# Examination Feedback Summary

## GCSE Sciences - Biology, Chemistry and Physics
## June 2015 Series

This document provides a summary of the common issues identified in student responses in the June 2015 series. The summary refers to both the Foundation and Higher tier papers. Please note that some issues refer to the common questions found on both tiers.

This summary is not a substitute for detailed feedback on each individual question, which can be found in the Report on the Exam available on e-AQA or on the past papers section of our website.

# GCSE Biology

## Feedback from 2015 series (B1, B2 and B3)

This report shows some areas where students showed less knowledge or skills than expected.

**Knowledge and Application**

Many students:

- were not sufficiently familiar with **why** each stage of the method used to grow pure cultures of bacterium is carried out (B1FQ3bi,ii&iii)
- were confused about what the **difference** is between adult cell cloning and tissue culture (B1FQ4bi)
- did not know that human cloning was illegal, or that there would be a long waiting list for kidneys to become available and that transplant operations had complications (B1FQ4c)
- did not know that oxygen is needed in decomposition (B1FQ5ci)
- did not know that human skin cells divide for growth and repair (B2FQ1b)
- could not identify that stem cells are used to treat paralysis (B2FQ1cii)
- did not know that diffusion is the process by which oxygen moves from the blood to the cells lining the stomach (B2FQ3bi)
- did not know that the chloroplasts absorb the light energy needed for photosynthesis (B2FQ4aiii)
- could not identify the alveolus, mistaking it as the bronchioles and bronchi(B3FQ1ai)
- did not know that diffusion is the process by which oxygen moves from the air inside the lungs into the blood (B3FQ1bi)
- did not know that oxygen moves from the lungs into the blood through the walls of the capillaries (B3FQ1bii)
- did not work out that the concentration of glucose would stay the same after dialysis as it was the same concentration in both blood and dialysis fluid(B3FQ3di)
- knew that the concentration of urea in the blood is less after dialysis, although they could not give a reason why(B3FQ3diii)
- did not know the function of stomata as a means of gas exchange and controlling water loss in plants (B3FQ5b)
- students were not clear that the destruction of peat bogs increases the amount of **Carbon dioxide** in the atmosphere (B3FQ9b)
- did not know an effect of deforestation on **ecosystems** (B3FQ9c)
- did not know the name of a disease that thalidomide is used to treat today(B1FQ8aHQ1a)
- had a poor understanding of tropism, and did not know the name of a plant hormone or its role (B1FQ9b HQ3b)
- could not apply knowledge about pH and enzyme activity (B2FQ7ciii HQ1ciii)
- did not know that cells produced by mitosis were genetically identical because the chromosomes/DNA/genes had been **replicated,** many said that the ‘cell’ had been copied (B2FQ9aii HQ3aii)
- were unaware that less carbon dioxide is being removes from the atmosphere today than in the past (B1HQ2bii)

- did not fully define pathogens as microorganisms **that cause infectious diseases (**B1HQ4a)
- showed poor understanding of the timescale involved in evolution (B1HQ6bii)
- did not appreciate the importance of correct body temperature to ensure chemical reactions and enzymes can work efficiently (B1HQ7bii)
- could not define the term gene correctly (B1HQ8a)
- did not know why it is important to preserve endangered species (B1HQ8a)
- had poor understanding of adult cell cloning (B1HQ8b)
- had misconceptions and gaps in their knowledge about what is meant by a balanced diet, or what a nutrient group consists of. (B1HQ9a)
- did not know why scientists at the time did not realise how important Mendel's work was (B2HQ8c)
- that the terms 'flaccid' and 'turgid' are only appropriate for use when describing plant cells (B3HQ5aii)
- could not clearly express their ideas about the effect on cells if the balance between ions and water is not correct.(B3HQ5aii).

**Exam technique**

Examiners commented upon:

- students gave vague answers with insufficient information. They needed to qualify their answers (B1FQ4c) (B1FQ6bii) (B1FQ9ai HQ3ai)
- students not using correct scientific terms (B1FQ5cii)
- using too general a term, for example examiners will be looking for the term 'light' rather than 'sun' and 'gravity' rather than 'ground' or 'earth' for tropic response (B1H3b)
- students could not link ideas and apply knowledge to different situations for example, compost heaps have the same principle as the natural process of decay (B1FQ5Cii)
- not completing full answers by linking a statement to its affect for example, attract more prey **so** there would be more too eat (B1HQ5b)
- stating the obvious when asked for an explanation (B1HQ5b)
- not using the mark allocation correctly –if 3 marks were available candidates only gave 1 answer, or they used all answer lines repeating or elaborating on 1 marking point(B1HQ6a)
- not reading the question properly.
    - -fixing on one word in the question which reminded them of a previous past question and answered in those terms rather than the new question (B1FQ9bHQ3b)
    - failed to read vital information in the stem of the question (B1HQbii)
    - ignored the focus of the question so chose the wrong scale on the graph (B1HQ9c)
    - missed the significances of part of the wording of the question –a few days (B3FQ5ciii)
- not understanding that a comparative answer was needed (B1HQ4a & 5a)
- not explaining the consequences from a pattern they identified (B1FQ6bii).

## Misconceptions

The following were frequently seen:

- that the donor cloned child would be killed to obtain the kidney (B1FQ4c)
- that a light meter is a source of light (B2FQ8 HQ2)
- candidates only identified 22 pairs of chromosomes (those labelled 1 -22 ) and did not include the XX chromosome (B2FQ5a).

## Working Scientifically

Students:

- did not understand what a range was (B1FQ8bii HQ1bii))
- could not identify a control variable (B1FQ9ai HQ3ai)
- did not understand the idea of a control or its necessity when making comparisons (B1FQ9aiii HQ3aiii)
- misread scales on a graph (B1HQ2bi)
- misinterpreted data when presented with an unfamiliar type of graph (B1HQ2bii)
- found it difficult to link knowledge from previous parts of the question to help them interpret the graph (B2FQ7ci HQ1ci)
- used the word ‘accurate’ instead of ‘validity’ or ‘reliability’ when referring to the importance of having a large amount of data to improve an investigation. (B2HQ8aii).

## Calculations

Students often:

- showed correct working but couldn’t add up simple numbers (B1Q8biHQ1bi)
- appeared not to have had a calculator in the exam
- had difficulty when they had to use information from two separate sources, one a table and one a graph.
- found the concept of percentage increase and decrease challenging and especially when complicated by reference to a percentage increase. (B1HQ6bi)
- did not understand that the phrase ‘how many times more likely’ refers to the multiple of 1 result compared to another (B2FQ5bii)
- did not know that if asked to calculate a ratio it is not sufficient to just express the data in the question as a ratio, but it needs to be simplified to the lowest whole number ratio (B2HQ8ai).

# GCSE Chemistry

## Feedback from 2015 series (C1, C2 and C3)

This report shows some areas where students showed less knowledge or skills than expected.

**Knowledge and Application**

Many students:

- did not know that it was sulfur dioxide that caused acid rain not sulfur. Some thought that sulfur dioxide caused global warming, global dimming or destroyed the ozone layer (CH1FQ 3biii )
- did not know that the polymer of pentene is poly(pentene) (CH1FQ 3civ)
- did not know that calcium hydroxide is produced when calcium oxide reacts with water (CH1FQ 5aiii)
- did not relate the formula of carbon dioxide to the number of atoms (CH2FQ 1dii)
- did not know nitric acid was used to make ammonium nitrate (CH2FQ 2ci )
- often negated correct answer by including false statements such as 'good for heart disease' or 'good for bones' (CH3FQ 1c)
- answered in terms of 'non-corrosive', 'unreactive' but missed the 'volatile' mark (CH3FQ 5e)
- did not know that compounds formed from only non-metals consist of particles called molecules (CH1HQ 1eii )
- did not know the other part of the mixture used to produce aluminium, citing bauxite or aluminium ore. (CH2HQ3Ciii)
- did not understand the electrolysis of sodium chloride frequently naming hydrogen but also naming incorrect products such as sodium, water and carbon dioxide (CH2HQ 6b)
- did not know how a catalyst works (CH3FQ 4biii)
- wrote Na and Br rather than the ions (CH3FQ 9bi)
- did not understand displacement (CH3FQ 9biv)
- did not understand the concept of hard water ions and that they dissolve or enter solutions (CH3HQ 4a)
- did not know that an acid catalyst is required to produce esters (CH3HQ 5dii)
- did not know that the ions in solution that gave a white precipitate that dissolved in excess sodium hydroxide were aluminium ions (CH3FQ 6b)
- did not understand how a catalyst provides an alternative reaction pathway (CH3HQ 6bii)
- did not know the relevant properties of silver (CH2FQ 4a).
- did not know that a metal oxide is a base (CH2HQ 5b)
- did not understand the process of reduction reaction (CH2FQ 4ciii ).

## Exam technique

Examiners commented upon:

- students not using correct scientific terms, for example 'lightweight' rather than low density (CH1HQ 4c1)
- vague descriptions, for example described the shape memory properties of smart polymers poorly so that they could not distinguish with ordinary polymers. (CH1HQ 5cii)
- misunderstood the question focusing on properties of polymer bags rather than biopolymer bags (CH1FQ 4aii)
- did not understand the breadth of the question focusing just on the importance of oil as food but not mentioning its importance as a fuel (CH1FQ 6aii)
- misunderstood that the question so not realising that it was asking for a class of chemical eg. 'indicator' (CH2FQ 2ciii )
- not understanding that a comparative answer was needed and just quoted data (CH2FQ 5aii)
- misread the question by not linking the flow chart with the chemistry involved (CH1HQ 4bii)
- Gave general properties of an alloy rather than specific shape memory properties (CH2HQ 3ci)
- misunderstood the question providing a description of the gaining and losing of electrons rather than describing the structure and the bonding of an ionic compound (CH2HQ 6a)
- vague and poorly expressed responses using phrases such as 'energy level increases', 'it's losing energy', 'diagram curves up' (CH3HQ3ci)
- misinterpreted the question and answered in terms of what happened to the reactant in the equation and therefore stated that the amount of Hydrogen Iodide increases when the temperature increases. (CH3HQ 6ciii).

## Misconceptions

The following were frequently seen:

- misunderstood the industrial process thinking that the company needed to calculate the mass of reactants to make sure it was safe (CH1FQ 2ciii )
- thought that plants do not contain carbon or that biofuels do not release carbon dioxide (CH1FQ 4ciii)
- confused charge with mass (CH2FQ 1a)
- confused the distinction between more collisions and the rate of collisions (CH2FQ 5bii)
- misunderstood displacement and often wrote 'chlorine is stronger' (CH3FQ 9biii)
- did not provide a full account focusing only on localised ions but not mentioning atoms or ions in metals (CH2H Q3a)
- did not understand what ethical reasons were. Students suggested why iodine was harmful (CH2HQ 6c)
- thought that a higher pH was equivalent to a higher hydrogen ion concentration (CH3HQ 5Ciii)

- did not understand closed systems often referring to nothing leaving the system or entering the system but not both (CH3HQ 6ai)
- did not understand equilibrium often suggesting that the amount of reactants and products were equal rather than unchanging (CH3HQ 6aii).

**Working Scientifically**

Students:

- had little knowledge of the tap funnel and its use (CH1FQ 4bii)
- did not read the question fully with many students recommending that the experiment should be repeated but not suggesting calculating a mean (CH1HQ 2bii )
- misunderstood the question by referring to changing the mass of the zinc or the volume of the solution rather than changes to the apparatus (CH2FQ 6b)
- misunderstood the question giving reasons why impurities should be detected rather than why instrumental methods should be used (CH2HQ 3d)
- lack of practical experience with suggestion of incorrect procedures eg Suggested filtration, electrolysis and precipitation could be used for preparation of solid lead nitrate (CH2HQ 5ci )

**Calculations**

Students often:

- gave incorrect answers by not including *M*r in the percentage by mass calculation (CH2FQ 1eii)
- misunderstood percentage yield producing incorrect answers that used incorrect calculation (CH2FQ 3dii)
- did not understand that while twice as much energy was being released twice as much water also needed to be heated (CH3HQ 8b)

# GCSE Physics

## Feedback from 2015 series (P1, P2 and P3)

**Physics topics**

**Knowledge and Application**

- Conduction, convection and radiation – many could not identify the correct method of energy transfer (PH1FP 4d). A lot of students thought that the cooling fins of a hot object would make the air around them cooler (PH1FP 4eii). There is some evidence that students struggle with energy transfers in unfamiliar contexts (PH1HP 7c).
- Conduction - students often mixed particles and bulk properties, writing about particles being less dense or cold particles and heat particles (PH1HP 7b).
- U-values – many did not know what the term 'U-value' meant (PH1FP 7bi/PH1HP 2bi) or the effect of insulation on U-value (PH1FP 7bii/PH1HP 2bii).
- Specific heat capacity – many students were not clear that it is the temperature that changes and not the mass of a substance (PH1FP 4b).
- Electromagnetic radiation – students were unable to give two properties of all electromagnetic waves (PH1HP 4c).
- Doppler effect – many students did not recognise the Doppler effect from the information in the diagram and the stem of the question (PH1HP 6).
- Radioactivity - many students thought it appropriate that a teacher would need to wear a lead suit whilst conducting a classroom based radioactivity experiment (PH2FP 6bi).
- Atomic models –many students did not realise that an atom with no overall charge must have an equal and opposite amount of positive and negative charge (PH2FP 8a). The terms relative charge and relative mass were not well known (PH2FP 8c).
- Rutherford-Marsden experiment – many students did not know what the plum pudding model was and why the model was replaced (PH2FP 8a&8b/PH2HP 2a&2b).
- Nuclear fission - many students wrote that it was the atoms that split not the nuclei (PH2HP 3ai). Some responses were seen that referred to the nucleus of a cell and DNA of the atom changing.
- Circuit symbols - many students could not draw the correct circuit symbol for a resistor and fewer still could draw the correct symbol for a voltmeter in the correct place in a circuit (PH2FP 7ci&7cii and PH2HP 1ci&1cii).
- Momentum conservation was not well understood. Whilst most students did manage to calculate the momentum for one car before a collision (PH2HP 4cii), they could not use this to calculate a speed of another car after the collision.
- Seat-belts and energy transfers - students could express answers in terms of work done or momentum change, but most responses did not do so (PH2HP 4d).
- Resultant forces – students did not correctly link a resultant force with a change in velocity (PH2HP 6a).
- Velocity - students did not appear to understand the distinction between speed and velocity (PH2HP 6aii) and many could not identify the velocity-time graph for an object falling from a stationary position (PH2HP 6c).
- The motor effect – although most students could identify the motor effect, they were not able to identify the direction of the force (PH3HP 5aii), could not say how you could change

the direction of force on the wire (PH3FP 4c) and did not explain why a force acts on a current carrying wire in a magnetic field (PH3HP 5ai). Many could not describe what would happen if an alternating current was used (PH3HP 5b) instead of a direct current.
- Transformers - many did not include alternating currents or alternating magnetic fields when explaining how a transformer works (PH3HP 8a). The advantages of switched-mode transformers were not well understood (PH3FP 2bii).

**Completing diagrams**

- A number of students did not attempt questions involving diagrams (PH1FP 1ai&1aii, PH1HP 4bi&4bii).
- Many students were not able to complete ray diagrams showing refraction (PH1FP 1ai), could not complete a figure to show total internal reflection (PH3HP 6ai) and were not able to complete the refracted rays on a diagram of a concave lens (PH3HP 4cii).
- Many students were not familiar with the term 'normal' when discussing rays (PH1FP 1aii, PH1HP 4bii).

**Exam techniques**

Examiners commented upon:

- many students repeated information from the stem of a question without adding any of their own knowledge or understanding (PH1FP 7a/PH1HP 2a – QWC, PH1HP 5ci)
- explain – this command word is not always well understood. Many students simply compared data from the stem of a question without offering any reasoning behind the data (PH1HP 5ci)
- state – many took an instruction to state a value (linking GPE and KE) to mean they had to calculate a value (PH2HP 6bii)
- precision of language - lots of students failed to identify that a potential difference was *induced* (PH3FP 6a/PH3HP 8a). Few could explain in scientific language why a tilted bus would topple over (PH3HP 7a).

Working Scientifically

Students:

- were not able to successfully identify why a line graph was drawn instead of a bar chart, with some stating that bar charts 'were not accurate' (PH1FP 8aii/PH1HP 3aii)
- were expected to draw a curved line of best fit. Most students instead drew straight lines (PH2FP 6ci) and consequently were unable to correctly extrapolate (PH2FP 6ciii)
- failed to circle an anomalous result on a graph (PH3FP 6c)
- could not accurately describe the shape of a graph (PH2FP 7ai) or identify patterns shown on a graph (PH2HP 6c)
- struggled with the meaning of the term resolution and were not able to successfully identify the resolution of a given measuring instrument (PH3FP 5aii) or identify the resolution needed to produce the data on a given graph (PH1FP 8ai/PH1HP 3ai)
- some students thought a ruler should be used to measure the mass of an object (PH1FP 4c)

- stated ‘human error’ without clarifying what the error is, is generally insufficient for the mark (PH3FP 6ci).

**Calculations**

- Make sure that students have a calculator and that they understand how to use brackets so that the calculation they carry out is the one that they intended to (PH1HP 7a, PH2FP 3a).
- Students were not always able to round to the correct number of significant figures (PH1HP 5bii).
- Choose the correct equation, substitute values into it and then calculate the answer. Many students incorrectly re-arranged before substituting values (PH1FP 2b, PH1FP 5b).
- Converting between kW and W – students should be careful of converting units when it is not necessary (PH1FP 5b).
- Students should be able to recall the correct units in physics equations –many students were unable to give a unit for focal length (PH3HP 4ei) and some gave $m/s^2$ as the unit of speed (PH1FP 6b). A surprising number of students did not know that the ohm is the unit for resistance (PH2FP 7bi). The unit for specific heat capacity was also not well known (PH1HP 7a).
- A large number of students failed to square the speed in a calculation of kinetic energy (PH2HP 6bi).
- Many students could calculate the pressure of a liquid but failed to calculate the force on a slave piston when given the surface area (PH3HP 7bii).