

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

Thursday 9 November 2006 – 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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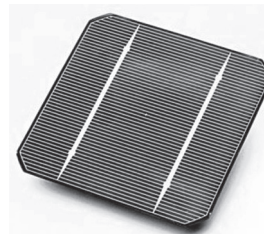
Questions 1 to 16 must be answered by Foundation-tier candidates only.
Higher-tier candidates start at question 17.

Solar cells

Sharon was investigating the use of a solar cell to provide electricity.

1. The solar cell uses

- A chemical energy
- B kinetic energy
- C light energy
- D heat energy



2. The **energy** produced by the solar cell is measured in

- A volts
- B amps
- C watts
- D joules

3. The **type** of current supplied by the solar cell is

- A direct
- B thermal
- C magnetic
- D static

4. A **disadvantage** of solar cells is that

- A they damage the ozone layer
- B they are noisy
- C they produce greenhouse gases
- D they are expensive

5. Sharon wants to calculate the efficiency of the solar cell.
Which equation should she use?

- A $\text{efficiency} = \text{useful input} \times \text{voltage input} \times 100\%$
- B $\text{efficiency} = \text{useful input} \times \text{total output} \times 100\%$
- C $\text{efficiency} = \frac{\text{useful output}}{\text{voltage input}} \times 100\%$
- D $\text{efficiency} = \frac{\text{useful output}}{\text{total input}} \times 100\%$

Producing current

Vinoja is choosing a new electrical cell (battery) for her MP3 player.

Her MP3 player uses one AA battery.

Vinoja uses a website to find information about different AA batteries.

The table shows this information.

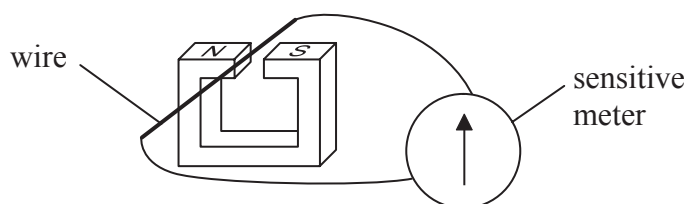


brand	type of battery	playing time before battery runs out (hours)	cost per battery (p)
Permacell	dry	80	70
Cheapo	dry	25	20
Permacell	rechargeable	50	180
Cheapo	rechargeable	40	120

6. The type of current supplied by a battery is
- A alternating
 - B rotating
 - C chemical
 - D direct
7. How many hours of playing time would Vinoja get from one Cheapo dry battery?
- A 20
 - B 25
 - C 40
 - D 80
8. Cheapo dry batteries are
- A least expensive and give least playing time
 - B least expensive and give most playing time
 - C most expensive and run out last
 - D most expensive and give least playing time
9. Vinoja compares dry batteries and rechargeable batteries. An advantage of using dry batteries is
- A they can be recharged
 - B she does not need to buy a charger
 - C they are cheaper to transport
 - D they can be stored upside down

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

Vinoja thinks about generating her own electricity to save on battery costs. She uses the apparatus shown below.



10. Vinoja moves the wire up and down between the poles of the magnet. The meter shows the voltage produced is

- A zero
- B alternating
- C always negative
- D always positive

11. Vinoja moved the wire downwards and obtained this reading:



She wondered how to make the needle go the other way like this:



To do this Vinoja should

- A move the wire from side to side
- B move the wire upwards
- C turn the magnet round and then move the wire upwards
- D move the wire downwards slower

12. Which of these would cause little or no increase in the size of the induced voltage in Vinoja's experiment?

- A using a longer straight wire
- B using a coil instead of a single wire
- C using a stronger magnet
- D moving the wire faster

Safe as houses

Brian works on the outside of his house.

He uses a mains-powered drill to make a hole in the brick wall.
His drill has a metal handle.



13. The electric motor in Brian's drill is designed to transfer electrical energy into
- A sound energy
 - B potential energy
 - C kinetic energy
 - D heat (thermal) energy
14. In the electric drill the earth wire must connect to
- A the metal handle
 - B the on/off switch
 - C the coil of the electric motor
 - D all plastic parts
15. Brian could use a battery-powered drill instead of the mains-powered drill. One **advantage** of the battery-powered drill is that
- A it uses less energy
 - B it runs out of energy after a while
 - C it is much better for the environment
 - D it reduces the chance of electrocution
16. The drill's motor has a commutator (split ring and brushes). The commutator will
- A reverse the current in the motor coil
 - B increase the magnetic field
 - C increase the current in the motor coil
 - D reverse the magnetic field

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.

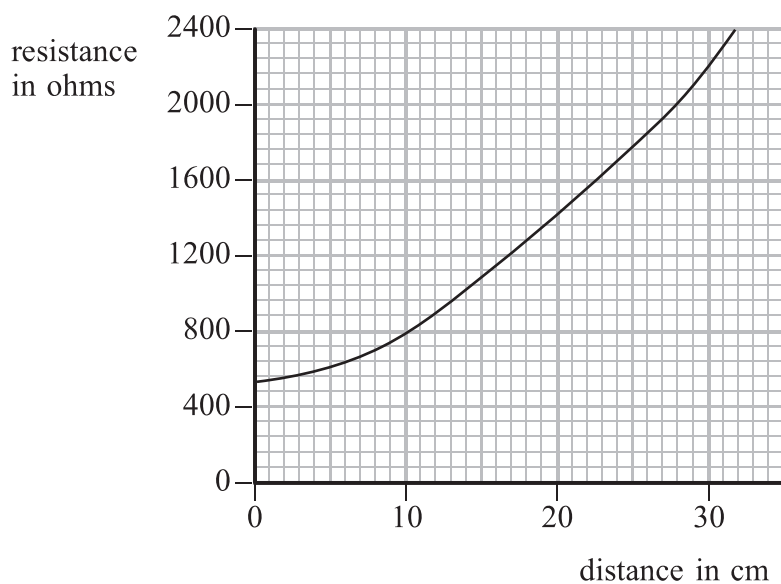
Use this information and diagram to answer questions 17, 18 and 19.

Light-dependent resistor (LDR) experiment

Jane uses this apparatus to find out how the resistance of an LDR varies. She notes the resistance of the LDR when it is at different distances from the lamp.

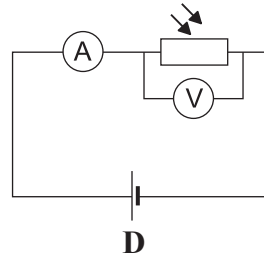
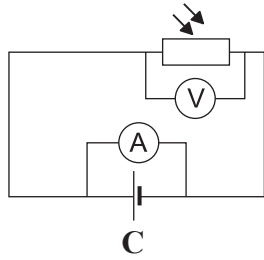
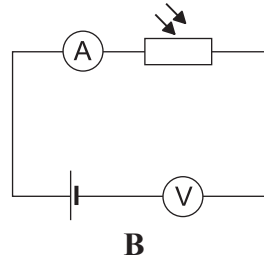
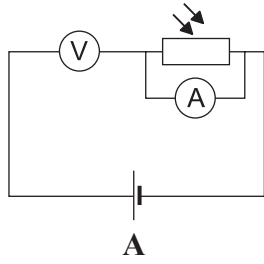


The graph of her results looks like this.

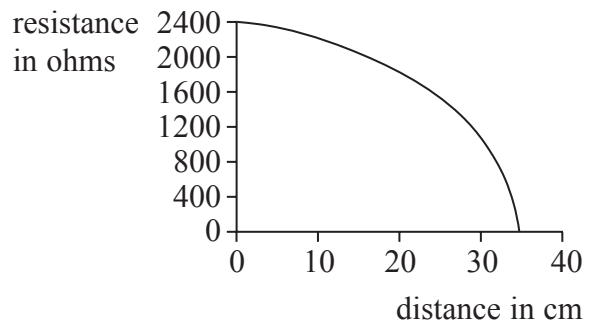
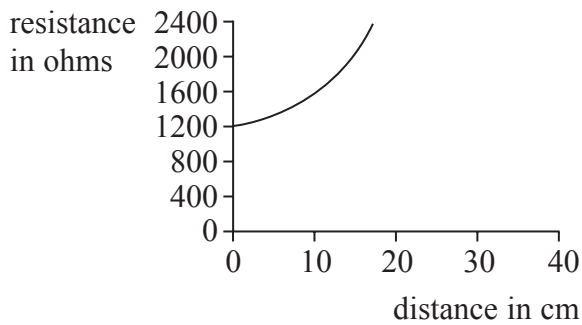
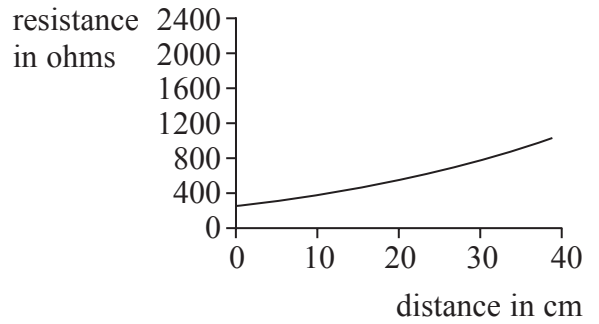
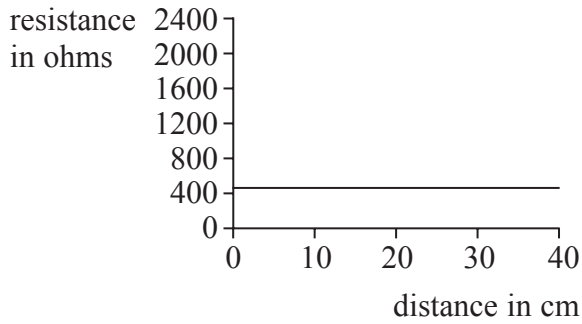


17. When Jane moves the lamp from 10 cm to 30 cm, the resistance of the LDR increases by
- A 800 ohms
 - B 1400 ohms
 - C 2200 ohms
 - D 2400 ohms

18. Which circuit should Jane use to measure the resistance of the LDR?



19. Jane repeated the experiment using a lamp which was less bright. Which of these shows her new graph?



20. Jane's teacher sets up another LDR experiment. This time she uses a data logger to measure the resistance and a computer with a monitor to display the graph. Which of these is **not** a reason for using the data logger in this experiment?
- A Data loggers are very expensive
 - B The data logger can take measurements overnight
 - C The data logger always measures correctly
 - D People can make mistakes when reading instruments

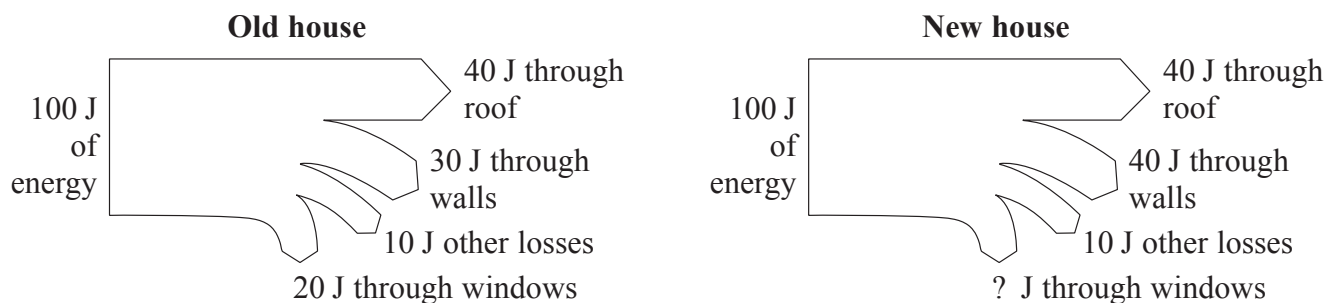
Alan's new house

Alan is buying a new house. He wants to make sure that the new house has energy saving features.

Use this information and the diagrams to answer questions 21 and 22.

These two diagrams show energy losses from his old house and the new house.

Each diagram shows what happens to each 100J of energy input.



21. How much energy is lost through the windows in Alan's new house?
- A 0 J
 - B 10 J
 - C 20 J
 - D 40 J
22. In which part of the new house is a higher percentage of energy lost compared to the old house?
- A walls
 - B roof
 - C other areas
 - D windows

Use this information to answer questions 23 and 24.

Alan collects some information about four types of loft insulation.

type of insulation	cost to insulate loft	money saved from heating bill each year
1	£150	£10
2	£200	£20
3	£240	£40
4	£400	£50

23. Which argument explains why Alan should **not** use the cheapest insulation?
- A Cheap things are poor quality
 - B It is well below his budget for improvements
 - C It will only have a small effect on his heating bill
 - D It will be toxic and damage his health
24. Which of the four types of insulation is most cost effective and so will pay for itself in the shortest time?
- A insulation 1
 - B insulation 2
 - C insulation 3
 - D insulation 4

TOTAL FOR FOUNDATION-TIER PAPER: 24 MARKS

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.**

25. Alan decided to set up a small wind-powered generator in his garden. Some of his neighbours objected to the generator because it would
- A add to noise pollution
 - B produce greenhouse gases
 - C generate alternating current
 - D damage the ozone layer

Safe as houses

Brian works on the outside of his house.

He uses a mains-powered drill to make a hole in the brick wall. His drill has a metal handle.



26. Whilst Brian is drilling it starts to rain. Brian unwisely continues drilling and gets an electric shock when the drill becomes wet. The shock is less likely to kill Brian if his drill has been connected to
- A a fuse
 - B an earth wire and a fuse
 - C an earth wire
 - D a residual current circuit breaker (RCCB)

27.

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

Brian's drill has a power rating of 500 W. He uses the drill for a total of 3 hours. Electrical energy costs 8p per kW h. The cost of the electricity Brian uses is

- A 12 p
- B 20.8 p
- C 24 p
- D 12 000 p

28. The fuse blows when Brian's drill breaks down.
These three statements describe what happens to a fuse when it blows:

- 1 This breaks the circuit.
- 2 The large current heats up the metal fuse wire.
- 3 The fuse wire melts.

The correct order for the statements is

- A** 2 3 1
B 1 3 2
C 2 1 3
D 3 2 1

29. Brian decides to use his cordless drill instead.
Which row of the table correctly describes recent improvements in cordless power tools?

	changes in	technological improvement
A	batteries	higher output current for longer periods
B	transformers	smaller coils giving greater output voltage
C	batteries	lower voltage batteries are now rechargeable
D	transformers	thinner coils use less metal

30. Brian makes two statements about electricity.

- 1 Electricity is a clean fuel and this means he does not add to the greenhouse effect by using electricity.
- 2 We will soon be able to rely on wind-powered generators to supply our electricity all the time.

The correct statements are

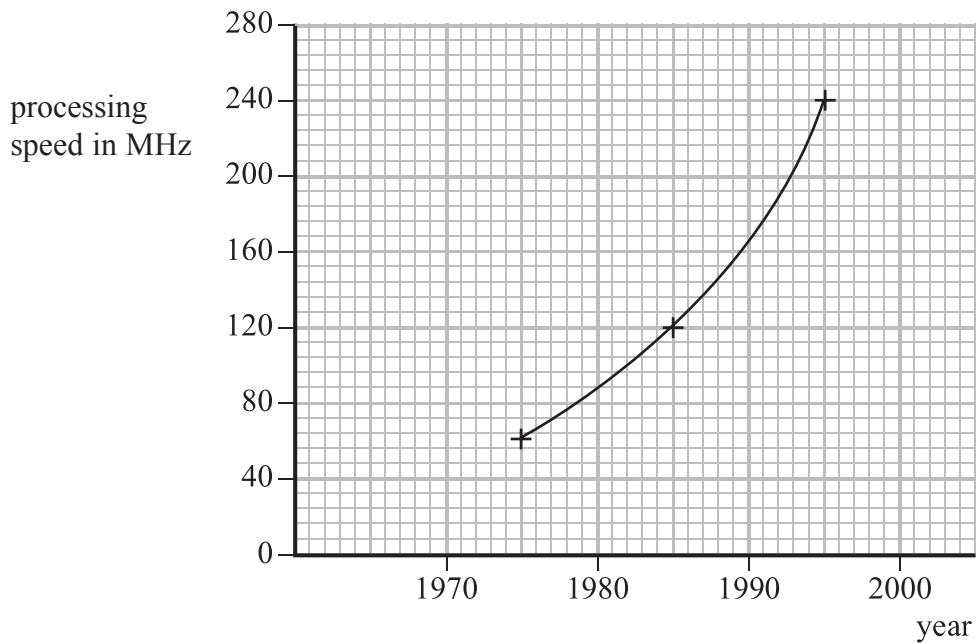
- A** 1 only
B 2 only
C both 1 and 2
D neither

Old computers

Peter has decided to replace his old computer.



Peter had bought a new computer every 10 years.
The graph shows the changes in processing speed of his old computers.



31. During the period shown the processing speed of Peter's computers was
- A proportional to their ages
 - B proportional to the date
 - C doubling every 10 years
 - D doubling every 20 years
32. Peter uses the graph to make a statement about the processing speed of **all** computers. The statement **cannot** be valid because
- A valid graphs must have straight lines
 - B he did not have a control experiment
 - C his computers were out of date
 - D there was not enough data

33. Which of these statements and explanations is correct for electronic processors?

	statement	explanation
A	we will always be able to increase processor speed	we can use higher voltages
B	we will reach an upper limit of processor speed	we cannot go on making transistors smaller forever
C	we will reach an upper limit of processor speed	the voltages will be too small to measure
D	we will always be able to increase processor speed	we can make transistors microscopic

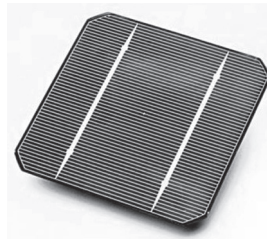
34. Peter uses his computer to collect and display data from some experiments about plant growth.

Which of these is the best reason for Peter to use the computer?

- A** It processes information very quickly
- B** It displays the data as a graph
- C** It takes regular measurements over a long time
- D** It is linked to the internet

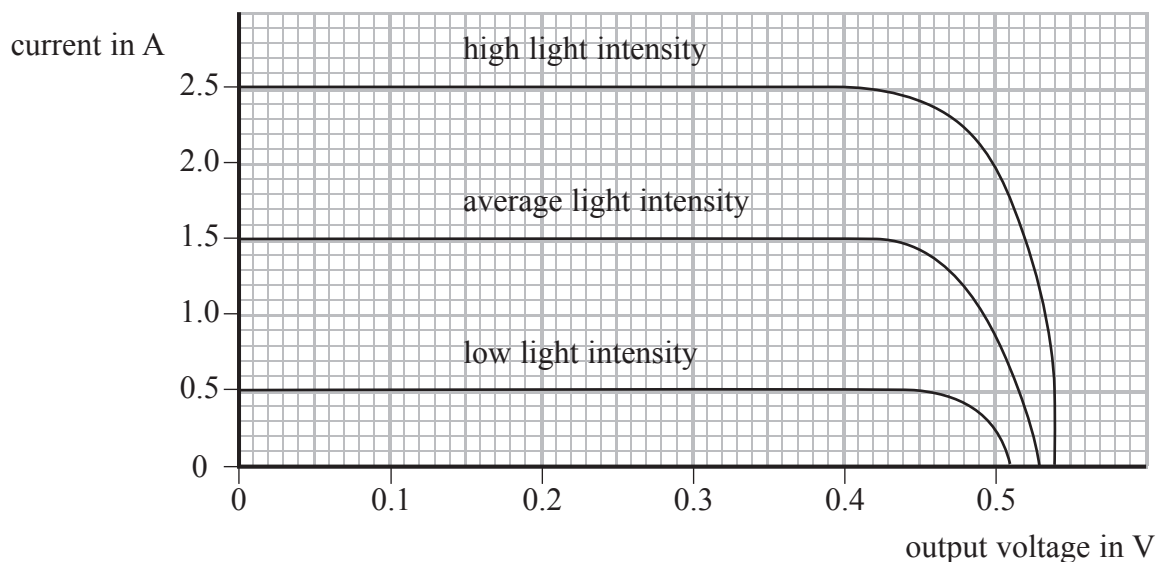
Solar cells

Sharon was investigating the use of a solar cell to provide electricity.



Use this information to answer questions 35 and 36.

Sharon produced this graph to show how current and voltage varied for different intensities of light.



35. Which of these statements best describes the relationship between output voltage and light intensity?

- A Output voltage depends only a little on its light intensity
- B Output voltage is directly proportional to light intensity
- C Output voltage is inversely proportional to light intensity
- D Output voltage is independent of light intensity

36.

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

What is the power output of the solar cell at 0.4 V on an average day?

- A 0.25 W
- B 0.6 W
- C 1.0 W
- D 2.0 W

37. Sharon's solar cell has an efficiency of 12%.
The solar cell produced 24 J of electrical energy.
How much light energy had fallen on the solar cell?

- A 0.5 J
- B 2 J
- C 50 J
- D 200 J

38. Sharon wanted to use electricity from solar cells to light her house instead of using energy from the National Grid.

Which row of the table correctly gives a benefit and a drawback to her plan?

	benefit of using solar cells	drawback of using solar cells
A	constant supply of electricity	expensive to install
B	small panel will replace electricity supply from National Grid	low power output
C	no atmospheric pollution	expensive to install
D	no effect on the environment	low power output

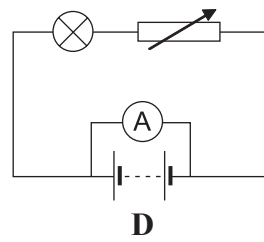
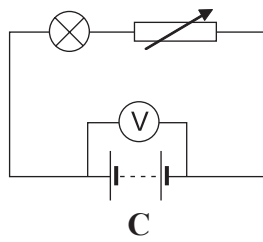
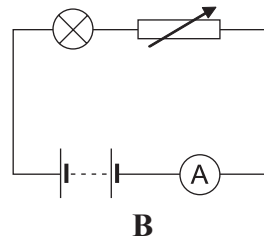
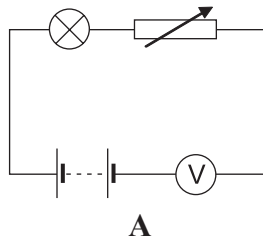
39. Here are two statements about solar cells.

- 1 In a sunny country near the Equator only a few solar cells are needed to replace a power station.
- 2 A panel of solar cells could take many years to pay for itself in energy savings.

The correct statements are

- A 1 only
- B 2 only
- C both 1 and 2
- D neither

40. Sharon decides to store some energy in a battery.
 She wants to check the accuracy of the data about battery capacity.
 She plans to use a stopwatch and an electrical circuit.
 Which of these circuits should she use?



TOTAL FOR HIGHER-TIER PAPER: 24 MARKS

END