NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1 Science, 2009

90191 Describe aspects of physics

Credits: Five

9.30 am Monday 23 November 2009

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.

If you need more space for any answer, use the page(s) 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 2–12 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.

For Assessor's use only	Achievement Criteria			
	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.

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

$$E_p = mgh \qquad F_{gravity} = mg \qquad E_k = \frac{1}{2}mv^2$$

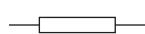$$\text{Work} = Fd \qquad P = \frac{E}{t} \qquad V = IR \qquad P = IV$$

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

$$g = 10 \text{ N kg}^{-1}$$
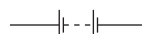
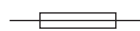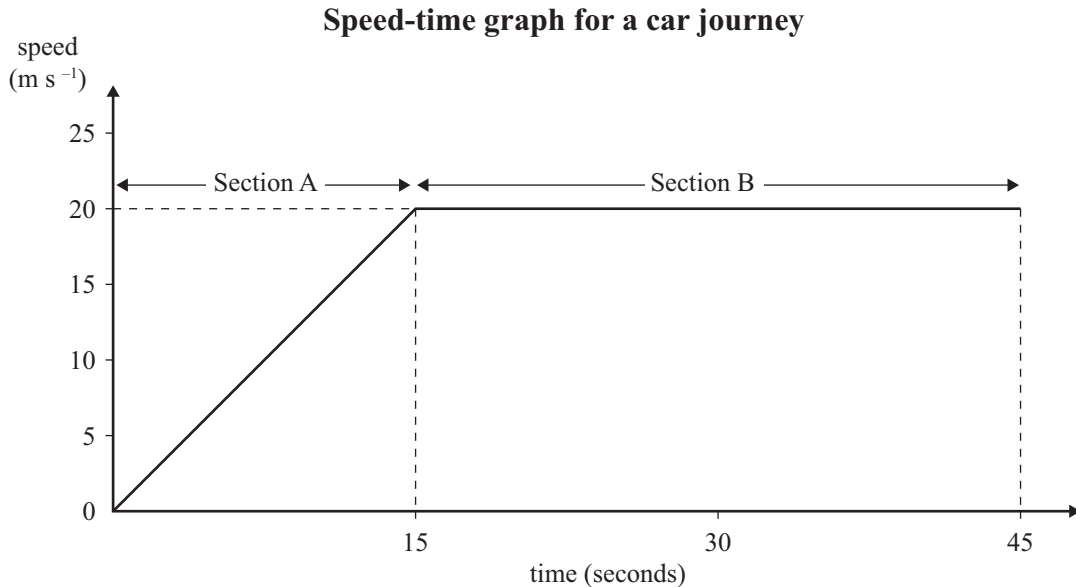| resistor	lamp	battery	switch

voltmeter	ammeter	fuse

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

QUESTION ONE : A CAR JOURNEY

The speed-time graph below represents part of the journey of a car.

Speed-time graph for a car journey

The motion of the car is different between section A and section B.

(a)   Use the mass of the car ($m = 1\,200$ kg) and information from the graph to calculate the net force acting on the car in section A, **and** in section B. Include the unit in your answer.

Net force calculation for section A

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_____ net force for section A = _____ (_____)
                                                                          unit

Net force calculation for section B

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_____ net force for section B = _____ (_____)
                                                                          unit

(b) Discuss the forces that act on the car in sections A and B and explain how they affect the motion produced.

In your answer you should:

- state whether the forces are balanced or unbalanced in **each** section, and describe the **resulting** motion of the car in **each** section
- explain why the **net force** results in the different type of motion described in each section.

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QUESTION TWO: ENERGY

The same car now drives 25 m up a slope and stops.

5000 N
25 m
10 m

(a) Calculate the work done by the car as it travels up the slope, and give the appropriate unit.

Work = _____ (_____)
unit

(b) The energy gained by the car ($m = 1\,200$ kg) at the top of the slope does not equal the work done.

Discuss why these two values are not equal.

In your answer you should:
• name the type of energy the car has, when stopped at the top of the slope
• calculate the difference between the work done and the energy at the top of the slope
• explain where the "missing" energy has gone and why this occurs.
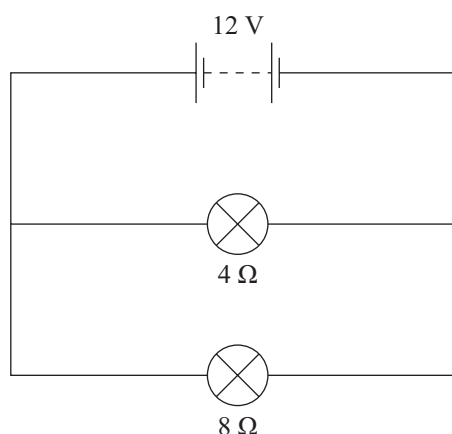
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QUESTION THREE : ELECTRICAL CIRCUITS

Study the following two circuits which contain two lamps of **different** resistance.
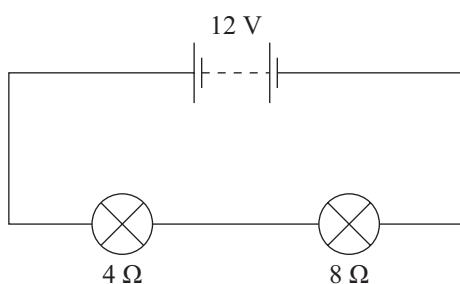
Circuit A   **Circuit B**

When observed, the brightness of the two lamps in each circuit is **not** the same.

(a) Explain **why** the voltage for the 4Ω lamp in **circuit A** is lower than the voltage for the 4Ω lamp in **circuit B**. A calculation is NOT required.

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(b) Calculate the **current** flowing through the 4Ω lamp in **circuit B**.

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_____ Current in circuit B = _____ A

(c) State in which circuit the 4Ω lamp will be brightest, and justify your choice.

In your answer you should:

- explain the link between resistance, current, voltage and power output to brightness.
- compare, by calculation, the power output of the **4Ω** lamp in **each** circuit, giving the appropriate unit.

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Question Four is on the following page.

QUESTION FOUR: THE HOT-WATER CYLINDER

Water can be heated by a hot-water cylinder. The water in the cylinder is heated by an electric element made from metal, placed near the base of the cylinder as shown in the diagram.

Discuss how the water heats in the water cylinder **and** why it is important to take the hot water out from the top of the cylinder rather than the bottom.

In your answer you should include:
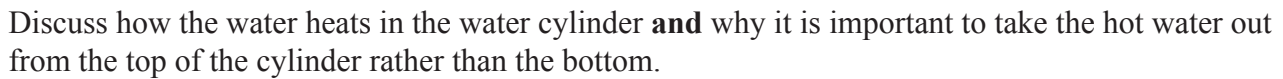
• a description of any heat transfer process(es) involved **in terms of particles**
• named arrow(s) on the diagram above to show any heat transfer
• an explanation of why metal is used for the heating element
• an explanation of why the hot-water exit is placed at the top.

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

Question number	

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