OXFORD

INTERNATIONAL AQA EXAMINATIONS

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

INTERNATIONAL GCSE

PHYSICS

Paper 1

Thursday 8 November 2018 07:00 GMT Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator
- the Physics Equations Sheet (enclosed).

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you worked out your answer.

Information
- The maximum mark for this paper is 90.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

Answer **all** questions

Do not write outside the box

0 1 **Figure 1** shows a computer.

Figure 1

0 1 . 1 The computer has a power rating of 0.30 kW.

Calculate the energy transferred by the computer when it is used for 5.0 hours.

Use the Physics Equations Sheet.

[2 marks]

Energy = _____ kWh

Do not write outside the box

0 1 . 2 Suggest **one** reason why the computer may transfer less energy than you calculated in Question **01.1**.
Tick **one** box.

[1 mark]

The computer may not always work at full power. ☐

The computer wastes some energy. ☐

The computer creates extra energy. ☐

0 1 . 3 During 1 week the computer transfers 12 kWh of energy.

cost per kWh = $0.15

Calculate the cost of using the computer for 1 week.

[2 marks]

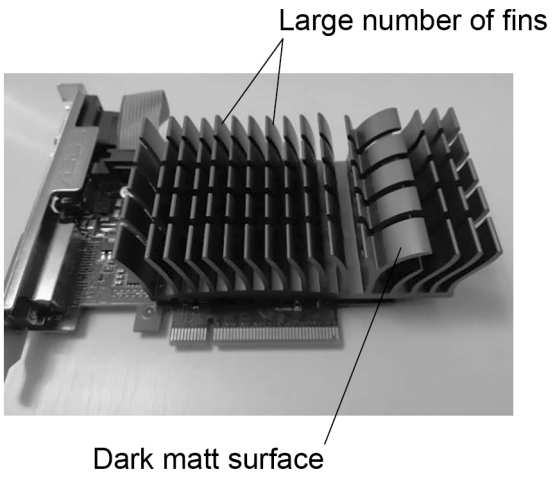
Cost = $ _____

Question 1 continues on the next page

While the computer is being used some of the components get hot.

Figure 2 shows one of the components that gets hot.

Figure 2



0 1 . 4 Some features of the component help it to transfer energy quickly.

Draw **one** line from each feature to the reason why it helps the component transfer energy quickly.

[2 marks]

Feature	Reason
Dark matt surface	gives a large surface area.
	increases the melting point.
	makes it a very good conductor.
Large number of fins	provides very good insulation.
	makes it a good emitter of infrared radiation.

Do not write outside the box

0 1 . 5 The fins are made of metal.

Why are metals good thermal conductors?

[1 mark]

0 1 . 6 Most of the radiation emitted by the component is infrared radiation.

Give **two** changes to the infrared radiation emitted by the computer component as the temperature of the component increases.

[2 marks]

1 _____

2 _____

0 1 . 7 The component emits a range of electromagnetic radiation.

What name is given to the electromagnetic radiation emitted at a particular temperature by the component?
Tick **one** box.

[1 mark]

- Black-body radiation ☐
- Cosmic radiation ☐
- Ionising radiation ☐
- Nuclear radiation ☐

11

Turn over for the next question

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0 2 A student is investigating magnetism.

0 2 . 1 Name **one** magnetic material.

[1 mark]

---

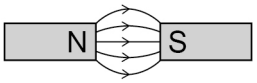
0 2 . 2 The student places two magnets close to each other.

Which diagram shows the correct magnetic field pattern in the region between the two magnets?

Tick **one** box.

[1 mark]

A



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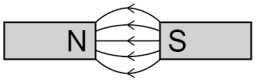

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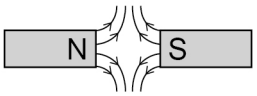

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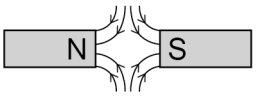


0 2 . 3 The two magnets are brought closer together.

What happens to the size of the force on each magnet as they are moved closer together?

Tick **one** box.

[1 mark]

The force decreases. ☐

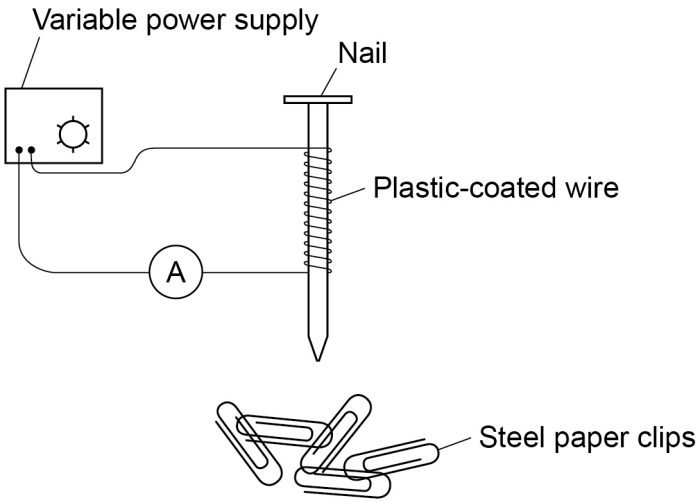
The force increases. ☐

The force stays the same. ☐

Do not write outside the box

0 2 . 4 The student builds an electromagnet as shown in **Figure 3**.

Figure 3



Describe how the student could investigate how the magnitude of the current affects the strength of the electromagnet.

[6 marks]

9

Turn over ►

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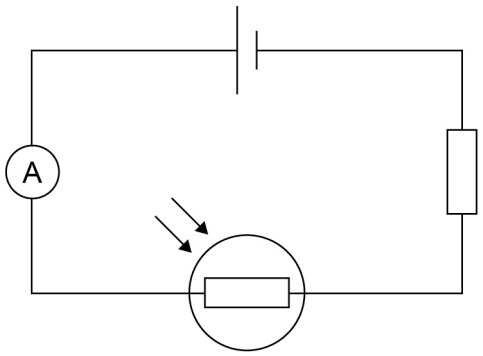
0 3 A student investigated how the resistance of an LDR varied with light intensity over a 24-hour period.

0 3 . 1 **Figure 4** shows part of the circuit the student set up.

Figure 4



Complete the circuit diagram to show how the student could measure the potential difference across the LDR.

Use the correct circuit symbol.

[2 marks]

0 3 . 2 How could the student use her measurements to calculate the resistance of the LDR?

[1 mark]

Do not write outside the box

0 3 . 3 The student decided to improve the investigation by connecting the LDR to a sensor and data logger. The sensor measured the resistance of the LDR directly.

The data logger recorded the resistance of the LDR every second for 24 hours.

Explain why recording the resistance every second improved the investigation.

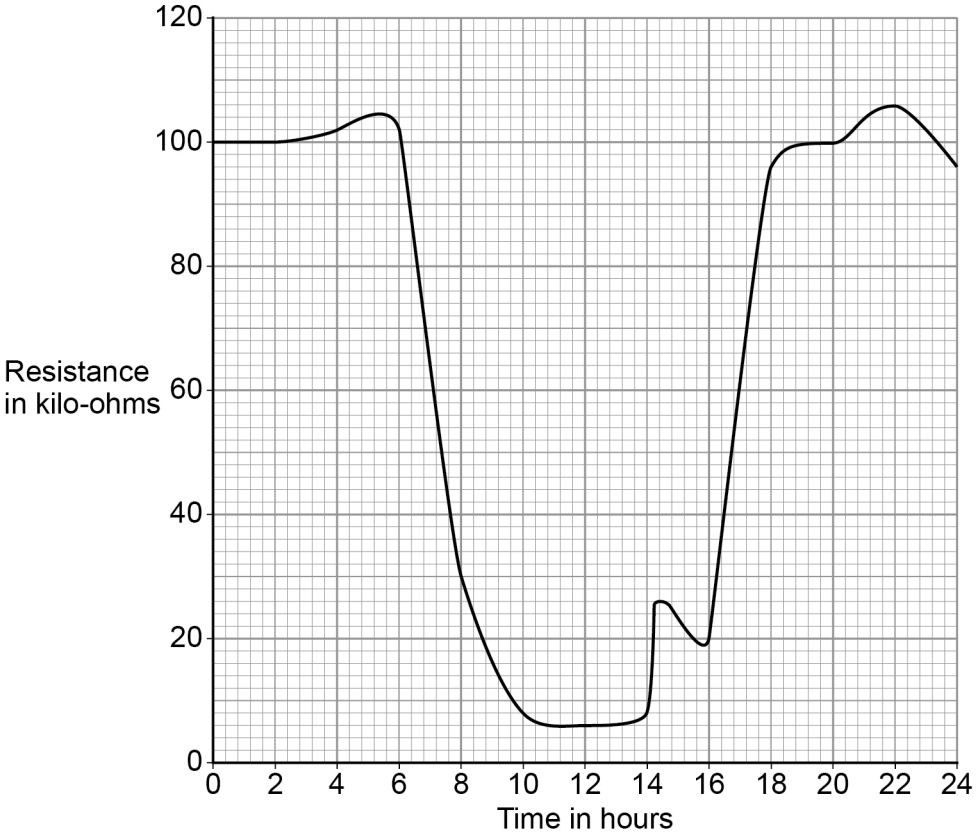
[2 marks]

Question 3 continues on the next page

0 3 . 4 The student placed the LDR and data logger outdoors away from any shade.

Figure 5 shows the results from the student's investigation.

Figure 5



Explain the shape of the graph in **Figure 5**.

[4 marks]

Do not write outside the box

0 3 . 5 **Figure 6** shows a girl talking on a mobile phone.

The mobile phone contains a light sensor that works in the same way as an LDR.

Figure 6

When the girl is holding the phone to her ear, the phone's screen stops emitting light.

Explain why this increases the time before the mobile phone needs to be recharged.

[2 marks]

11

Turn over for the next question

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0 4 The process of nuclear fusion releases energy.

0 4 . 1 Describe the process of nuclear fusion.

[2 marks]

0 4 . 2 Why is energy released in a fusion reaction?

[1 mark]

0 4 . 3 Where does nuclear fusion occur naturally?

[1 mark]

0 4 . 4 Nuclear fusion reactors use two isotopes of hydrogen as fuel.

Complete **Table 1**.

[2 marks]

Table 1

Isotope	Number of protons	Number of neutrons
$^{2}_{1}H$	1	1
$^{3}_{1}H$		

Do not write outside the box

0 4 . 5 Explain why fusion reactions can only happen if the temperature is very high.

[2 marks]

Some countries are building experimental nuclear fusion reactors.

0 4 . 6 Give **two** reasons why these countries may work together.

[2 marks]

1

2

0 4 . 7 Working nuclear fusion reactors could provide an almost limitless supply of energy.

All commercial nuclear power stations currently use a different process called nuclear fission. This process produces waste.

Explain why the waste produced is a problem.

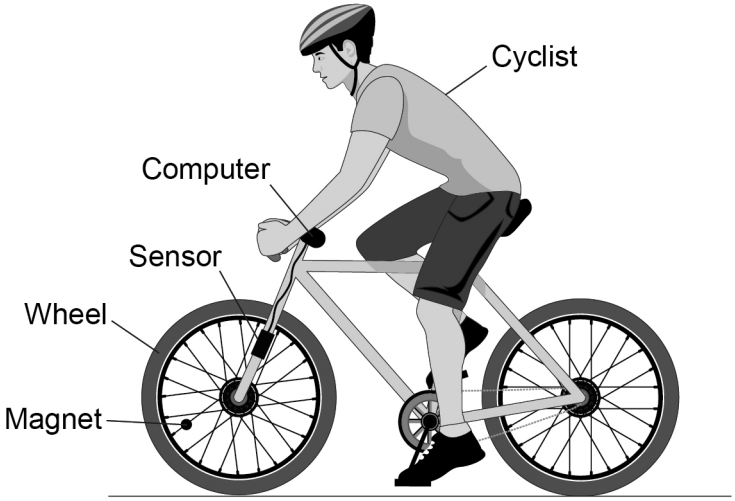
[3 marks]

13

Turn over ►

0 5 **Figure 7** shows a bicycle with a computer attached.

Figure 7



As the wheel turns the magnet passes the sensor.

The computer records the number of times the magnet passes the sensor.

0 5 . 1 As the bicycle travels a distance of 11 m the front wheel makes 5.0 revolutions.

Calculate the circumference of the front wheel of the bicycle.

[2 marks]

Circumference = _____ m

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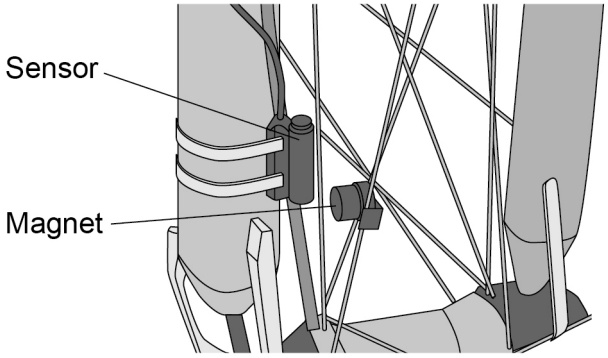
Figure 8 shows the magnet and the sensor.

The sensor contains a conductor which is part of a complete circuit.

Figure 8



0 5 . 2 Explain why there is a current in the sensor as the magnet moves past it.

[3 marks]

0 5 . 3 The current in the sensor causes a force to be exerted on the magnet.

In which direction is the force on the magnet?
Tick **one** box.

[1 mark]

Perpendicular to the direction the magnet is moving in. ☐

In the same direction the magnet is moving in. ☐

Opposite to the direction the magnet is moving in. ☐

Question 5 continues on the next page

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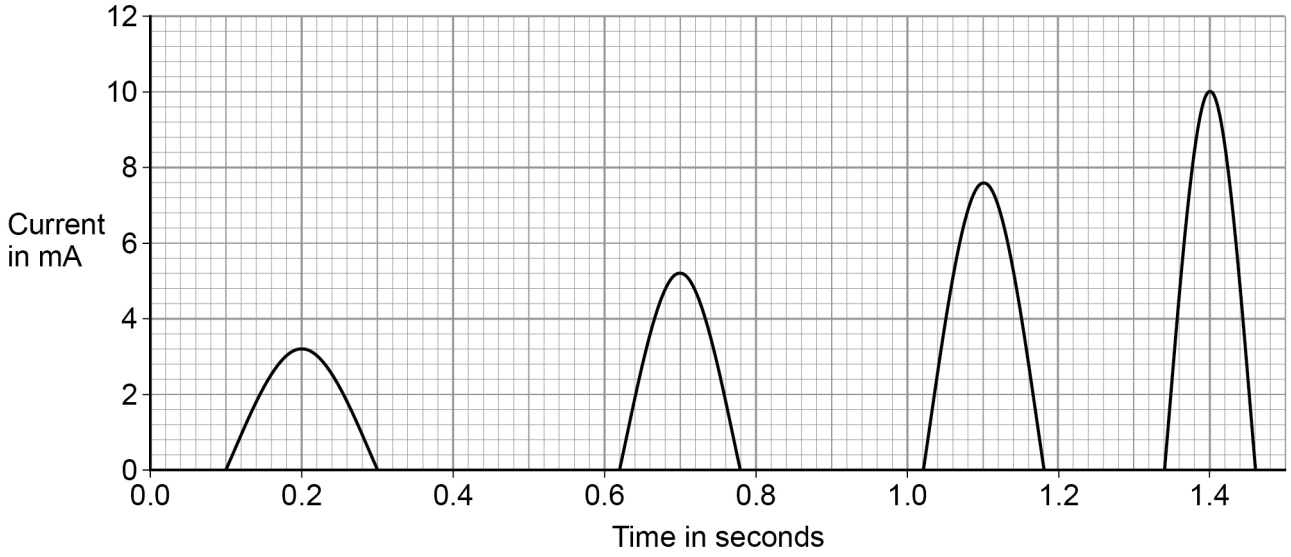
Figure 9 shows how the current in the sensor varied as the bicycle moved.

Figure 9



0 5 . 4 Explain the movement of the bicycle using information from **Figure 9**.

[4 marks]

0 5 . 5 Use **Figure 9** to estimate the average current in the sensor the first time the magnet passed the sensor.

[1 mark]

Do not write outside the box

0 5 . 6 The second time the magnet passed the sensor the average current was 3.4 mA.

Determine the charge flow in the sensor the second time the magnet passed the sensor.

Use the Physics Equations Sheet.

[4 marks]

Charge flow = _____ C

0 5 . 7 The combined mass of the bicycle and a cyclist is 75 kg.

During a cycle ride the maximum kinetic energy of the bicycle was 15 000 J.

Calculate the maximum velocity of the bicycle.

Use the Physics Equations Sheet.

[3 marks]

Maximum velocity = _____ m/s

18

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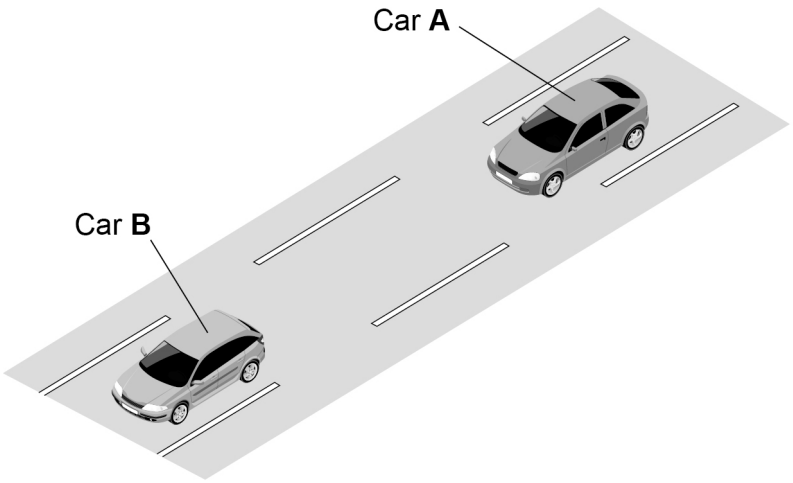
0 6 **Figure 10** shows cars on a horizontal road. The cars are moving at a steady speed in a straight line.

Sensors in car **A** monitor the distance to the car in front.

Figure 10



0 6 . 1 Describe the horizontal forces acting on car **A**.

[2 marks]

0 6 . 2 Car **A** has a mass of 1200 kg and is travelling at a speed of 30 m/s.

Calculate the force required to stop car **A** in 6.0 seconds.

Use the Physics Equations Sheet.

Give the unit.

[3 marks]

Force = _____ Unit = _____

Do not write outside the box

0 6 . 3 Car **B** stops suddenly. Car **A** has an automatic braking system, which applies the brakes immediately, bringing car **A** to a stop.

Explain the effect the automatic braking system has on the stopping distance.

[4 marks]

0 6 . 4 The weather conditions affect the stopping distance of a car with automatic braking.

Give **two** other factors that affect the stopping distance.

[2 marks]

1 _____

2 _____

0 6 . 5 The sensors in car **A** emit and detect radio waves.

The radio waves have a frequency of 7.7×10^{10} Hz.

The speed of radio waves is 3.0×10^{8} m/s.

Calculate the wavelength of the radio waves.

[2 marks]

Wavelength = _____ m

13

Turn over ►

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0 7 The Voyager 2 space probe was launched in 1977.

It is powered by the energy released when the radioactive isotope plutonium-238 decays.

0 7 . 1 Plutonium-238 (Pu) decays into uranium-234 (U) by emitting an alpha particle.

Complete the nuclear equation for the decay of plutonium-238.

[2 marks]

$$^{238}_{94}\text{Pu} \longrightarrow \underline{\quad}^{234}\text{U} + \underline{\quad}^{\quad}_{\quad}\alpha$$

0 7 . 2 The space probe contains a lot of very sensitive equipment that would be damaged by nuclear radiation.

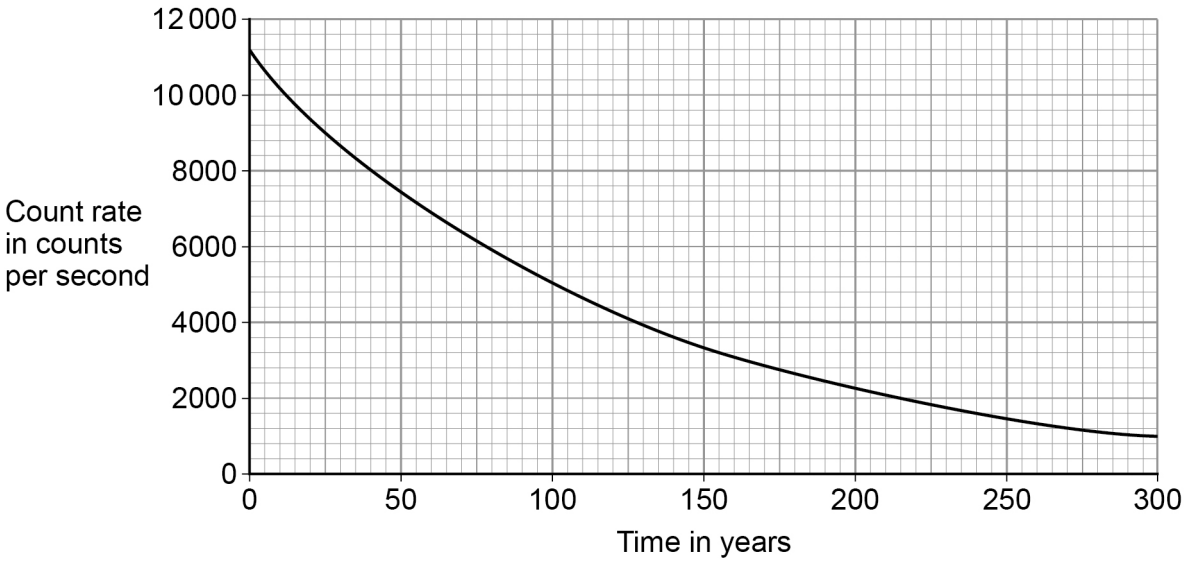
Explain why a radiation source that emits alpha particles is suitable for the space probe.

[2 marks]

Do not write outside the box

Figure 11 shows how the count rate of a sample of plutonium-238 varies with time.

Figure 11



0 7 . 3 Determine the half-life of plutonium-238.

[2 marks]

Half-life = _____ years

0 7 . 4 The space probe is still operating in space today.

When the space probe was launched in 1977 the power source had an output of 158 W.

Determine the power output of the power source today.

Use information from **Figure 11**.

[3 marks]

Power output = _____ W

Turn over ►

Do not write outside the box

0 7 . 5 Explain why an isotope with a longer half-life than plutonium was not chosen to power the space probe.

[2 marks]

0 7 . 6 The space probe is currently at the edge of our solar system. Scientists use a unit called the astronomical unit (AU) to measure the large distances in the solar system.

1 AU = 1.5×10^{11} m

The signals that the space probe sends back to Earth travel at a speed of 3.0×10^{8} m/s.

The space probe is currently 120 AU from Earth.

Calculate the time it takes for a signal from the space probe to reach Earth.

Give your answer in hours.

[4 marks]

Time = _____ hours

15

END OF QUESTIONS

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