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90191

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Level 1 Science, 2004

90191 Describe aspects of physics

Credits: Five
2.00 pm Wednesday 17 November 2004

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

Show ALL working.

If you need more space for any answer, use the page provided at the back of this booklet and clearly number the question.

Formulae and symbols that you may find useful are given on page 2.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Achievement Criteria *For Assessor's use only*		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Describe aspects of physics. ☐	Explain aspects of physics. ☐	Discuss aspects of physics. ☐
Overall Level of Performance ☐		

The following may be useful.

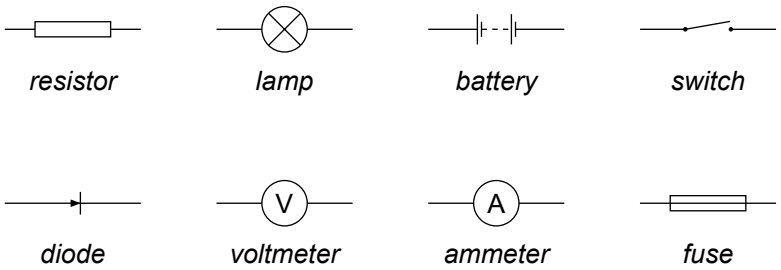
$V_{\text{average}} = \dfrac{d}{t}$ $\quad F = ma$ $\quad a = \dfrac{\text{change in speed}}{\text{change in time}}$

$E_{\text{p}} = mgh$ $\quad F_{\text{gravity}} = mg$ $\quad E_{\text{k}} = \dfrac{1}{2}mv^2$

$Work = Fd$ $\quad P = \dfrac{E}{t}$ $\quad V = IR$ $\quad P = IV$

$g = 10 \text{ m s}^{-2}$

$g = 10 \text{ N kg}^{-1}$



You are advised to spend 40 minutes answering the questions in this booklet.

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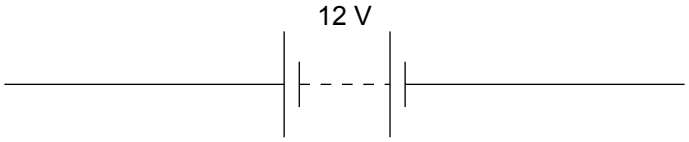
QUESTION ONE: ELECTRICITY

Marty is the coach of the local women's cricket team.
Marty decides to rewire the lights on the team's trailer. He knows that the lights need to be wired in parallel.

(a) Complete the following circuit diagram to show the two light bulbs in parallel to each other, connected to the 12 V battery.



(b) Marty placed a voltmeter across one of the bulbs in the circuit.

What would be the voltage reading?

Voltage = _____ V

(c) Discuss the advantages of wiring the bulbs in **parallel** rather than in series.

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Marty can only find two different bulbs, a 6 W bulb and a 12 W bulb. He connects these two bulbs into the trailer circuit. One shines more brightly than the other.

(d) Explain why the 12 W bulb shines more brightly than the 6 W one.

(e) Calculate the current passing through the **6 W** bulb. Include an appropriate unit.

Current = _____ _____ (unit)

(f) Calculate the resistance of the **12 W** bulb.

Resistance = _____ Ω

QUESTION TWO: THE GAME BEGINS!

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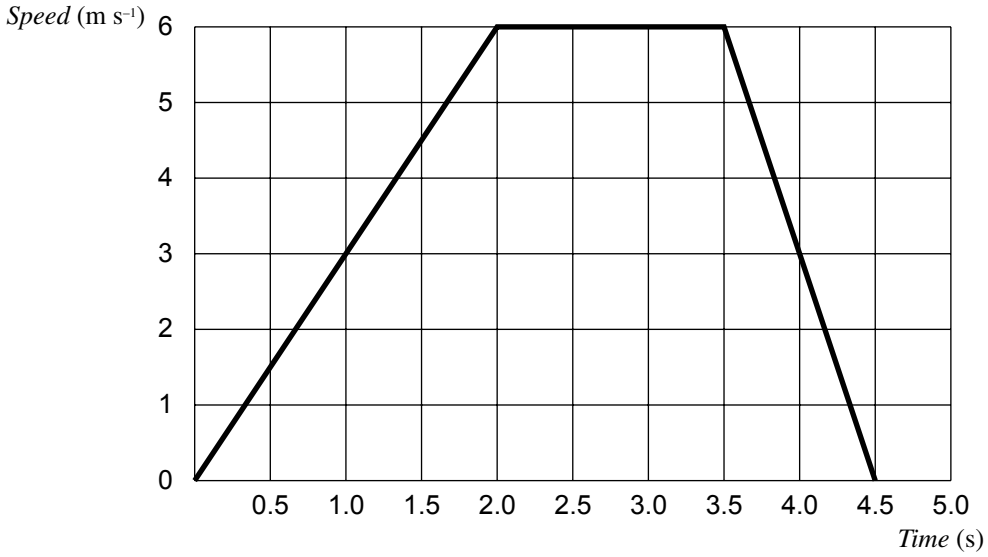
In the team's first game, Jacki is the opening bowler. The speed-time graph below shows the motion of Jacki as she runs in to bowl.

Speed-time graph for Jacki's run



(a) What is the maximum speed Jacki reaches?

Speed = _____ m s^{-1}

(b) Fully describe the motion of Jacki between 2.0 s and 3.5 s.

_____

_____

(c) Use the formula $a = \frac{\text{change in speed}}{\text{change in time}}$ to calculate Jacki's acceleration between 0 s and 2.0 s.

_____

_____

_____

Acceleration = _____ m s^{-2}

(d) Using the speed-time graph, calculate the **total distance** travelled by Jacki as she ran in to bowl.

_____

_____

_____

_____

Distance travelled = _____ _____ (unit)

QUESTION THREE: THE GAME CONTINUES

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Jacki's team bats later in the day. When Jacki first strikes the ball, she hits it badly and it travels straight up.

(a) At its highest point, TWO **vertical forces** act on the ball. On the diagram below, use arrows to **draw** and **name** these two forces.

(b) Explain whether the forces are balanced or unbalanced at the highest point.

(c) The ball left the bat with an initial speed of 20 m s^{-1}. The mass of the ball is 160 g (0.16 kg). Use the formula $E_k = \frac{1}{2} mv^2$ to find the initial kinetic energy of the ball.

Kinetic energy = _____ J

(d) Assuming that the energy is conserved throughout the upward flight of the ball, calculate the maximum height reached by the ball.

Maximum height reached = _____ _____ (unit)

QUESTION FOUR: REFRESHMENTS

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Marty brings a vacuum flask of hot coffee with him to the game. A simplified diagram of a vacuum (or thermos) flask is shown.

[For copyright reasons, this resource cannot be reproduced here. See below.]

Adapted from p80
'Steps in Physics' John Byron,
Oxford University Press (1980)

(a) Name the process by which heat travels through a **metal**.

(b) Name the process by which heat travels through a **vacuum**.

(c) Explain how a plastic stopper in the top of the flask stops heat transfer better than a metal stopper.

(d) A vacuum flask is made to keep drinks hot. **Discuss** how the flask shown above is able to keep the drink hot.

Extra paper for continuation of answers if required.
Clearly number the question.

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Question number