

The Pique Lab Learning Centre
P4 CCI™ Science Course
Answer Booklet

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TOPIC: PLANTS, FUNGI & BACTERIA

Qn	Answer
Q1	2
Q2	1
Q3	3
Q4	4
Q5a	Reproduces by spores
b	Bracket fungi do not make their own food. Instead, they feed on the dead matter that they grow on by breaking them down into simpler substances and absorbing them.
c	Choose any 2 out of the 4 <ol style="list-style-type: none"> 1) Flowering plants produce flowers but bracket fungi do not produce flowers. 2) Flowering plants produce fruits but bracket fungi do not produce fruits. 3) Flowering plants reproduce by seeds but bracket fungi reproduce by spores. 4) Flowering plants trap sunlight for photosynthesis to make their own food while fungi cannot make their own food. Instead, they feed on the plants or animals that they grow on, dead or alive. They do so by breaking them down into simpler substances and absorbing them.
Q6a	Mould/Bread mould
b	Reproduce by spores
c	They grow best in places with water, air (oxygen) and warmth.
Q7a	Living thing F makes its own food but living thing H does not make its own food.
b	No, I do not agree. Bacteria cannot make its own food and do not reproduce by spores, unlike E. OR No, I do not agree. E makes its own food and reproduces by spores, unlike the bacteria.

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TOPIC: ANIMAL CLASSIFICATIONS

Qn	Answer
Q1	2
Q2	3
Q3	4
Q4	1
Q5a	<p>P: Amphibians Q: Mammals R: Reptiles</p> <p>OR</p> <p>P: Outer covering of moist skin Q: Outer covering of hair R: Outer covering of dry skin covered with scales</p>
b	Group R. A python has an outer covering of dry skin covered with scales, like the animals in group R.
c	<p>1) They have hair as their outer covering. 2) The adults produce milk and suckle their young.</p>
d	<p>1) The animals in both groups are cold-blooded. 2) The animals in both groups reproduce by laying eggs.</p>
Q6a	Animal X does not have scales and lays eggs.
b	Animal Y has scales but animal X does not have scales.
c	<p>Mammals: W Birds: X Insects: X Fish: Z Reptiles: Y Amphibians: X</p>
Q7a	<p>Animal X: Insects Animal Y: Fish</p>
b	Animal Z is warm-blooded, does not breathe through gills, does not have three body parts and does not have scales as its outer covering.

c	<p>Similarity: Both animals do not have three body parts.</p> <p>Difference: Animal Y breathes through gills but animal Z does not breathe through gills.</p> <p>OR</p> <p>Animal Y has scales as its outer covering but animal Z does not have scales as its outer covering.</p> <p>OR</p> <p>Animal Z is warm-blooded but animal Y is not warm-blooded.</p>
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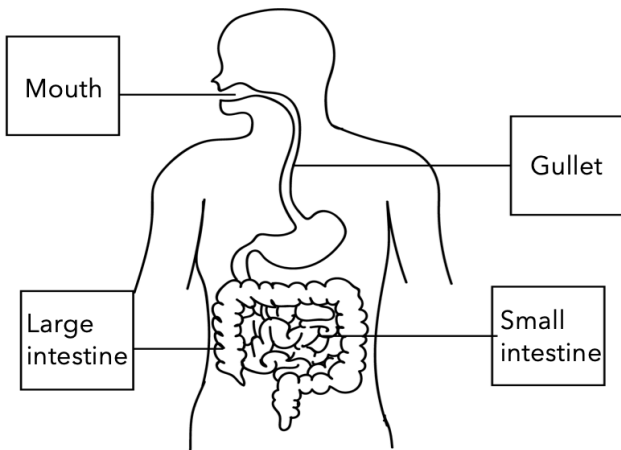
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TOPIC: MATERIALS

Qn	Answer
Q1	3
Q2	4
Q3	3
Q4	2
Q5a	P, M, L, Q
b	Choose: Material P.
c	<p>Use Data: All the water that was poured onto material P remained on the material.</p> <p>Explain Data: This means that material P is waterproof (property).</p> <p>(Link back to purpose): Thus, a drinking straw made of material P would not absorb any of the drink, preventing any drink from leaking out of the straw.</p>
Q6a	The flexibility of the rulers.
b	<p>Choose: Material A.</p> <p>Use Data: Material A bent the most when a 500 g weight was placed on it.</p> <p>Explain Data: This means that material A is the most flexible (property).</p> <p>(Link back to purpose): Thus, a strap made of material A will be able to bend the most around the user's wrist, allowing the user to wear the watch most comfortably.</p>
Q7a	Choose: Material Y.
b	<p>Use Data: No light was detected by the light sensor when material Y was tested.</p> <p>Explain Data: This shows that material Y is opaque (property).</p> <p>(Link back to purpose): Thus, light that is reflected off the person in the bathroom will not be able to pass through the bathroom door made of material Y, preventing people outside the bathroom from seeing the person in the bathroom.</p>

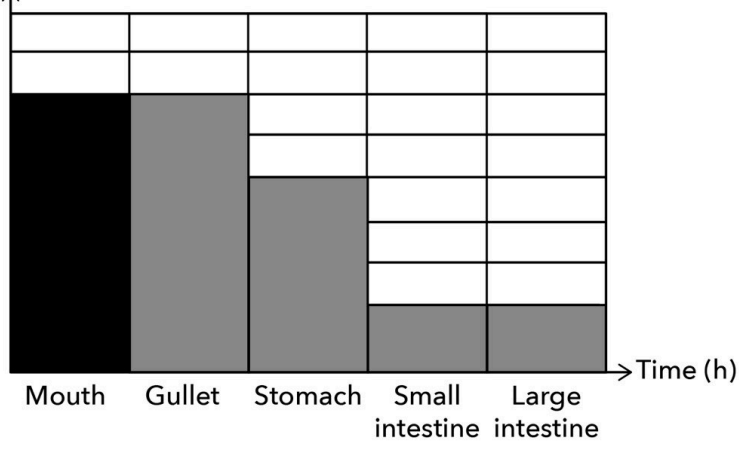
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TOPIC: DIGESTIVE SYSTEM

Qn	Answer
Q1	3
Q2	4
Q3	3
Q4	2
Q5a	Digestive juices. Substance X can be found in parts P, Q and R.
b	The absorption of excess water and mineral salts from undigested food into the bloodstream.
c	The teeth chew food and break down food into smaller pieces. This increases the amount of surface area of the food in contact with the digestive juices for faster digestion of the food.
d	Both parts absorb substances into the bloodstream.
Q6a	 <p>The diagram shows a human silhouette with the digestive system highlighted. Labels with lines pointing to the corresponding organs are: Mouth (at the top left), Gullet (at the top right), Small intestine (at the bottom right), and Large intestine (at the bottom left). The stomach is shown in the center, connected to the gullet and the small intestine.</p>
b	The stomach churns and mixes the food with digestive juices, which break down the food into simpler substances.
c	Circulatory system
Q7a	6, 3, 5, 1, 2, 4
b	Gullet, large intestine, anus

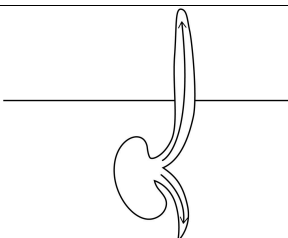
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TOPIC: BODY SYSTEMS

Qn	Answer
Q1	3
Q2	4
Q3	2
Q4	1
Q5ai	System P: Respiratory System
a ii	System Q: Circulatory System
b	<p>Small intestine.</p> <p>The small intestine breaks down food into simpler substances and absorbs digested food through its walls into the bloodstream.</p>
c	Lungs
Q6a	Ribcage
b	Heart and lungs
c	Skeletal system
Q7a	<p>Amount of undigested food ↑</p>  <p style="text-align: center;">Time (h) →</p> <p style="text-align: center;">Mouth Gullet Stomach Small intestine Large intestine</p>
b	<p>The digestive system breaks down food into simpler substances, which is absorbed through the walls of the small intestine into the bloodstream. The circulatory system then transports blood rich in digested food through the blood vessels to all parts of the body.</p>

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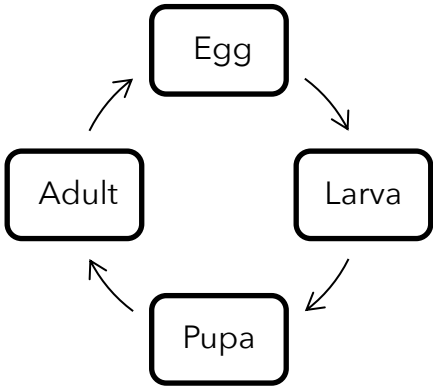
TOPIC: PLANT LIFE CYCLE

Qn	Answer
Q1	3
Q2	4
Q3	3
Q4	1
Q5a	P: Seed leaf Q: Roots
b	The true leaves at this stage have not fully developed to trap sunlight for photosynthesis to make its own food yet. Thus, part P, which is the seed leaf, provides food for the seedling to grow until the true leaves are fully developed.
c	The plant will die. If all of Part Q are removed, there will not be any roots to absorb water and mineral salts from the ground. Thus, the leaves will not be able to receive water for photosynthesis to make food, causing the plant to die.
d	She should observe flowers and/or fruits growing on the plant.
Q6a	Factors required for germination: Oxygen, water and warmth Factor that does not affect germination: Light
b	The root
c	
Q7a	Part X: Flower Part Y: Stem
b	The plant will die. When part Y is broken, the water-carrying tubes in the stem will be damaged. Thus, the water absorbed by the roots cannot be transported to the leaves, causing them to be unable to carry out photosynthesis to make food. This causes the plant to die.

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TOPIC: ANIMAL LIFE CYCLE

Qn	Answer
Q1	1
Q2	4
Q3	2
Q4	1
Q5a	Animal Y has a three-stage life cycle, lays eggs in water and does not moult.
b	Animal Z moults in the larva stage to shed its hard outer covering to grow bigger.
Q6a	Both have an egg stage/adult stage.
b	<p>The butterfly has a 4-stage life cycle but the chicken has a 3-stage life cycle.</p> <p>OR</p> <p>The young of the butterfly does not resemble its adult but the young of the chicken resembles its adult.</p> <p><i>*Moulting is not accepted as the question asked for differences based only on the diagram.</i></p>
c	The butterfly lays many eggs at one time to increase the chances that some of the eggs would not be eaten by predators and would hatch to form larva. The larva would then develop into adults that can reproduce, ensuring the continuity of its own kind.
d	The larva stage. The larva feeds a lot on the leaves of the plants, damaging the farmers' crops.
e	<p>1) The larva feeds a lot but the pupa does not feed.</p> <p>2) The larva moults but the pupa does not moult.</p> <p>3) The larva can move from place to place but the pupa cannot move from place to place.</p>

Q7a	
b	<p>The adult stage. The adult mosquito has wings and is able to fly. Thus, it is hardest to catch and kill.</p>
c	<ol style="list-style-type: none"> 1) Pour away stagnant water. 2) Introduce fishes into the pond. 3) Pour a layer of oil onto the surface of the water. The layer of oil blocks the breathing tubes of the larvae and pupae and does not allow air to enter. This prevents them from taking in oxygen from the surrounding air, causing them to die.

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TOPIC: MAGNETS

Qn	Answer
Q1	1
Q2	3
Q3	3
Q4	2
Q5a	B: Any number between 0 to 3 inclusive C: 9
b	1) Increase the number of batteries in the circuit. 2) Increase the number of coils of wire around the iron bar.
c	No, I do not agree. We can only conclude that bar G is a magnet if it repels the magnetised iron bar F as only like poles of two magnets facing each other would repel. Since bar G was only attracted by iron bar F, we can only conclude that bar G is made of a magnetic material.
Q6a	Object M is a magnet. Rule #1: The magnet's magnetism acted at a distance and Rule #2: passed through the plastic table top, which is made of a non-magnetic material, Rule #3: to attract the steel toy car, which is made of a magnetic material. This caused the steel toy car to move to the right when object M moved to the right.
b	After being dropped on the ground several times, object M lost its magnetism. Thus, object M is only a magnetic material and is unable to attract the steel toy car.
c	The copper toy car will not move. Copper is a non-magnetic material and will not be attracted by object M.
Q7a	Metal bar Y. Metal bar Y can attract the paper clip from the furthest distance.
b	Choose any magnetic material: Steel/Iron/Nickel/Cobalt

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TOPIC: MATTER

Qn	Answer
Q1	4
Q2	3
Q3	2
Q4	3
Q5a	70 cm ³
b	130 cm ³ . Water has a definite volume and cannot be compressed.
c	Less than 600 cm ³ . There are air spaces between the marbles. As water does not have a definite shape, water can enter to displace the air, causing the total volume of the marbles and water in container A to be less than 600 cm ³ .
Q6a	Air occupies space in the cup and cannot escape. However, as air does not have a definite volume, some of the air in the cup was compressed and decreased in volume. This allowed some water to enter the cup to occupy the space previously taken up by the air.
b	Poke a hole at the base of the cup. The air in the cup escapes through the hole, allowing water to enter the cup to occupy the space previously taken up by the air.
c	With two holes in the lid of the can, air from the surroundings will enter the can through one hole to occupy the space of the condensed milk that is escaping through the other hole. This allows the condensed milk to flow out faster.
Q7a	While the coloured water has a definite volume and cannot be compressed, air does not have a definite volume and can be compressed. Thus, Sasa was able to push the plunger in.
b	15 ml *Any reasonable answer between 15 ml to 20 ml (not inclusive). Air can actually only be slightly compressed.

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TOPIC: LIGHT ENERGY

PROPERTIES OF LIGHT/LIGHT RAYS

Qn	Answer
Q1	1
Q2	2
Q3	Light from the Sun is reflected off the lady, which is then reflected off the side mirror of the motorcycle into the rider's eyes, enabling the rider to see the lady standing behind the motorcycle.
Q4a	5 objects G
b	1) Place more objects G closer to each other on the moving belt. 2) Increase the speed of the moving belt.
c	An object that is 5 cm in height cannot block light from the barcode scanner from reaching the light sensor. Thus, the light sensor still receives all the light from the barcode scanner, preventing the object from being detected.

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TOPIC: LIGHT ENERGY

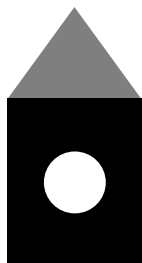
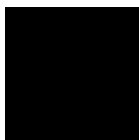


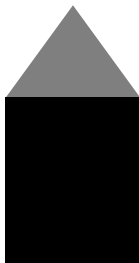
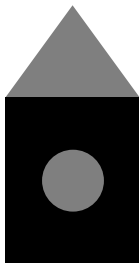
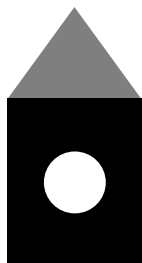
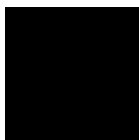


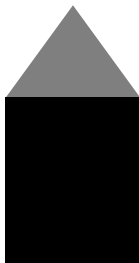
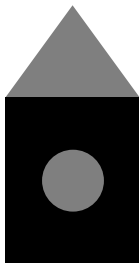
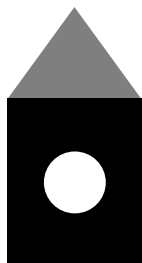
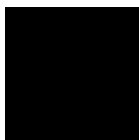


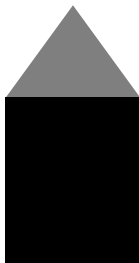
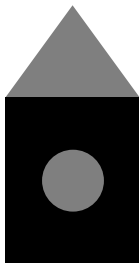
PROPERTIES OF MATERIALS

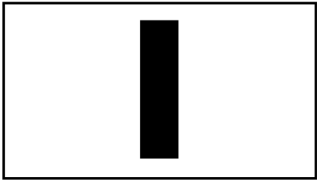
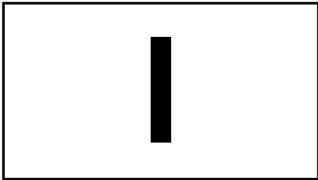
Qn	Answer
Q5	3
Q6	1
Q7a	<p>Choose: Material Z.</p> <p>Use Data: The amount of light detected by light sensor A is the most.</p> <p>Explain Data: This shows that material Z is the most reflective (Property). Thus, most light from the streetlamps would be reflected off the safety vest made of material Z, allowing the cyclist wearing the safety vest to be seen most easily (Purpose).</p>
b	<p>Choose: Material X.</p> <p>Use Data: The amount of light detected by light sensor B is the most.</p> <p>Explain Data: This shows that material X allows the most amount of light to pass through (Property). Thus, most light from the Sun would be able to pass through the windows made of material X into Stefanie's room, allowing her room to be lit most brightly (Purpose).</p>
Q8a	Cup Q blocks more light than cup P.
b	<p>Cup P: Frosted glass</p> <p>Cup Q: Metal/Wood/Ceramic</p> <p>Cup R: Clear glass/Clear plastic</p>
c	<p>10.30 am</p> <p>* Any reasonable time in the mid-morning.</p>

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TOPIC: LIGHT ENERGY

SHADOWS

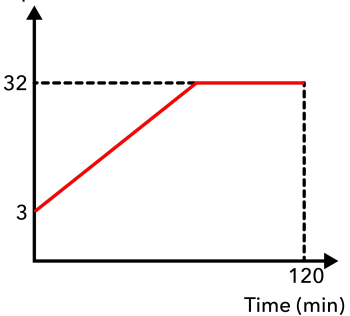
Qn	Answer														
Q9	4														
Q10	2														
Q11	3														
Q12a	<table><tr><td></td><td></td><td></td></tr><tr><td>Position <u>C</u></td><td>Position <u>A</u></td><td>Position ____</td></tr><tr><td></td><td></td><td></td></tr><tr><td>Position ____</td><td>Position <u>B</u></td><td>Position ____</td></tr></table>						Position <u>C</u>	Position <u>A</u>	Position ____				Position ____	Position <u>B</u>	Position ____
															
Position <u>C</u>	Position <u>A</u>	Position ____													
															
Position ____	Position <u>B</u>	Position ____													
b	The shadow of the object was formed when light from the torch, which travels in a straight line, was blocked by the metal block, which is opaque, and the triangular block made of frosted glass, which is translucent.														

Q13a	<div><div><p style="text-align: center;"><u>Screen P</u></p></div><div><p style="text-align: center;"><u>Screen Q</u></p></div></div>
b	The shadows will become smaller, darker, and sharper/clearer.

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TOPIC: HEAT ENERGY

HEAT TRANSFER

Qn	Answer
Q1	3
Q2	2
Q3	1
Q4a	47 °C
b	The temperature of the water increased. The metal piece conducted heat from the candle flame to the cooler water, causing the water to increase in temperature.
c	Heat travels from a warmer region to a cooler region.
Q5a	<p>Until the 100th minute, the temperature of the orange juice increased from 3 °C to 32 °C. From the 100th minute to the 120th minute, the temperature of the orange juice remained constant at 32 °C.</p> <p>The cooler orange juice gained heat from the warmer surrounding air and increased in temperature until the juice reached room temperature, which is 32 °C. Since the orange juice has reached room temperature, there is no temperature difference between the orange juice and the surrounding air. Thus, there is no more heat transfer between the orange juice and the surrounding air.</p>
b	<p>Temperature (°C)</p>  <p style="text-align: center;">Time (min)</p>

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TOPIC: HEAT ENERGY

CONDUCTORS OF HEAT

Qn	Answer
Q6	4
Q7	1
Q8a	The warmer water in the 3 cups lost heat to the cooler surrounding air and decreased in temperature.
b	<p>Choose: Material B.</p> <p>Use Data: The temperature of the water in the cup made of material B decreased the slowest.</p> <p>Explain Data: This shows that material B is the poorest conductor of heat (Property). Thus, the warmer food in a container made of material B would lose heat to the cooler surrounding air the slowest, allowing the food to be kept warm for the longest period of time (Purpose).</p>
Q9a	<p>Choose: Material T.</p> <p>Use Data: The temperature of the water in flask Q increased the most/fastest.</p> <p>Explain Data: This shows that material T is the best conductor of heat (Property). Thus, the base of a frying pan made of material T would conduct heat from the flame to the food the fastest, allowing the food to cook the fastest (Purpose).</p>
b	Air is a poor conductor of heat. Therefore, a jacket with air spaces conducts heat from our warmer body to the cooler surrounding air slowly, keeping us warm in a cold country.

P4 CCI™ SCIENCE COURSE

TOPIC: HEAT ENERGY

HEAT PROCESSES

Qn	Answer
Q10	1
Q11	2
Q12a	On a hot day, the tracks will gain heat from the Sun to expand and increase in volume . The gaps allow space for the tracks to expand, preventing the tracks from buckling and becoming damaged.
b	Measurement of 2.5 cm: 2 pm (Any reasonable answer from 12 pm to 4 pm) Measurement of 3.5 cm: 6 pm Any reasonable answer after 4 pm)
Q13	Jimmy can first heat the metal rim over a flame. The metal rim will gain heat from the flame to expand and increase in volume. After fitting the rim around the cartwheel, he can immerse both the rim and the cartwheel in a basin of ice. The metal rim will lose heat to the ice to contract and decrease in volume, allowing the metal rim to fit tightly around the wooden cartwheel.