AQT

Please write blurily in block capitals.

Your number | | | | | | Your PIN | | | | |

Username _____

Password _____

Candidate signature _____

A-level PHYSICS

Paper D

Friday 8 June 2018 Morning Time allowed: 2 hours

Materials (the worst topic)

For this paper you could have:

- The answers
- Intelligence
- A sense of humour

Instructions

- Use white ink or white ball-point pen (do me a favour and don't subject me to your god-awful handwriting).
- Colour in the boxes at the top of this page.
- Answer **all** questions that you don't want. You deserve pain.
- You must read the questions and answer the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book ($\mu \neq 0$). Cross through any work you do not want to be marked. Also cross out the ones you do; save me time.
- Show no working to prove you're smart, and by doing so inexplicably prove you are not.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper would have been 85 if I could make enough questions.
- You are expected to use a scientific calculator where appropriate, for example the explain questions.
- A Data and Formulae Booklet is provided as a loose insert. In fact it's so loose it got lost on its way to being on your desk.

For Use	
Question	Mark?
1	
2	
3	
4	
5–29	
TOTAL	

Do not write outside the box or else

Section A

Answer **all** questions in this section.

0 1 . 1 **Figure 1** shows the decay of a neutron to a proton.

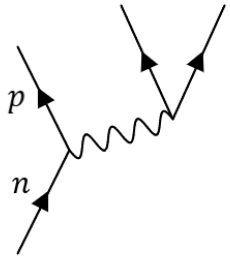


Figure 1

List all possibilities for the two missing particles. Explain which is most likely.

[2 marks]

That's a nice family you got there. Do not write outside the box

0 1 . 2 Daft Dale has come up with a particle diagram shown in **Figure 2.**

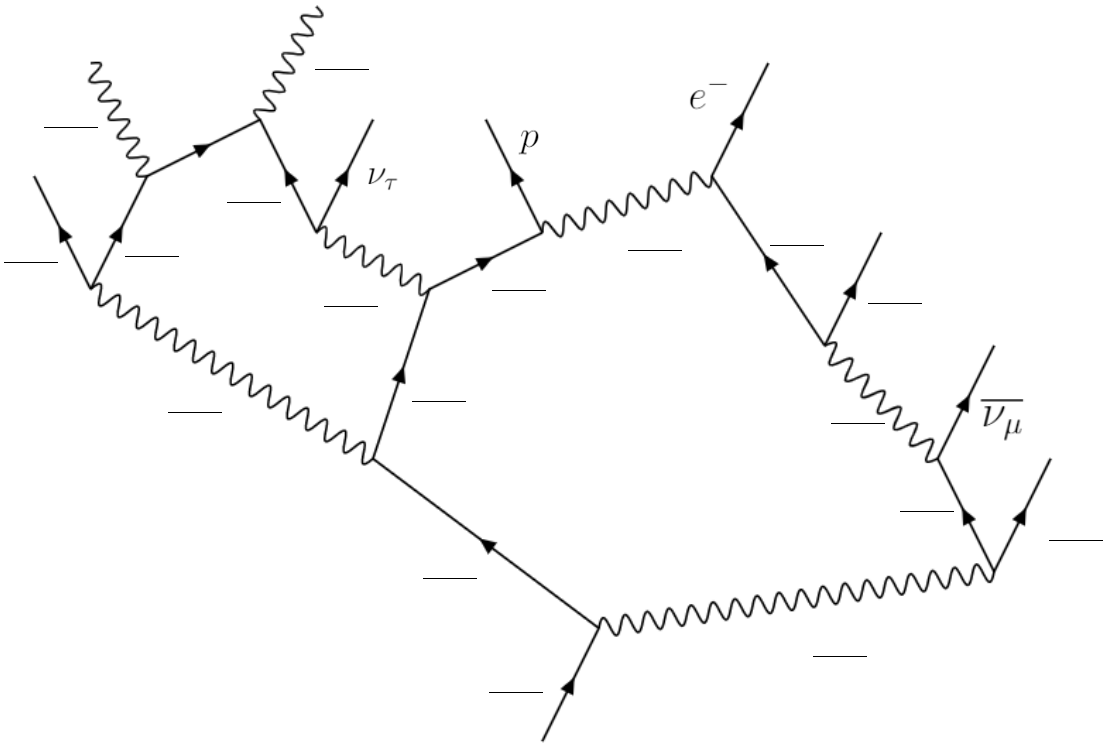


Figure 2

Fill in the missing particles in **Figure 2**.

[6 marks]

0 1 . 3 Explain two reasons why it is incredibly unlikely for the above interaction to occur.

[4 marks]

12

Turn over for the next question

This is Terry→웃 Bad things can happen to him. Do not write outside the box

0 2 . 1 **Figure 3** shows a network of an infinite series of 1Ω resistors.

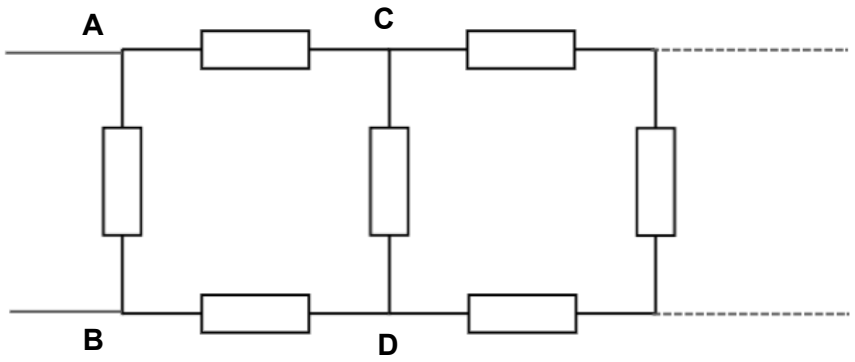


Figure 3

Given that the potential difference between A and B is effectively the same as the potential difference between C and D, find the overall resistance R, between the points A and B

[5 marks]

R = _____ Ω

0 2 . 2 **Figure 4** shows a network of identical 1Ω resistors. **Figure 5** shows the same network drawn in a different way .

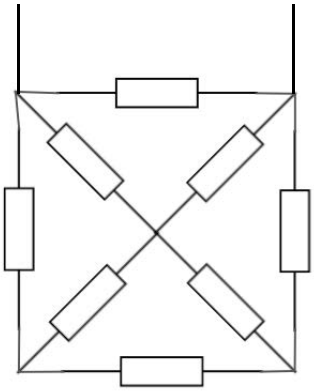


Figure 4

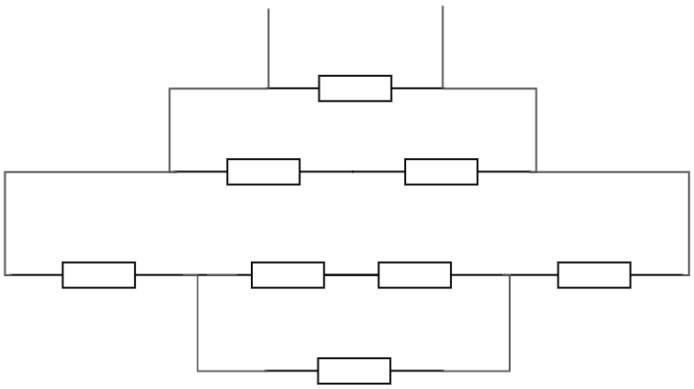


Figure 5

Figure 6 shows a similar network.

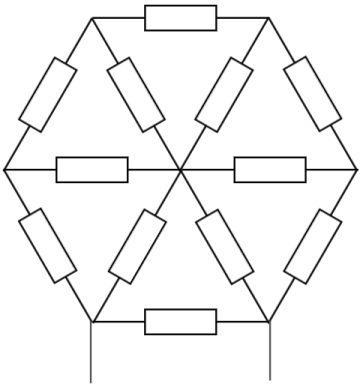


Figure 6

Draw a similar network to **Figure 5** for **Figure 6**. **[6 marks]**

0 2 . 3 What is the resistance of a network of 1Ω resistors similar to **Figure 6**, but of a polygon with an infinite number of sides?

[7 marks]

Ur ugly

Do not write outside the box

_____ Ω

18

Turn over for the next question

0 3 . 1 **Figure 7** shows a 2x1m block of unit uniform mass sat against a wall.

Figure 7

Explain how far you could place a second identical block over it without it falling over. **[2 marks]**

0 3 . 2 If I added another block under the stack, how far along it could I move the stack?

Distance = _____ m **[4 mark]**

Do not write outside the box

People who do:

Find STEP easy

Probably speak to the manager

Use an iphone

Laughed when Mufasa died.

Thinks there's more doors than wheels

0 3 . 3 For a stack of n blocks that are stacked so that the topmost block reaches the furthest distance from the wall, derive a suitable equation for the distance from the wall of the second block from the bottom.

[2 marks]

Do not write outside the box

Or the box will write on you

0 3 . 4 How many blocks are required for the stack to reach a distance of 4m?

[6 mark]

Number of blocks= _____

14

Turn over for the next question

Do not write outside the box

We'll find out

0 4 . 1 A particle is projected from the ground at an angle θ and a speed of u. Given that $\sin(2x)=2\sin(x)\cos(x)$, find the angle which produces the largest horizontal distance

[4 mark]

angle = _____ °

0 4 . 2 Explain where along a particle's trajectory is the distance from its point of projection maximized

[3 marks]

0 4 . 3 Show that if the particle was projected at this angle, that the angle does not maximize the maximum distance of the particle's trajectory to the point of projection.

[6 mark]

0 4 . 4 Find an angle that produces a distance greater than the greatest distance produced by the angle found.

[3 marks]

angle = _____ °

16

END OF SECTION A

Section B

Each of Questions **08** to **32** is followed by four responses, **A**, **B**, **C** and **D**.

For each question select the best response.

21 dumb ways to die have just become 22

Do not write outside the box

Only **one** answer per question is allowed.
For each answer completely fill in the circle alongside the appropriate answer.

CORRECT METHOD 

WRONG METHODS 

If you want to change your answer you must cross out your original answer as shown. 

If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown 

You may do your working in the blank space around each question but this will not be marked. Do **not** use additional sheets for this working.

0 5 When a material is unstretched, it has a resistivity of ρ, and a resistance of R. It also has a Hooke's constant of k, Young Modulus of E. What is the Young modulus of a material with corresponding values 4ρ, 2R and 2k?

[1 mark]

A E

B 2E

C 4E

D 8E

You'll still get marks. Just not the kind you were expecting.

Do not write outside the box

0 6 Which pair of material properties are the same for any substance?

[1 mark]

A	Young Modulus	Resistivity	⬭
B	Tensile strain	Optical density	⬭
C	Relative permittivity	Young Modulus	⬭
D	None of the Above		⬭

0 7 Two huge nuclei with 10 protons are a distance of 1m apart. They are in equillibrium

How many neutrons do they have?

[1 mark]

A 3.5×10^{18} ⬭

B 2.1×10^{10} ⬭

C 1.3×10^{29} ⬭

D 8.8×10^{27} ⬭

0 8 A capacitor is partially discharged through a 1Ω resistor in series with an identical capacitor. It initially has 1 coulomb of charge and 1V of potential difference across it.

What is the potential difference across the second capacitor at the end of the discharge?

[1 mark]

A 0V ⬭

B $\frac{1}{e}$ V ⬭

C 0.5V ⬭

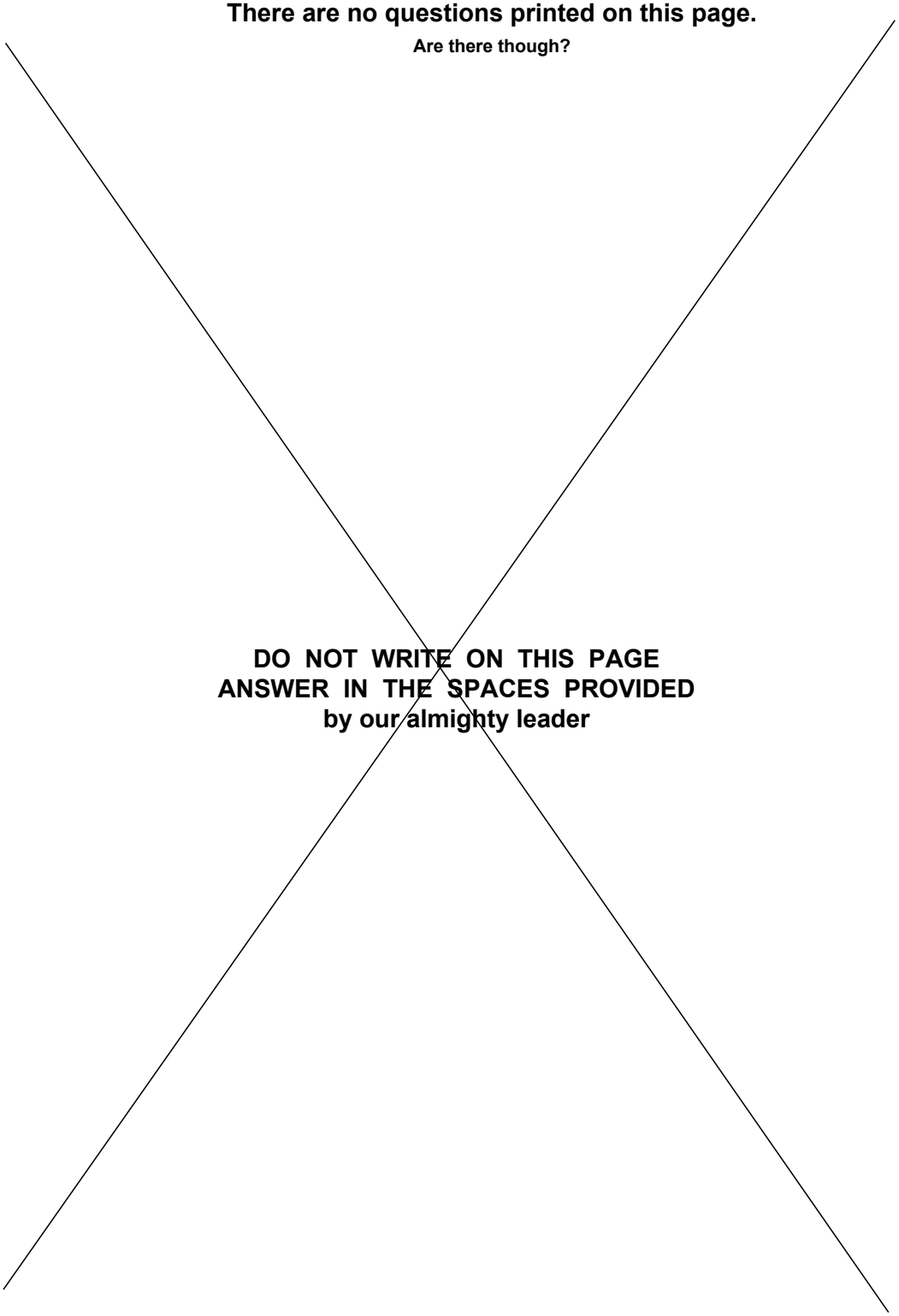
D 1V ⬭

END OF QUESTIONS (I got lazy)

I dare you

There are no questions printed on this page.

Are there though?



DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED
by our almighty leader