

2014 Senior External Examination

Physics

Paper Two — Question book

Monday 10 November 2014

1 pm to 3:10 pm

Time allowed

- Perusal time: **10 minutes**
- Working time: **2 hours**

Examination materials provided

- Paper Two — Question book
- Paper Two — Resource book
- Paper Two — Response book

Equipment allowed

- QCAA-approved equipment
- ruler graduated in millimetres
- non-programmable calculator
- graphing calculator

Paper Two is an **open book** examination. You may refer to any paper-based material that you have brought into the examination room.

Directions

You may write in this book during perusal time.

Paper Two has **six** questions that assess Complex reasoning processes.

Attempt **all** questions. Show all working.

Assessment

Paper Two assesses the following assessment criterion:

- Complex reasoning processes

Assessment standards are at the end of this book.

After the examination session

Take this book when you leave.

Planning space

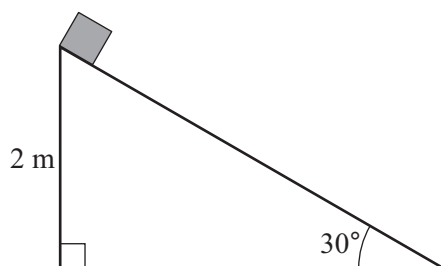
Complex reasoning processes

Paper Two has **six** questions. Attempt **all** questions.

Write your responses in the response book. Show all working.

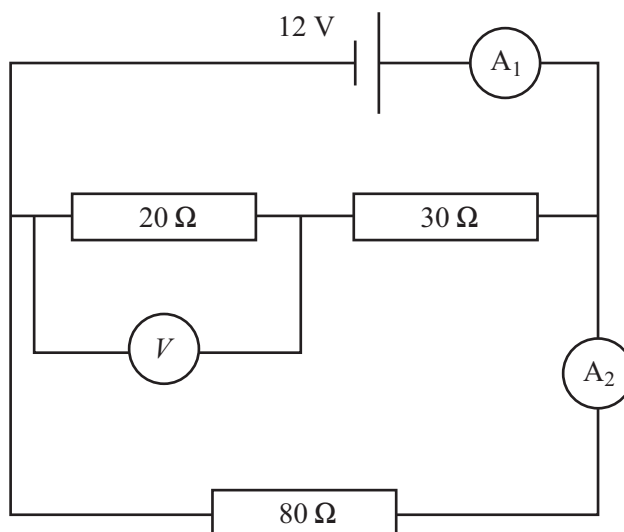
Question 1

A mass of 10 kg is placed onto an inclined plane as shown in the diagram below. Given a frictional force of 20 N directed against the motion of the mass, how long would it take to reach the bottom of the plane?



Question 2

Consider the circuit below. What are the readings on each of the meters?



Question 3

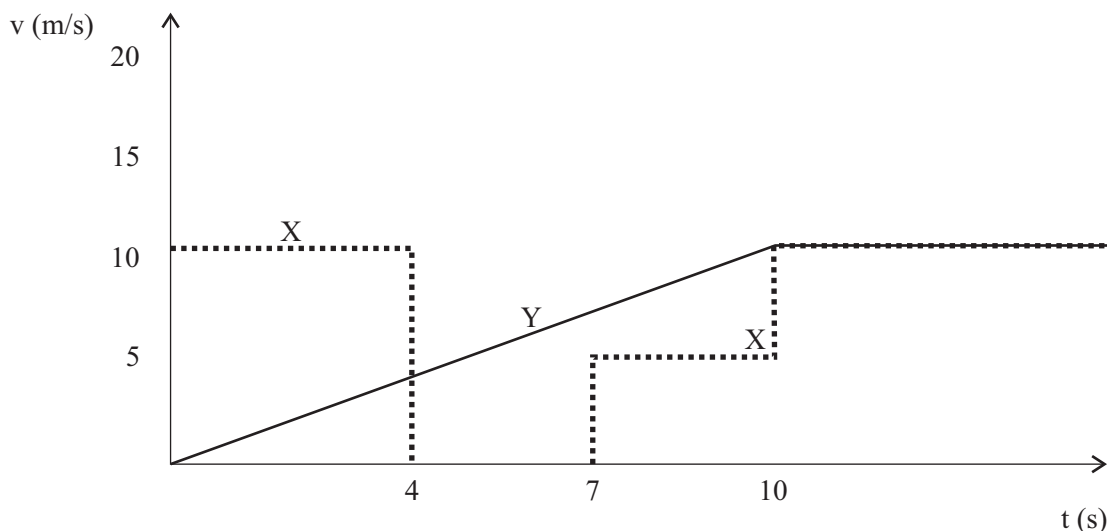
Trampolinists use the elastic energy of the trampoline and energy from their legs to achieve significant heights. An 80 kg person stands on a trampoline, which sinks down 20 cm.

Given that the trampoline is 120 cm off the ground and can be depressed to the ground, what is the maximum height above the ground that the trampoline alone could project the person?

Question 4

Two runners, X and Y, complete a race as shown on the graph below. Their velocities differ over the first 10 seconds of the race as indicated, but after this period they maintain a constant velocity of 10 ms^{-1} until the end of the race, which the winner completes in a time of 20 seconds.

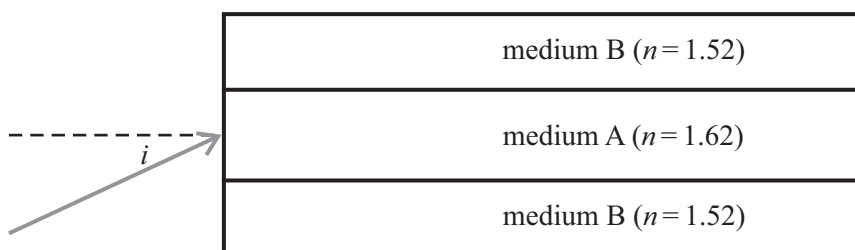
- Who won the race?
- How much later did the second runner cross the finish line?



Question 5

The diagram below shows a light ray entering medium A (refractive index $n = 1.62$) from a vacuum. Medium A is sandwiched between two layers of medium B (refractive index $n = 1.52$).

What must the maximum value of the incident angle i be for the light ray to totally internally reflect in medium A?



Question 6

A rocket has a mass of 50000 kg, which includes 30000 kg of fuel. It expels exhaust from its engines at a velocity of 5000 m/s at a rate of 75 kg/s until its fuel supply is exhausted.

Assuming the rocket is in space and not significantly influenced by gravitational fields, what is the average acceleration of the rocket during the time of engine operation?

End of Paper Two

Assessment standards from the Physics Senior External Syllabus 2000 (amended 2003)

Paper Two

Criteria	Very High Achievement	High Achievement	Sound Achievement	Limited Achievement	Very Limited Achievement
Complex reasoning processes	A high ability to use complex reasoning in challenging situations involving the candidate's understanding of subject matter and a high ability to use scientific processes at an advanced level.	Competence in using complex reasoning in challenging situations involving the candidate's understanding of subject matter and competence in using scientific processes at an advanced level.	Some success in using complex reasoning in challenging situations involving the candidate's understanding of subject matter and some success in using scientific processes at an advanced level.		

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