

Only a minority of candidates discussed the validity of their conclusion, with most candidates simply restating their conclusion.

Pack B Activity 2 Task A

(a) (i) The majority of candidates were able to calculate the missing mean value.

(ii) Even at Higher level, candidates found it quite difficult to identify the anomalous value in the table.

(b) (i) Only a minority of candidates were able to identify the line correctly as C.

(ii) There was considerable error carried forward for determining the maximum resistance.

(c) Many candidates were able to calculate the resistance of OptoT4 at 50 units light intensity, although many did not write down their method. Centres are advised to encourage their candidates to do this.

(d) Most candidates were able to determine the range of OptoX500 from Graph 1.

(e) (i) Only about half of the higher tier candidates managed to sketch a suitable line (below the line of the graph shown). Many either left this blank or simply drew a line with steeper gradient.

(ii) Only those candidates that produced a correct answer to (e) (i) were then able to give a suitable reason for their choice, although there was some credit for identifying a linear line.

Pack B Activity 2 Task B

Most candidates were able to give a comment about the suitability or not of the method, but then struggled to qualify this with a relevant, correct, explanation. Many candidates managed to suggest a suitable improvement, with ‘using a lamp‘ being the most common suggestion. Few candidates were able to state more than one improvement. A majority of candidates could state that the method was unsuitable for judging if the LDR could be used in the toy phone, but most were unable to explain it, particularly in terms of not measuring high light intensities.

APPLIED SCIENCE (SINGLE AWARD)

GCSE (NEW)

Summer 2018

UNIT 4: PRACTICAL ASSESSMENT

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 candidates 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, candidates 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.
- Controlled 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 effect of exercise on heart rate

This practical was a popular choice for both Applied Science (double award) and Applied Science (single award). Whilst most candidates attempted all sections of the assessment, responses were often very poor and the data collected was often of questionable quality.

Section A

Many candidates were able to make a good attempt at this section although the lack of clarity in the risk assessment often cost candidates marks. Similarly, the table often lacked headings and / or units.

Section B

(a) Whilst the dependent variable was often correctly identified many candidates were unable to identify controlled variables in this experiment.

(b) Both selection of suitable scales and plotting accurately was a challenge for many candidates although they could often describe the relationship between variables on the graph.

(c) Responses here were vague and lacked detail. Commonly candidates were able to gain a mark for identifying an increase in how quickly the heart pumps.

(d) It was pleasing to see some good attempts in (i) with candidates recognising the link between fitness and recovery time. However (ii), where candidates were asked to identify improvements to the method was inaccessible to most.

(e) Those candidates who interpreted the question correctly often were able to gain some credit for outline plans although their work again lacked detail and clarity.

Investigating the effect of concentration on the rate of reaction between hydrochloric acid and calcium carbonate.

This practical was for single award applied science only. Due to the small sample of work seen it is difficult to make many general conclusions about the standard of the work seen. However, it was evident again that the clarity of candidates' expression and poor graph plotting skills caused many marks to be lost.

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