WESTMINSTER SCHOOL
THE CHALLENGE 2018

PHYSICS

Thursday 3 May 2018

Time allowed: 30 minutes

Please write in black or blue ink.
Calculators are allowed.
Write your answers in the spaces provided.

For examiner use only

Total Mark		

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P1 (Multiple Choice – 10 marks)

Choose A,B,C,D or E for each of the following questions.

a) Which of these values is an appropriate estimate of the weight of a football?

A: 0.5 kg *B: 5 lb* *C: 5 N* *D: 50 g* *E: 50 N*

b) A cyclist travels along a straight road at 45 km/h. After 12 minutes he has travelled

A: 9 m *B: 540 m* *C: 3.75 km* *D: 9 km* *E: 32.4 km*

c) Which of the following words best describes the particles in carbon dioxide gas at room temperature?

A: atoms *B: molecules* *C: ions* *D : electrons* *E : neutrons*

d) This January 2018 there was a widely publicised supermoon. A supermoon occurs when the full moon

A: is bigger than usual *B: is closer than usual* *C: is nearer the horizon*

D: occurs twice in one month *E: coincides with a lunar eclipse*

e) A girl is on a train travelling at a steady speed of 10m/s. As the train passes a station, she throws a ball at 2 m/s relative to her in the opposite direction to the train. It lands after 1.5 seconds. How far does the ball travel whilst airborne when viewed from the station platform?

A: 3m *B: 12m* *C: 13 m* *D: 15 m* *E: 18 m*

f) In a cinema film that shows 24 frames per second, a 12-spoked stagecoach wheel appears stationary. The time, in seconds, taken for one rotation of the stagecoach wheel is:

A: 1/9 *B: 1/3* *C: ½* *D: 2* *E: 12*

g) A boy of mass 50 kg balances symmetrically on two stilts, each having an area of 10 cm^2 in contact with the ground. The pressure exerted by one stilt, in Newtons per square centimetre, is

A: 50 *B: 25* *C: 5* *D: 2.5* *E: 0.5*

h) When a moving car is brought smoothly to rest by application of the brakes, the kinetic energy of the car is mostly converted to

A: potential energy in the engine

B: potential energy in the brakes

C: sound energy

D: heat in the brakes

E: heat in the road surface

i) A pupil suggests three ways of increasing the resistance of a length of wire:

(i) using a longer length of the same wire

(ii) using the same length of a wire made of a more resistant material

(iii) Using a thicker wire of the same length and of the same material

Which of the suggestions do you think would work?

A: (i), (ii) and (iii)

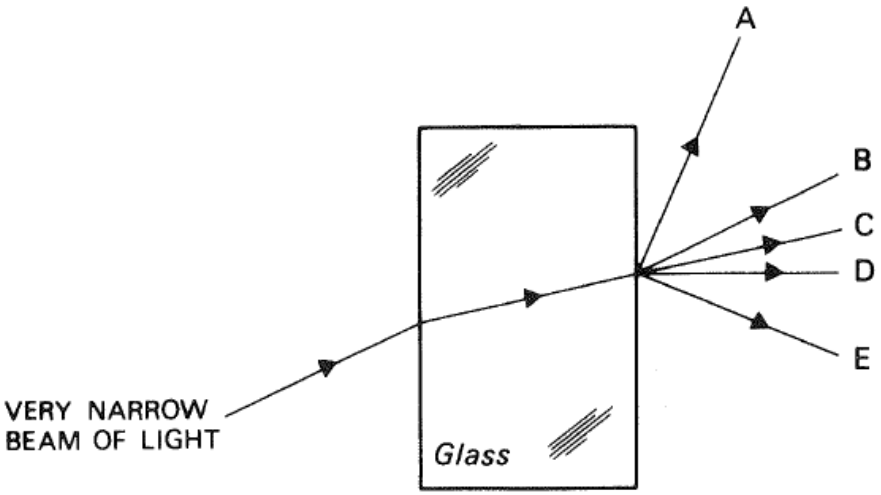
B: (i) and (ii) only

C: (i) and (iii) only

D: (iii) only

E: some other response

j) A very narrow beam of light passess through a thick block of glass. Along which path will it emerge? Ring the letter for the correct path.



Short answer Questions

P2

When viewed from a point about the North Pole of the Earth, all the motions of the Earth and the Moon appear anticlockwise.

a) Sketch a diagram of the Moon and Earth, relative to the Sun's position (not to scale), with arrows to show the directions of the orbital and rotational motions of the Moon and Earth.

[3]

b) As the Moon orbits the Earth, the same face of the Moon always points towards the Earth. Because of this, the Moon is said to be "tidally locked" to the Earth. The far side of the Moon is often called the dark side of the Moon. Explain why the phrase "dark side of the Moon" is misleading. You should include a diagram.

[3]

P3

This question is about sand on a beach.

a) Estimate the width of a grain of sand:

_____ unit _____

[1]

b) Use your estimate in a) to determine the number of grains of sand on a beach that is 1.1 km long, 500 m wide and with an average depth of sand of 2.0 m.

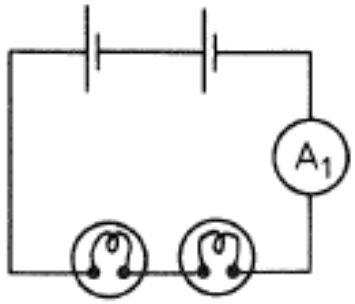
Marks will be awarded for clear working.

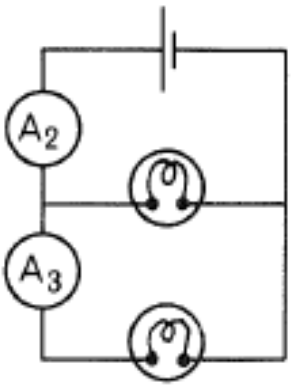
[3]

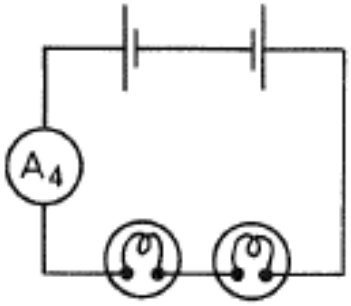
P4 ELECTRICITY

In the following circuits, similar lamps, ammeters and cells of negligible internal resistance are used. **When one cell is connected in series with a lamp and an ammeter, the reading on the ammeter is 0.2 A and the lamp shines with normal brightness**.

a) Write down the readings of the ammeters numbered 1 – 4 in each of the following circuits:

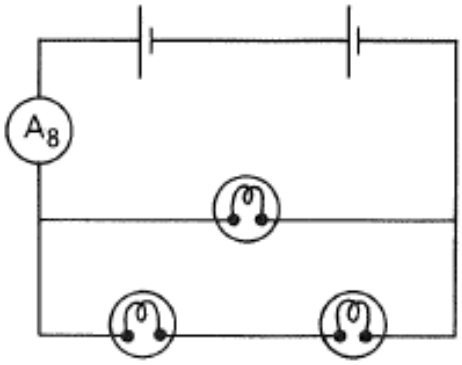






[4]

b) Comment on the brightness of the lamps in the following circuit:



[2]

c) Suggest the reading shown by the ammeter in the circuit above.

[1]

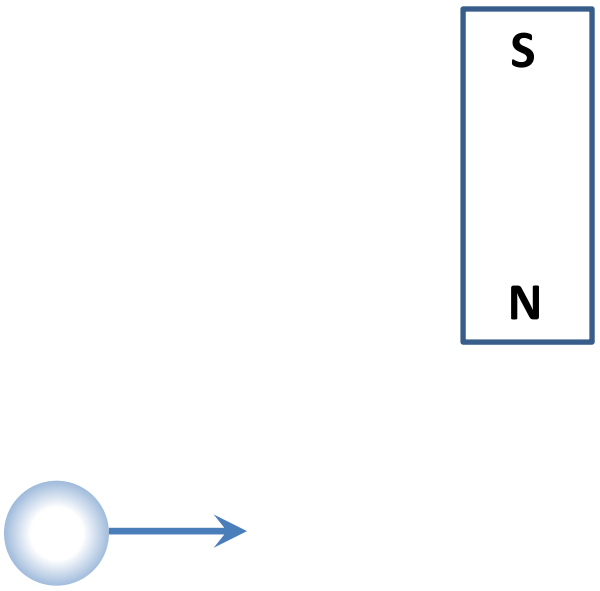
d) Draw a circuit to show how you could connect a battery, bell and two push switches so that the bell could be rung at the front door of a house or at the back door?

Nb, symbol for a bell: 

[3]

P5

A steel sphere rolls towards a magnet as shown in the diagram below. The initial direction of the steel sphere has been shown.



a) Trace the path of the sphere on the diagram.

[2]

b) State how, if anything, the path of the steel sphere will change if the poles of the magnet are reversed.

[1]