

Surname	Initial(s)
Signature	

Paper Reference(s)

**5009**

# Edexcel GCSE

## Science

Physics P1a

Topic 9: Producing and Measuring  
Electricity

Topic 10: You're in Charge

**Foundation and Higher Tiers**

Monday 12 March 2007 – Morning

Time: 20 minutes

**Materials required for examination**

Multiple Choice Answer Sheet  
HB pencil, eraser and calculator

**Items included with question papers**

Nil

### **Instructions to Candidates**

Use an HB pencil. Do not open this booklet until you are told to do so.  
Mark your answers on the separate answer sheet.

**Foundation tier candidates:** answer questions 1 – 24.

**Higher tier candidates:** answer questions 17 – 40.

All candidates are to answer questions 17 – 24.

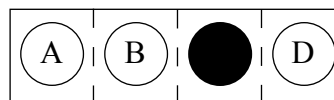
**Before the test begins:**

Check that the answer sheet is for the correct test and that it contains your candidate details.

**How to answer the test:**

For each question, choose the right answer, A, B, C or D  
and mark it in HB pencil on the answer sheet.

For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

Do any necessary calculations and rough work in this booklet. You may use a calculator if you wish.

You must not take this booklet or the answer sheet out of the examination room.

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**Questions 1 to 16 must be answered by Foundation tier candidates only.  
Higher tier candidates start at question 17.**

### **Solar cells**

Omar has a calculator which is powered by solar cells.

1. The current from a solar cell is
  - A direct
  - B alternating
  - C hot
  - D static
  
2. In a solar cell, the electrical energy comes from
  - A chemical energy
  - B light energy
  - C heat energy
  - D wind energy
  
3. Some people prefer solar cells to wind turbines because
  - A the wind blows more often than the Sun shines
  - B wind turbines make more noise
  - C the Sun is bigger than the Earth
  - D solar cells work better at night

### **Alec's kettle**

Alec has just bought a 1.5 kW electric kettle.

4. The '1.5 kW' is
  - A the current
  - B the voltage
  - C the energy
  - D the power
  
5. The kettle is efficient at transferring electrical energy into
  - A water
  - B steam
  - C heat
  - D burning



6. The power of the kettle is the rate at which
- A steam appears
  - B energy is transferred
  - C the water heats up
  - D the kettle boils dry
7. Alec says that life would be very difficult without electricity. Before the discovery of electricity people could **not**
- A heat their homes
  - B cook their food
  - C use the Internet
  - D see at night

### Lawnmowers

David looks after the local park.  
He cuts the grass with an electric lawnmower.  
Many lawnmowers use mains electricity but David's uses its own battery.



8. A battery mower is better for this job than one that uses mains electricity. This is because
- A it will be quieter
  - B it needs no cable so is safer
  - C it is lighter so it will move faster
  - D it needs no sharpening
9. The motor in David's mower works because of a force between a current-carrying wire and
- A an ammeter
  - B a dynamo
  - C a commutator
  - D a magnetic field

Use this information to answer questions 10, 11 and 12.

David needs to replace the battery.  
He finds this data about four suitable batteries.

part number	voltage (V)	capacity (Ah)	height (cm)	price (£)
136	12	14	17	38.60
257	12	5	10	12.60
662	12	30	17	45.90
475	12	22	17	17.20

10. David thinks that it is difficult to compare the price (£) and the capacity (Ah) of the batteries. To make the comparison easier, he should arrange the data in order of increasing

- A part number
- B voltage
- C capacity
- D height

11. Some of David's friends looked at the data. This is what they said.

Asif: Increasing the capacity always increases the price.

Beryl: Increasing the voltage always increases the capacity.

Carlos: Increasing capacity always gives increasing height.

Dom: There is no simple relation between capacity and price.

Whose conclusion is correct from the data?

- A Asif
- B Beryl
- C Carlos
- D Dom

12. A battery with a capacity of 5 Ah should be able to supply a current of

- A 5 amps for 5 hours
- B 2.5 amps for 0.5 hours
- C 1 amp for 5 hours
- D 10 amps for 2 hours

### Lights for Anne's bicycle

13. Anne's bicycle has cells to power the lights.  
She wants to work out if it is cost effective to use a dynamo instead.

Anne finds out the price of a cell and the price of a dynamo.

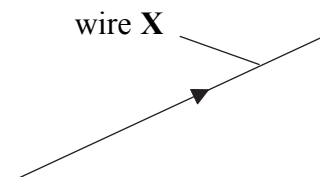
Which row of the table shows the other information Anne needs to find out?

	information about the cell	information about the dynamo
A	how long it is likely to last	how long it is likely to last
B	how long it is likely to last	how bright the lights will be
C	how bright the lights will be	how long it is likely to last
D	how bright the lights will be	how bright the lights will be

14. Anne chooses to use the dynamo.  
When she rides down a hill the lights work well.  
When she rides up a hill, the lights are dim.  
This is because

- A the dynamo turns the wrong way
- B the magnet turns against the Earth's magnetic field
- C the magnet turns slower as she goes uphill
- D charges can only flow downhill

15. Inside Anne's dynamo, wire X is moving upwards.



The arrow shows the direction of the current produced in wire X.  
To reverse the direction of the current, Anne could

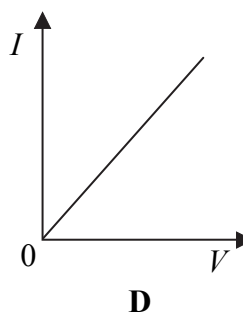
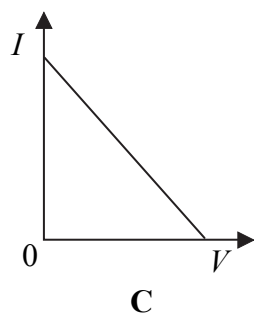
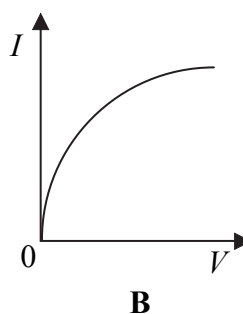
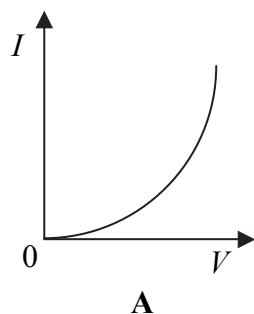
- A increase the current
  - B make the magnet stronger
  - C move the wire downwards
  - D reverse the magnet and move the wire downwards
16. The current in the wire is a flow of
- A positive electrons
  - B positive protons
  - C negative electrons
  - D negative protons

Higher tier candidates start at question 17 and answer questions 17 to 40.  
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

### Ohm's law

In 1827, Georg Ohm published the results of some experiments. He had investigated the current in a conductor and the voltage across it. His conclusion was  $V = I \times R$ .

17. Which of these shows his conclusion?



18. He let scientists in other parts of the world know of his discovery.  
Which of these methods would he have used in 1827?

- A** the radio
- B** a telephone
- C** the internet
- D** a letter

19. The table shows some of the readings on the ammeter and voltmeter in an experiment to demonstrate Ohm's law.

ammeter (A)	voltmeter (V)
2	2
3	4
4	6
5	8

There is something wrong with one of the meters.  
Four people suggest what is wrong.

Alice: The ammeter reads 0 when the voltmeter reads 0.

Bill: The ammeter reads 0 when the voltmeter reads 1.

Craig: The ammeter reads 1 when the voltmeter reads 0.

Dora: The ammeter reads 1 when the voltmeter reads 1.

Who is correct?

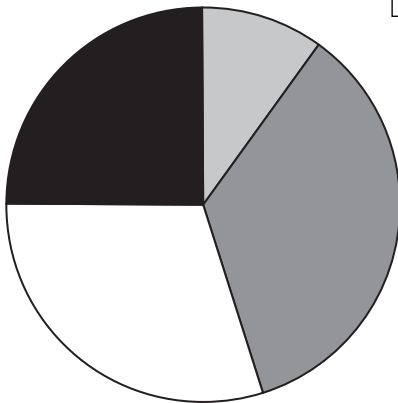
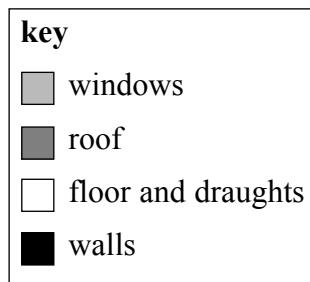
- A Alice
- B Bill
- C Craig
- D Dora

### Keeping warm

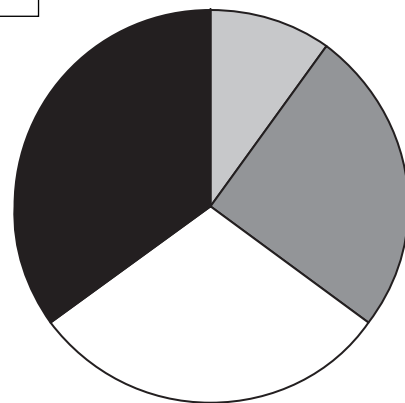
20. The table gives some information about the ways in which energy is lost from a house.

way in which energy is lost	percentage (%) of total loss
through windows	10
through roof	25
through floor and draughts	30
through walls	35

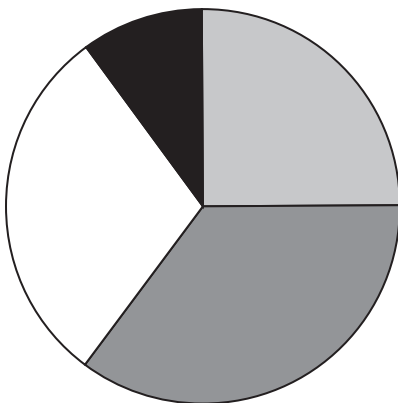
Which pie chart below shows this information?



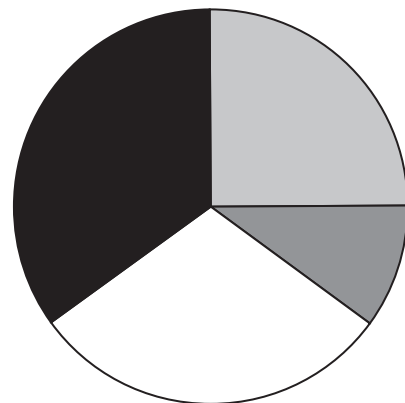
**A**



**B**

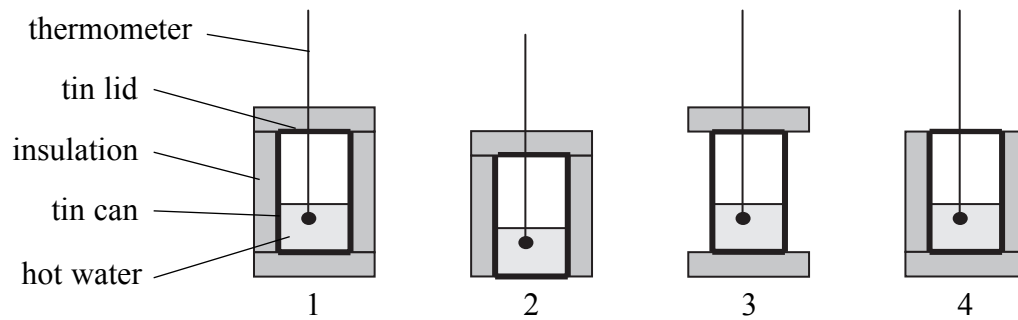


**C**



**D**

21. Nina was investigating the factors which affect the energy loss from a house. She set up these experiments.



Which pair of experiments should she use to compare heat loss through the roof with that through the floor?

- A 1 and 3  
 B 1 and 4  
 C 2 and 3  
 D 2 and 4
22. The table shows information about four energy saving methods for a house.

	energy saving method	cost (£)	saving each year (£)
A	loft insulation	300	100
B	double glazing	3000	100
C	fitted carpets	600	30
D	draught excluders	40	10

Which energy saving method will pay for itself in the shortest time?

### John's model car



23.

$$\text{power} = \text{current} \times \text{voltage}$$

The voltage across the motor in the car is 6.0 V.  
Charge moves through the motor at a rate of 1.5 A.  
What is the power of the motor?

- A 0.25 W
- B 4.0 W
- C 7.5 W
- D 9.0 W

24.

$$\text{cost} = \text{power} \times \text{time} \times \text{cost of 1 kWh}$$

The battery of the car is recharged from the mains.  
Electrical energy enters the battery at a rate of 2 J/s for 5 hours.  
Electricity costs 10p for each kWh.  
How much does it cost to charge the battery?

- A 0.1p
- B 6p
- C 100p
- D 6000p

**TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS**

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**Foundation tier candidates do not answer any more questions after question 24.**

**Questions 25 to 40 must be answered by Higher tier candidates only.  
Foundation tier candidates do not answer questions 25 to 40.**

**Hospital technician**

25. A technician tests a faulty lamp, when it is connected to the mains.  
A current of 10 mA passes through the technician and he feels an electric shock.  
The 1 A fuse in the lamp's plug does not prevent the technician receiving a shock.  
This is because

- A the fuse wire does not melt
- B the fuse wire melts too quickly
- C the fuse fitted to a mains device should be 13 A
- D the mains cannot supply a current as high as 10 mA

26. Many pieces of hospital equipment are connected to circuit breakers.  
Compared to a fuse, a residual current circuit breaker (RCCB)

- A gives greater protection to the equipment
- B needs to be used with an earth wire
- C needs to be replaced more often
- D acts more quickly

27. The table includes one situation which would cause an RCCB to switch off the supply.  
Which row of the table is it?

	current in live wire (A)	current in neutral wire (A)	current in earth wire (A)
A	1	0	1
B	1	1	0
C	13	13	0
D	13	13	13

28. Which of these is **not** important when choosing a new X-ray machine?

- A How dangerous will it be?
- B How expensive will it be?
- C How much room will it take up?
- D How are the X-rays produced?

29. The technician knows that the X-ray machine needs 30 mJ of energy to produce some X-rays.  
She also knows that the energy of these X-rays is only 0.6 mJ.  
The efficiency of the X-ray machine is

- A 2%
- B 18%
- C 29.4%
- D 500%

## Lindsay's greenhouse

Lindsay has a greenhouse where she grows tomatoes. She knows that they will grow quicker if she keeps a light on at night. She also knows that she needs to keep the inside of the greenhouse warm in winter.



Lindsay uses a light dependent resistor (LDR) and a thermistor in the greenhouse to sense when lighting or heating is needed.

30. She shines a bright light on the LDR. Which row of the table is correct?

	resistance of the LDR	current in the LDR
<b>A</b>	increases	increases
<b>B</b>	decreases	increases
<b>C</b>	increases	decreases
<b>D</b>	decreases	decreases

31. Lindsay's friends investigated how the temperature of the thermistor affected its resistance. They said:

In our investigation, we found that the resistance increased as the temperature increased.

Anita

We think that if we double the temperature, the resistance will also double.

Ben

Our investigation was good because we could measure current, voltage and temperature accurately.

Chris

We used an ammeter and a voltmeter in our investigation and calculated the resistance.

Deshini

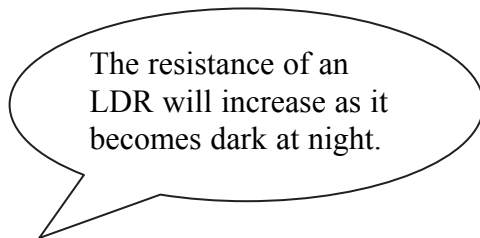
Who has made an evaluation of the investigation?

- A** Anita
- B** Ben
- C** Chris
- D** Deshini

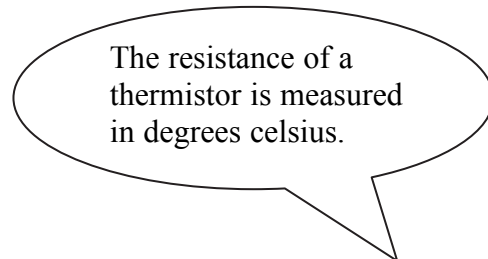
32. At room temperature, this thermistor has a resistance of  $21 \Omega$ .  
When it is in series with a heater and a power supply, the current in the heater is 3 mA.  
What is the voltage across the thermistor?

- A 7 mV
- B 63 mV
- C 7 V
- D 63 V

33. Lindsay and Deshini were talking about LDRs and thermistors.



Lindsay



Deshini

Who is correct?

- A Lindsay only
- B Deshini only
- C both Lindsay and Deshini
- D neither

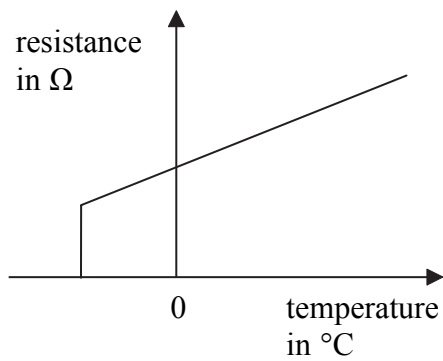
### Maglev trains



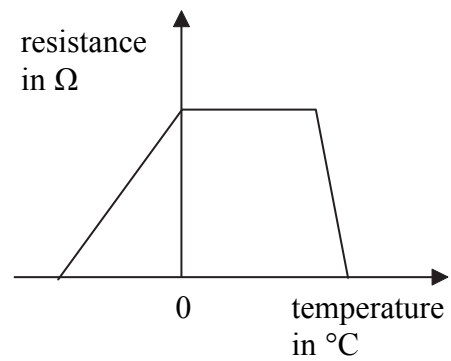
Source: [www.wikipedia.org](http://www.wikipedia.org)

34. Maglev trains are more efficient than other trains because they
- A waste less energy as thermal energy
  - B go faster
  - C can carry fewer passengers
  - D use renewable energy

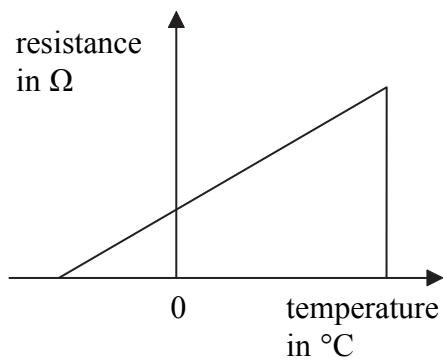
35. Superconductivity helped in the development of Maglev trains because it allowed the creation of
- A large magnetic fields with small heat loss
  - B large magnetic fields with large heat loss
  - C small magnetic fields with small heat loss
  - D small magnetic fields with large heat loss
36. Which of these would reduce the cost of running a Maglev train?
- A developing tracks with less friction
  - B increasing the number of people who travel by train
  - C developing materials which are superconducting at temperatures lower than is now possible
  - D developing materials which are superconducting at temperatures higher than is now possible
37. Which of these represents superconductivity?



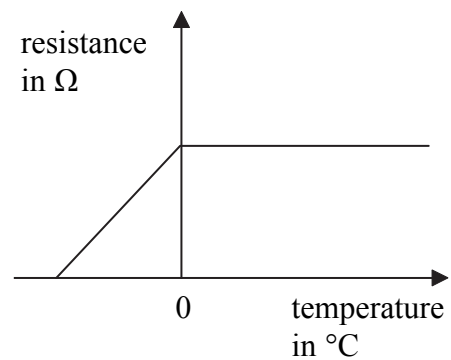
A



B



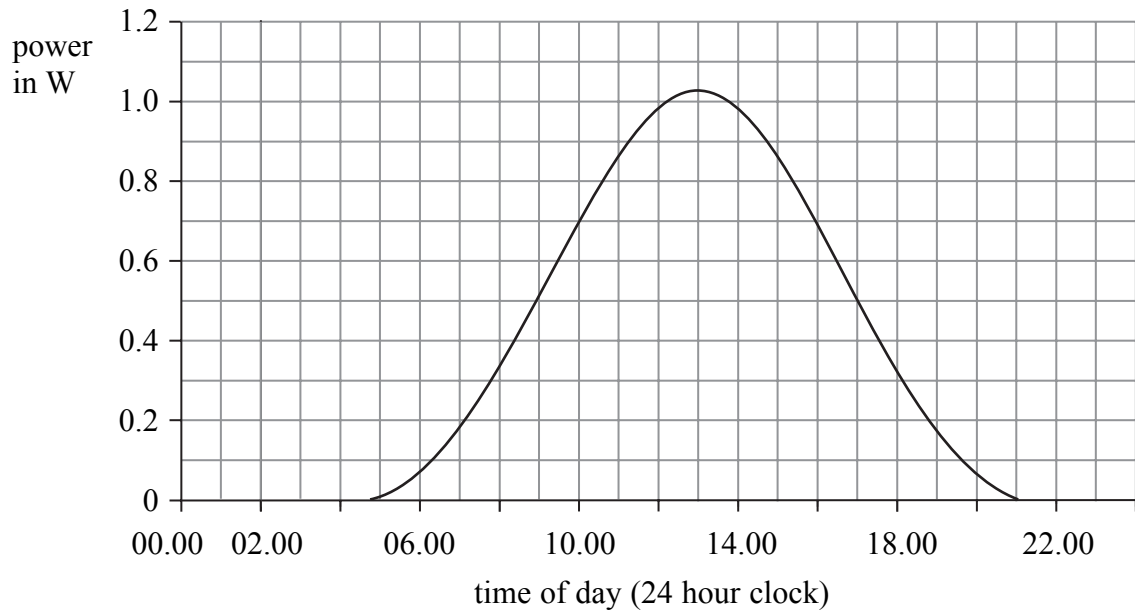
C



D

## Solar cells

The graph shows the power produced by a solar cell on a sunny day.



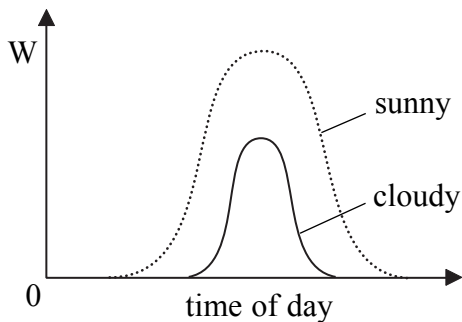
38. At what two times was the power 0.5 W?

- A 06.30 and 17.00 hours
- B 06.30 and 19.45 hours
- C 09.00 and 17.00 hours
- D 09.00 and 19.45 hours

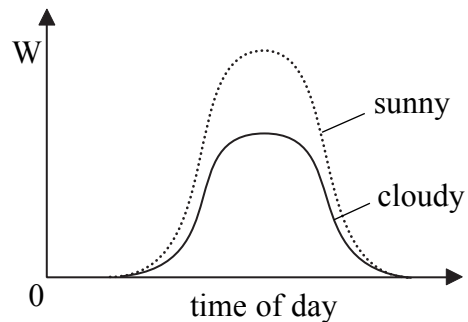
39. A solar cell is to be fixed horizontally.  
This is best if the solar cells are installed

- A at the North Pole
- B on the equator
- C in the United Kingdom
- D at the South Pole

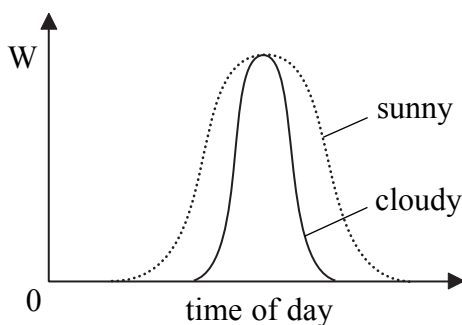
40. The day after the graph on page 15 was recorded, it was cloudy.  
Which graph shows the power output (W) of the same solar cell on these sunny and cloudy days?



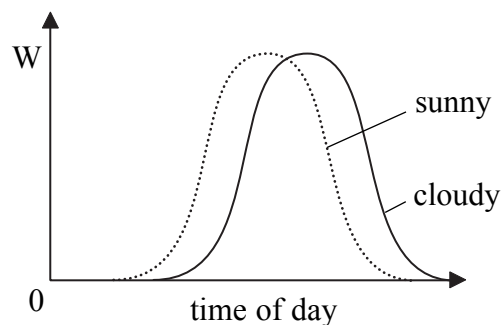
**A**



**B**



**C**



**D**

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**TOTAL FOR HIGHER TIER PAPER: 24 MARKS**

**END**