



SCHOLARSHIP EXAMINATION

PHYSICS

2013

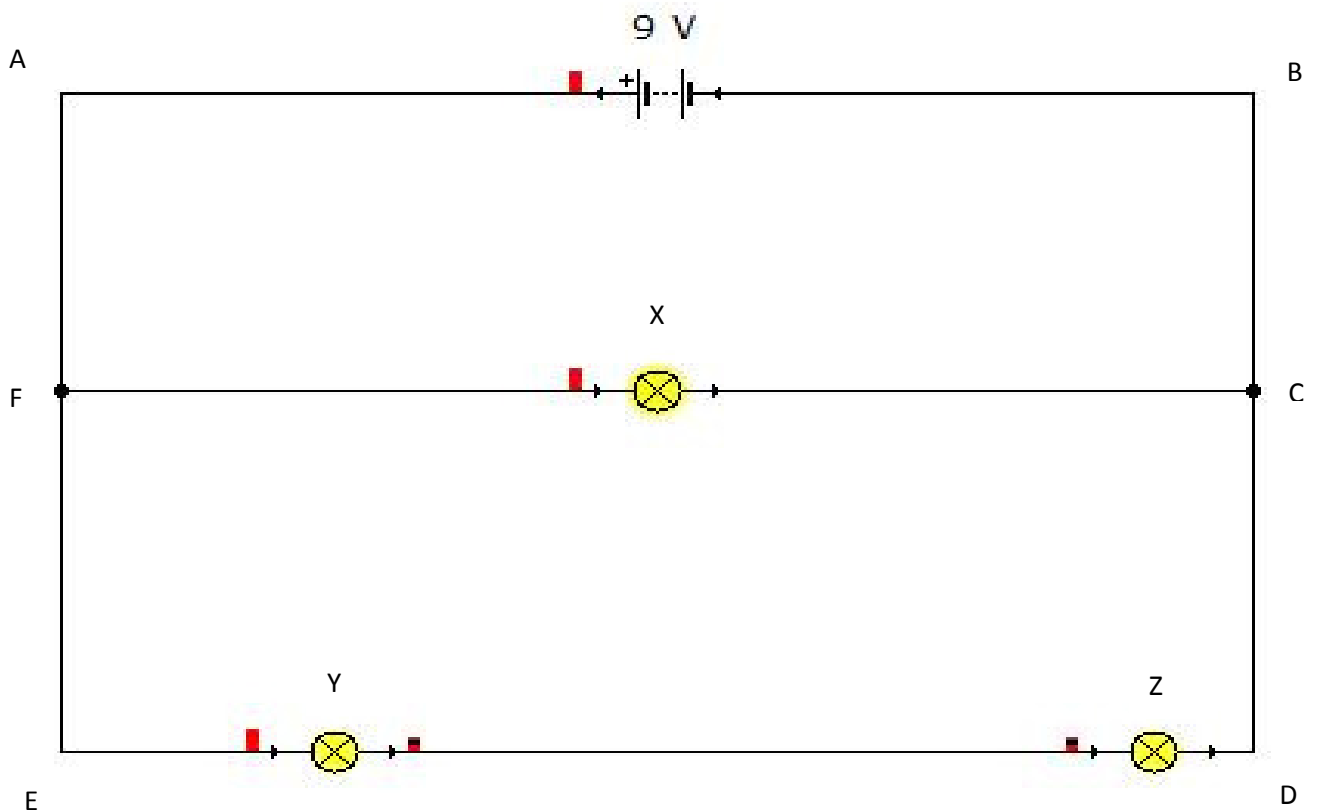
Time: 30 minutes

Name:

School:

*Candidates will need a pen, pencil and ruler
and a calculator should be used for this paper*

- 1 In the circuit below the bulbs X, Y and Z are identical. When Y is connected to the battery alone it is lit to normal brightness.



- a) Describe the brightness of Bulb X above. (1)

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- b) Describe the brightness of bulb Z. (1)

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- c) Add a component to the circuit diagram that would allow you to dim the brightness of bulb X, but not Y or Z. (2)

- d) Add a meter to the diagram that will measure the current flowing through bulb Y. (2)

e) Explain what you could do to the circuit in order to make the bulb Z brighter. (1)

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f) The current flowing from the battery is 0.7 A and the current flowing through Z is 0.3 A. What current will be flowing through bulb X? (2)

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g) Are bulbs Y and Z connected in series or parallel? _____ (1)

2 A see-saw is 4m long from seat to seat and is pivoted in the middle.

Dad weighs 900N, Mum 750N and their son Jim 200N.

Mum and Dad sit on the seats and then Dad has to move to make it balance.

a) Draw a diagram showing the see-saw balanced with arrows representing the weights and showing any known distances. (3)

b) How far did Dad have to move to balance the see-saw? (3)

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Mum and Dad sit on the see-saw seats and Jim climbs on above the pivot. He then walks towards Mum.

c) How far does he need to walk to get the see-saw to balance? (3)

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3 John and Jane see some workmen building a fence on the far side of the school playing fields. John notices that when the hammer hits the post they hear no sound until about a second later.

a) Why is there a delay? (2)

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Jane says that they can use this to measure the speed of the sound waves. They measure the distance from their observation position to the fence post with a trundle wheel as 450m. They then get the workmen to hammer on the post and time the sound several times, starting the watch when the hammer strikes the post and stopping it when they hear the sound.

b) Why should they repeat the timings? (1)

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Their times were 1.5s, 1.4s, 1.5s, 1.3s, 1.4s, and 1.3s

c) Use the data to calculate the speed of sound.(Show your working) (4)

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Due to human reaction times the timings covered a range of 1.3 to 1.5 seconds. Jane suggests that the timing could be done with much more precision using a digital video camera. These capture 25 images per second and can be played backwards or forwards one frame (picture) at a time.

d) Show that the time between consecutive frames is 0.04s. (1)

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e) The frames each show the time since the record button was pressed and the sound level detected by the built in microphone. Describe how the camera could be used to measure the time more precisely than with a stop watch. (3)

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