

Edexcel IAL Biology A Level

Core Practical 12

Investigate the effects of temperature on the development of organisms (such as seedling growth rate or brine shrimp hatch rates), taking into account the ethical use of organisms.



Independent variable: Temperature

Dependent variable: Number of brine shrimp hatched OR number of seedlings germinated

Equipment list - Brine Shrimp

- Brine shrimp eggs
- 6 beakers
- Marker pen
- Water baths and refrigerators at the following temperatures: 15°C, 20°C, 25°C, 30°C and 35°C
- Thermometer
- Sea salt
- Weighing scales
- Measuring cylinder
- Spatula
- Dechlorinated water
- Stirring rod
- Graph paper
- Scissors
- Magnifying glass
- Forceps
- Pipette
- Light source

Equipment list - Seeds

- Seeds
- 5 petri dishes
- Marker pen
- Water baths and refrigerators at the following temperatures: 15°C, 20°C, 25°C, 30°C and 35°C
- Thermometer
- Cotton wall
- 50 cm³ measuring cylinder
- Distilled water

Ethics

When handling living organisms for scientific research and learning it is important to **treat them with care and to minimise potential harm**. When using organisms experimentally as a student you have a responsibility to gain as much advancement in knowledge and learning as possible from them. The availability of the organisms you could use in this experiment should be considered, since those easier to obtain will make increase the practicality of the research.



Method

Method 1 - Brine Shrimp

1. Use the marker pen to mark 5 of the beakers with the following temperatures: 15°C, 20°C, 25°C, 30°C and 35°C
2. Use the weighing scales and spatula to measure and weigh out 2g of sea salt into each beaker, followed by 100 cm³ of dechlorinated water. Stir the mixture with the stirring rod in order to **dissolve the salt**.
3. Dampen some paper with the salt solution and place a pinch of brine shrimp eggs on to the paper. Use a magnifying glass to separate and count the eggs until you have roughly 40 on the paper.
4. Cut the paper around the eggs so the size of the paper is **smaller than the area of the 5 beakers** prepared, then place the piece of paper **eggs-side-down** into one of the beakers. Allow 2-3 minutes for the eggs to fall off the paper and into the beaker, finally removing the paper from the water with tweezers or forceps.
5. Repeat steps 2, 3 and 4 for the remaining 4 beakers.
6. Place the marked beakers into the water baths and refrigerators that correspond the temperature written on them and leave them for 24 hours.
7. Prepare the sixth and last beaker as described in step 2.
8. Remove the first beaker and use a bench lamp or other light source to shine light into the beaker, causing the brine shrimp that have hatched to swim to the surface. Use a pipette to remove the shrimp one at a time, placing them into the **empty** sixth beaker as you count them.
9. Record the number of brine shrimp that have hatched at that temperature in a results table and place the hatched shrimps in a location as instructed by your teacher.
10. Repeat steps 8 and 9 with the remaining 4 beakers.

Temperature (°C)	Number of brine shrimp hatched
15	
20	
25	
30	
35	



Method 2 - Seedlings

1. Use a marker pen to label 5 petri dishes with the following temperatures 15°C, 20°C, 25°C, 30°C and 35°C
2. Mould a 1 cm layer of cotton wool into the bottom of each petri dish and place 20 seedlings on to the petri dish, using tweezers or forceps. Spread the seedlings out so they are **evenly distributed** across the dish.
3. Use the measuring cylinder to slowly add 30 cm³ of water to each dish and then place each of the marked Petri dishes in their corresponding temperature environments.
4. Every 24 hours, add more distilled water to each dish so the seedlings and cotton wool **does not dry out**. Be sure to add the **same volume of water to each dish**.
5. After 5 days remove the Petri dishes from the water baths and refrigerators and count the number of seeds that have germinated for each temperature, recording the results in a suitable table.

Temperature (°C)	Number of seedlings germinated
15	
20	
25	
30	
35	

Graph and results table

A graph can be plotted of temperature against the number of brine shrimp hatched / seedlings germinated to observe the effect of temperature on the development of organisms.



Risk assessment

Hazard	Risk	Precaution
Liquids	Spillage that could cause surfaces to be slippery leading to an accident	Wipe up any liquid spillages as soon as they occur and put lids on bottles and put them away once used
Seedlings / brine shrimp samples	Potential allergic reaction	Wear gloves when handling, wash hands after the practical
Glassware	Cuts from sharp objects	Take care when handling glass objects; keep away from edge of desk
Lamp	Could get hot if left on for prolonged periods of time	Turn it off after use, take care when using it to avoid skin contact

