Benton Park School

Science Department

Biology

AQA Practical Assessment Booklet

Name:- _____

Teacher:- _____

Class:- _____

Experiment	Topic Area	Complete?	Comment
1	Decay		
2	Field Investigations		
3	Microscopy		
4	Microbiology		
5	Food Tests		
6	Osmosis		
7	Enzymes		
8	Photosynthesis		
9	Reaction Time		
10	Germination		

 Date: _____

Command words (science)

Command words and the words and phrases used in exam's that tell students how they should answer a question.

The following command words are taken from Ofqual's official list of command words and their meanings that are relevant to this subject. In addition, where necessary, we have included our own command words and their meanings to compliments Ofqual's list.

Calculate	Use numbers in the question to work these out.	**Draw**	Produce, or add a diagram.
Choose	Select from a range of alternatives.	**Estimate**	Give an approximate value.
Compare	Describe similarities/differences.	**Use**	The answer must include the information in the question.
Define	Specify the meaning of something.	**Work out**	Students should use numbers in the question.
Describe	Recall facts, events or process in an accurate way.	**Write**	Short answer, no explanation or description.
Design	Set out how something will be done.	**Evaluate**	Students should use the information provided as well as their own knowledge and consider evidence for or against.
Determine	Use the data provided to work out your answer.	**Explain**	Students should make something clear, or state reasons for something happening.
Give	Short answer only.	**Identify**	Name or characterise.
Label		**Justify**	Use evidence from the information supplied to support your answer.
Measure	Find an item of data for a given quantity.	**Name**	Single word or phrase.
Plot	Mark on a graph.	**Plan**	Write a method.
Predict	Give a plausible outcome.	**Show**	Provide structures evidence to reach a conclusion.
Suggest	Apply your won knowledge.	**Sketch**	Draw approximately.

 Date: _____

Hypothesis	A scientific statement that explains certain facts or observations	**Anomaly**	A result that does not fit the pattern
Prediction	This describes what you think will happen in an experiment	**Accuracy**	How close the reading is to the true value
Independent variable	This is the variable that is changed during an investigation. There should only be one of these.	**True value**	This is the real value of a measurement in an experiment
Dependent variable	This is the variable that changes as a result of a change in the independent variable	**Precision**	This is determined by the scale on the measuring apparatus e.g. a ruler marked mm is more precise than one in cm
Control variable	Variables that remain constant, to make sure that an investigation is valid	**Resolution**	The smallest change that can be read from a measuring device for example a ruler measured in mm or cm
Fair test	This is where only the independent variable is changed and the others controlled	**Calibration**	When we make sure that measuring apparatus is making correct readings e.g. the temperature of melting ice is 0 degrees Celsius
Valid	The results and conclusions will be this if the variables are correctly controlled	**Measurement error**	The difference between the real value and the measured value
Categoric variable	A variable that can be described by a label or category such as colour or surface	**Random error**	This error causes measurements to be spread around the true value – can be reduced by taking repeats and calculating a mean
Continuous variable	A variable which can have any numerical value	**Zero error**	When a piece of measuring equipment should be reading zero but it doesn't
Interval	This is the difference between the values of your independent variable	**Systematic error**	This is an error that is always the same for each repeat – usually because of an error in the equipment used
Range	The maximum and minimum values of the independent or dependent variables e.g. 'from 10cm to 50cm'	**Uncertainty**	When the results obtained are not as accurate as they could be due to the procedure carried out
Data	Information or measurements that you collect	**Repeatable**	If the same person can get the same reading using the same equipment and method
Datum	One piece of information	**Reproducible**	If another person can get the same result (trend/specific results) using the same method and equipment or with different method or equipment.

 Date: _____

Use of apparatus and techniques

All students are expected to have carried out the required practical activities in Required practical activities. These develop skills in the use of the following apparatus and techniques. AT 1–7 are common with combined science. AT 8 is biology only.

	Apparatus and techniques
AT 1	Use of appropriate apparatus to make and record a range of measurements accurately, including length, area, mass, time, temperature, volume of liquids and gases, and pH (links to A-level AT a).
AT 2	Safe use of appropriate heating devices and techniques including use of a Bunsen burner and a water bath or electric heater (links to A-level AT a).
AT 3	Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes.
AT 4	Safe and ethical use of living organisms (plants or animals) to measure physiological functions and responses to the environment (links to A-level AT h).
AT 5	Measurement of rates of reaction by a variety of methods including production of gas, uptake of water and colour change of indicator
AT 6	Application of appropriate sampling techniques to investigate the distribution and abundance of organisms in an ecosystem via direct use in the field (links to A-level AT k).
AT 7	Use of appropriate apparatus, techniques and magnification, including microscopes, to make observations of biological specimens and produce labelled scientific drawings (links to A-level AT d and e).
AT 8	Use of appropriate techniques and qualitative reagents to identify biological molecules and processes in more complex and problem-solving contexts including continuous sampling in an investigation (links to A-level AT f).

 Date: _____

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 Date: _____

1 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change.

Equipment →

- a small beaker containing milk
- a small beaker containing sodium carbonate solution
- a small beaker containing lipase solution
- 250 cm^3 beakers, to be used as water baths
- test tubes
- a test tube rack
- a marker pen
- 10 cm^3 plastic syringes
- a stirring thermometer
- a stop clock / stopwatch
- phenolphthalein in a dropper bottle
- water bath

Diagram →

Procedure →

1. Label two test tubes: one 'lipase' and the other 'milk'.
2. In the first test tube put 5 cm^3 of lipase solution.
3. In the other test tube put five drops of phenolphthalein solution.
4. Use a calibrated dropping pipette to add 5 cm^3 of milk to the tube containing the phenolphthalein.
5. Use another pipette to add 7 cm^3 of sodium carbonate solution to this test tube. The solution should be pink.
6. Put a thermometer into this test tube.
7. Put both test tubes into the water bath and wait until the contents reach the same temperature as the water bath.
8. Use another dropping pipette to transfer 1 cm^3 of lipase into the tube containing the milk and phenolphthalein. Immediately start timing.
10. Stir the contents of the test tube until the solution loses its pink colour.
11. Record the time taken for the pink colour to disappear.
12. Repeat the above steps for different temperatures of water bath.
13. Record your results in a table such as the one here and plot a graph of your results.

Dependent Variable	
Independent Variable	
Control Variable(s)	

Risk Assessment →

Hazard	Risk	Control
Sodium Carbonate		
Glassware		
Water		

How are you going to reduce the uncertainties in your measurements? →

 Date: _____

RECORDING YOUR DATA

In the space below record your data in the table →

Temperature of milk in °C	Time taken for pink colour to disappear in seconds			
	Trial 1	Trial 2	Trial 3	Mean

PROCESSING YOUR DATA

1. State the optimum conditions for bacteria to grow?

2. Which tested temperature above could farmers use to make good compost fastest?

3. Explain your answer to question 2.

 Date: _____

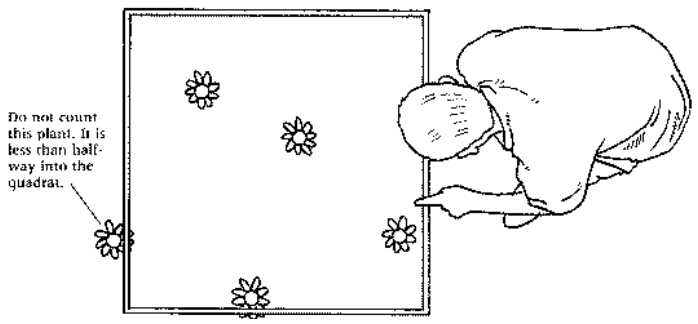
2 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species.

Equipment →

- a 1 m^2 quadrat
- a 30 m tape measure
- a clipboard
- a pen
- paper

Diagram →



Procedure →

1. Mark an area (10 x 10 m) with two measuring tapes at right angles to each other.
2. In a pair, use a random number generator or random number sheet to pick ten coordinates for the sampling area e.g. (2,5) (6,8) (0,4) etc.
3. As a class decide whether the first coordinate relates to the x or the y axis.
4. Each student should start at their coordinates and walk out until they meet each other.
5. Place the quadrat in the bottom left corner of the coordinate space. Record the number of plants in that area.
6. The quadrat covers an area of 0.25 m^2. You need to flip the quadrat in order to cover 1 m^2. See diagram.
7. Ensure the number of plants has been counted in 1m^2.
8. Record the number in an appropriate table.
9. Move on to the second coordinate and repeat steps 4-7 until 10 areas of 1m^2 have been sampled.
10. Calculate the mean number of plants per m^2 for the area.
11. Repeat the same process in the second area.

Dependant Variable	
Independent Variable	
Control Variable(s)	

Risk Assessment →

Hazard	Risk	Control
Quadrat		
Plants		

Why would it be advantageous to compare your results with another groups? →

 Date: _____

RECORDING YOUR DATA

In the space below record your data in the table →

Location number	Number of daisy plants per 1 m^2 quadrat	
	Trampled	Un-trampled
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Mean number of daisy plants per m^2		

PROCESSING YOUR DATA

1. State the purpose of random sampling?

2. Explain why it is important to calculate a mean value for your located species?

3. What does this information tell you about the habitat you have chosen?

 Date: _____

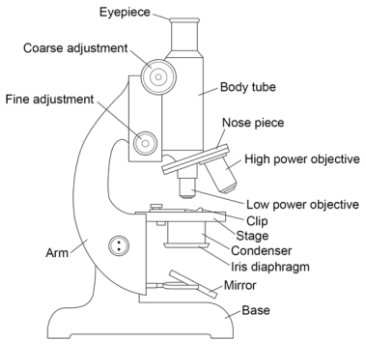
3 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Use a light microscope to observe, draw and label a selection of plant and animal cells. A scale magnification must be included.

Equipment →

- a small piece of onion
- a knife or scalpel
- a white tile
- forceps
- a microscope slide
- a coverslip
- a microscope
- iodine solution in a dropping bottle

Diagram →



Procedure →

1. Use a dropping pipette to put one drop of water onto a microscope slide.
2. Separate one of the thin layers of the onion.
3. Peel off a thin layer of epidermal tissue from the inner surface.
4. Use forceps to put this thin layer on to the drop of water that you have placed on the microscope slide.
5. Make sure that the layer of onion cells is flat on the slide.
6. Put two drops of iodine solution onto the onion tissue.
7. Carefully lower a coverslip onto the slide. Do this by placing one edge of the coverslip on the slide and then using a mounted needle to lower the other edge onto the slide.
8. Use a piece of filter paper to soak up any liquid from around the edge of the coverslip.
9. Put the slide on the microscope stage.
10. Turn the nosepiece to the lowest power objective lens.
11. Looking from the side (**not** through the eyepiece) turn the coarse adjustment knob so that the end of the objective lens is almost touching the slide.
12. Now looking through the eyepiece, turn the coarse adjustment knob in the direction to increase the distance between the objective lens and the slide. Do this until the cells come into focus.
13. Now rotate the nosepiece to use a higher power objective lens.
14. Slightly rotate the fine adjustment knob to bring the cells into a clear focus and use the low-power objective (×40 magnification) to look at the cells.
15. When you have found some cells, switch to a higher power (×100 or ×400 magnification).
16. In the space below make a clear, labelled drawing of some of these cells. Make sure that you draw and label any component parts of the cell.

Dependant Variable	
Independent Variable	
Control Variable(s)	

 Date: _____

Risk Assessment →

Hazard	Risk	Control

How are you going to reduce the uncertainties in your measurements? →

RECORDING YOUR DATA

In the space below record your observations →

PROCESSING YOUR DATA

1. Calculate the magnification of the equipment using the following equation:
   magnification = size of image /size of real object

2. State why iodine is added to the cell before you look at it under the microscope?

3. Explain how electron microscopy has increased understanding of subcellular structures

 Date: _____

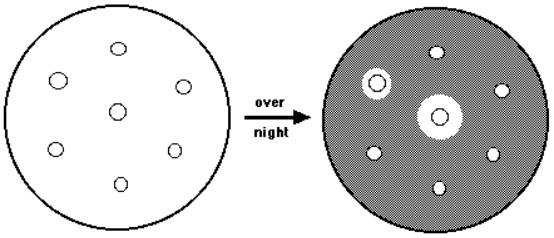
4 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition.

Equipment →

- three antiseptics (such as mouthwash, TCP, and antiseptic cream)
- disinfectant bench spray
- a 'discard beaker' of disinfectant
- a small beaker of ethanol
- forceps
- clear tape
- hand wash
- a wax pencil
- access to an incubator
- a nutrient agar plate
- a Bunsen burner
- a heatproof mat
- a disposable plastic pipette
- a culture of bacteria (*E. coli*)
- a glass spreader
- filter paper discs

Diagram →



Procedure →

1. Collect closed agar plate.
2. Light the Bunsen burner and place the agar plate beside it.
3. Dip the swab into the bacterial solution and then take the lid of your agar plate.
4. Spread the bacterial solution across the agar jelly in a swivel motion.
5. Using the tweezers place the antibacterial discs onto the agar.
6. Label your discs on your agar plate and close the lid.
7. Seal with tape.
8. Leave the agar plate to culture and record results.

Dependant Variable	
Independent Variable	
Control Variable(s)	

Risk Assessment →

Hazard	Risk	Control
Bacteria	Contamination	Do not touch the equipment or open petri dish

How could you use a preliminary investigation for this experiment? →

 Date: _____

RECORDING YOUR DATA

In the space below record your observations →

PROCESSING YOUR DATA

1. Which of the antibacterial discs was the most effective? Use evidence to support your answer.

2. State the purpose of the agar jelly in this experiment?

3. Explain how did you prevented contamination of your dish? How could this be improved?

 Date: _____

5 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Use qualitative reagents to test for a range of carbohydrates, lipids and proteins.
To include: Benedict's test for sugars; iodine test for starch; Biuret reagent for protein.

Equipment →

- safety goggles.
- iodine solution
- Sudan III stain solution
- Biuret solution
- a Bunsen burner, tripod and gauze to heat water
- a heatproof mat
- a thermometer
- food to be tested
- a pestle and mortar
- a stirring rod
- 5 × beaker, 250 ml
- 4 × test tube
- Benedict's solution
- Dimple tile

Diagram →

Procedure →

1. Use a pestle and mortar to grind up a small sample of food.
2. Transfer the ground up food into a small beaker and add distilled water.
3. Stir in order to allow some of the food content to dissolve in the water.
4. Half fill a test tube with some of this solution.
5. Add 10 drops of Benedict's solution to the solution on the test tube.
6. Place the test tube in a beaker of boiling water for about five minutes.
7. Note any colour change. If a sugar such as glucose is present, the solution will turn green, yellow, or brick-red, depending on the sugar concentration.
8. Take some of the remaining food solution from the conical flask and put about 5 ml of it into a dimple tile.
9. Add 9 drops of iodine solution and note any colour change. If starch is present you should see a black or blue-black colour appear.

Dependant Variable	
Independent Variable	
Control Variable(s)	

Risk Assessment →

Hazard	Risk	Control

How are you going to reduce the uncertainties in your measurements? →

 Date: _____

RECORDING YOUR DATA

In the space below record your data in a suitable table →

PROCESSING YOUR DATA

1. State the role of amylase in digestion.

2. Describe the results of your investigation.

3. Suggest and explain why the colour of the solution (after Benedict's solution has been added) can be used by diabetes suffers.

 Date: _____

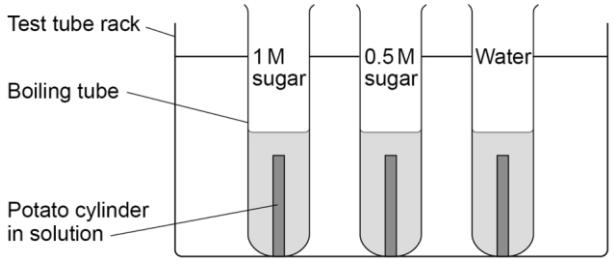
6 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.

Equipment →

- aubergine
- a cork borer
- a ruler
- a top-pan balance.
- 1 M sugar solution
- 0.5 M sugar solution
- distilled water
- a 10 cm^3 measuring cylinder
- labels
- three boiling tubes
- a test tube rack
- paper towels
- a scalpel
- a white tile

Diagram →



Procedure →

1. Using a cork borer, cut three potato cylinders of the same diameter.
2. Trim the cylinders so that they are all the same length (about 3 cm).
3. Accurately measure the mass of each aubergine cylinder.
4. Measure out 10 cm^3 of the 1 M sugar solution and place into the first boiling tube (labelled 1 M sugar).
5. Measure out 10 cm^3 of 0.5 M sugar solution and place into the second boiling tube (labelled 0.5 M sugar).
6. Measure out 10 cm^3 of the distilled water into the third boiling tube (labelled water).
7. Add one aubergine cylinder to each tube.
8. Leave the aubergine cylinders in the boiling tubes for 15-20 minutes.
9. Remove the cylinders from the boiling tubes and carefully blot them dry with the paper towels.
10. Re-measure the mass of each cylinder (make sure you know which is which).
11. Record your masses in a table such as the one below.

Dependant Variable	
Independent Variable	
Control Variable(s)	

Risk Assessment →

Hazard	Risk	Control
Knife	Cuts	Hold knife and aubergine in correct position

Did you repeat any of your measurements? Explain why you did/ did not repeat your results taken. →

 Date: _____

RECORDING YOUR DATA

In the space below record your data in the table →

	1 M sugar solution	**0.5 M sugar solution**	**Distilled water**
Initial length in mm			
Final length in mm			
Change in length in mm			
Initial mass in g			
Final mass in g			
Change in mass in g			

PROCESSING YOUR DATA

1. Describe the effect the concentration of the sugar solution has on the aubergine?
   a. 1M
   b. 0.5M
   c. H_2O

2. Explain what has happened in terms of osmosis.

3. Why did we peel the aubergine?

4. Why did we blot dry?

5. Why do we calculate change in mass?

 Date: _____

7 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Investigate the effect of pH on the rate of an amylase enzyme.

Equipment →

- test tubes
- a test tube rack
- water baths (electrical or Bunsen burners and beakers)
- spotting tiles
- a 5 cm^3 measuring cylinder or syringe
- a glass rod
- a stop watch
- starch solution
- amylase solution
- iodine solution
- thermometers

Diagram →

Procedure →

Dependant Variable	
Independent Variable	
Control Variable(s)	

Risk Assessment →

Hazard	Risk	Control

How could you use a preliminary investigation for this experiment? →

 Date: _____

RECORDING YOUR DATA

In the space below record your data in a suitable table →

PROCESSING YOUR DATA

1. Describe how the temperature has affected the rate of the chemical reaction?

2. State the main source of error in this investigation?

3. How could you reduce this error?

 Date: _____

8 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Investigate the effect of a factor on the rate of photosynthesis.

Equipment →

Diagram →

Procedure →

Dependant Variable	
Independent Variable	
Control Variable(s)	

Risk Assessment →

Hazard	Risk	Control

What range of values did you use for your investigation? Was this appropriate? →

 Date: _____

RECORDING YOUR DATA

In the space below record your data in a suitable table →

PROCESSING YOUR DATA

1. State the equation for photosynthesis?

2. Describe how and explain light effected the rate of photosynthesis?

3. Give a list of other abiotic factors that could affect photosynthesis:

 Date: _____

9 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Plan and carry out an investigation into the effect of a factor on human reaction time.

Equipment →

Diagram →

Procedure →

Dependant Variable	
Independent Variable	
Control Variable(s)	

Risk Assessment →

Hazard	Risk	Control

How are you going to reduce the uncertainties in your measurements? →

 Date: _____

RECORDING YOUR DATA

In the space below record your data in a suitable table →

PROCESSING YOUR DATA

1. Describe the effect caffeine has on the human body?

2. Describe the biggest cause of error in this investigation? (Link to metabolism)

3. The human body has reflex actions. Explain how does this process work?

 Date: _____

10 PLANNING YOUR EXPERIMENT

INVESTIGATION TITLE → Investigate the effect of light or gravity on the growth of germinating seeds. Record results as both length measurements and as careful, labelled biological drawings to show the effects.

Equipment →

Diagram →

Procedure →

Dependant Variable	
Independent Variable	
Control Variable(s)	

Risk Assessment →

Hazard	Risk	Control

Why would it be advantageous to compare your results with another groups? →

 Date: _____

RECORDING YOUR DATA

In the space below record your data in a suitable table →

PROCESSING YOUR DATA

1. State the factors seeds need to germinate efficiently?

2. List the abiotic factors that could disrupt this growth.

3. Choose one of your above abiotic factors and explain why that is the case.