4.1 Working Scientifically: Variables, Fair Tests and Planning: 10-minute Pack

Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A hypothesis is a testable scientific idea. Which of these is a hypothesis: "Which cup looks nicest?" or "Adding a lid reduces the cooling of water because less energy is transferred to the surroundings"?

(1)

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2 Callum records the temperature of cooling water at regular 30 s intervals, starting at 0 s and ending at 180 s. List all the recording times and state how many readings he will take, including the first and last.

(2)

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3 Yusuf uses a measuring cylinder to prepare water for a dissolving investigation. The scale from 20 ml to 30 ml is divided into five equal intervals. The bottom of the meniscus is three intervals above 20 ml. Calculate the volume of water.

(2)

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4 Priya times how long a trolley takes to travel a marked distance from one fixed ramp height. She records 1.8 s once and wants to judge how consistent this result is. Describe a suitable repeat procedure and explain what the extra readings would show.

(2)

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5 A class investigates how daily water volume affects seedling growth over seven days. They have similar seedlings of one species in identical pots with the same soil. Describe how to measure growth and give two further conditions to keep the same.

(3)

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Mark scheme · 4.1 Working Scientifically: Variables, Fair Tests and Planning: 10-minute Pack

Question 1

Selects the statement about adding a lid and cooling. **B1**

Answer: **Adding a lid reduces the cooling of water because less energy is transferred to the surroundings.**

Question 2

All seven times in the correct sequence, including 0 s and 180 s. **B1**

Seven readings, including both endpoints. **B1**

Answer: **0, 30, 60, 90, 120, 150 and 180 s; seven readings.**

Question 3

Finds the interval size using (30 - 20) / 5 = 2 ml. **M1**

26 ml, from 20 + 3 x 2, dependent on a correct method. **A1**

Answer: **26 ml.**

Question 4

Repeats under the same conditions, including the same height and measured distance. **B1**

Uses the spread or agreement of repeated times to assess consistency; allow spotting a possible anomalous result for checking. **B1**

Answer: **Repeat the timing at the same height and distance with the same trolley and release method. Compare the times to judge their spread and identify a result that may need checking.**

Question 5

Measures start and end stem heights from the same reference point and uses the increase in height. **B1**

One valid further control: light exposure, temperature or growth period. **B1**

A second distinct further control from that list; allow other justified conditions affecting growth except daily water volume. **B1**

Answer: **Measure each stem height at the start and after seven days and find the increase. Keep light exposure and temperature the same.**

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