

AQA Physics

GCSE Student calculation sheet

P3.5

Name Class Date

Energy resources

Specification references:

- P1.3 National and global energy resources
- MS 1c, 2a, 2b, 2f, 4a, 5a

Aims

In this worksheet you will learn how to read and understand data about different energy sources that is presented in different formats. You will interpret and evaluate the data and make conclusions. You will also calculate the cost of energy.

Learning objectives

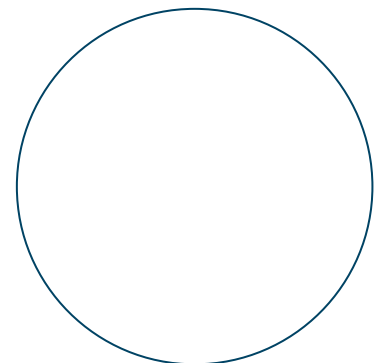
After completing this worksheet, you should be able to:

- interpret data presented in pie charts, graphs, and bar charts
- calculate efficiency, cost, and energy transferred by energy sources.

Worked example

- 1 Complete the pie chart to show the percentage of electrical energy that is provided by each energy resource. The percentages are shown in the table below. You will need a protractor.

Energy source	% of electrical energy provided
gas	41
coal	30
oil	?
nuclear	16
renewable sources	4



First, add up all the energy sources to check they equal 100%. The numbers you are given add up to 91%. So 'oil' must provide the missing 9% to make it 100%.

There are 360° in a circle. So each 1% is represented by 3.6°.

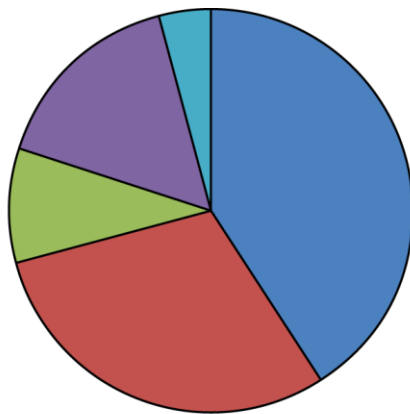
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Now work out how many degrees should be used to represent each energy resource in your pie chart:

Energy source	% of electrical energy provided	Angle of section in pie chart in °
gas	41	147.6
coal	30	108
oil	9	32.4
nuclear	16	57.6
renewable sources	4	14.4

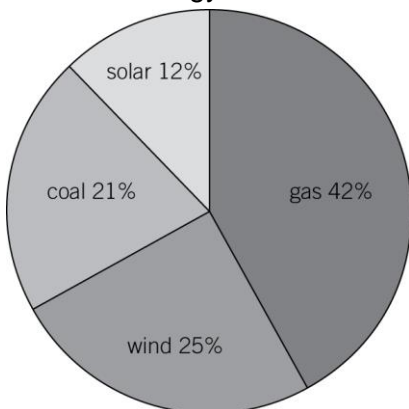
Now you can complete the blank pie chart above. You could add colours too. It should look similar to this:



■ gas ■ coal ■ oil ■ nuclear ■ renewable sources

Questions

1 The pie chart shows the energy resources used by one country to create its electrical energy.



a Calculate the percentage of energy produced by renewable sources.

..... (1 mark)

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Calculate the percentage of resources which do not contribute to global warming.

..... (1 mark)

b Calculate the percentage of resources used which do not contribute to the depletion of fossil fuels.

..... (1 mark)

c Calculate the percentage of resources which contribute to acid rain pollution.

..... (1 mark)

2 The table below shows the amount of solar energy received each second by a solar panel (in J/m²) when the panel is tilted at different angles to the horizontal on a roof of a house in the UK.

Month	Angle of tilt			
	20°	30°	40°	50°
February	460	500	480	440
April	600	620	610	600
June	710	720	680	640
August	640	660	640	580
October	480	520	500	460
December	400	440	420	410

a Which angle is the most efficient for capturing solar energy?

..... (1 mark)

b What is the average amount of energy per m² per second that is received by a panel kept at 40° over the whole year?

..... (1 mark)

c What is the overall pattern shown by increasing the angle of tilt of the solar panel?

.....

 (3 marks)

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d Is this data reliable and accurate? How could it be improved?

.....
.....
.....

(3 marks)

e The total area of the solar cell panels used by a householder is 15 m^2 . They keep the solar panel at 30° . The efficiency of the solar cells is 0.18. Calculate the *maximum* electrical energy available from the solar cell panels each second in August.

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.....

(3 marks)

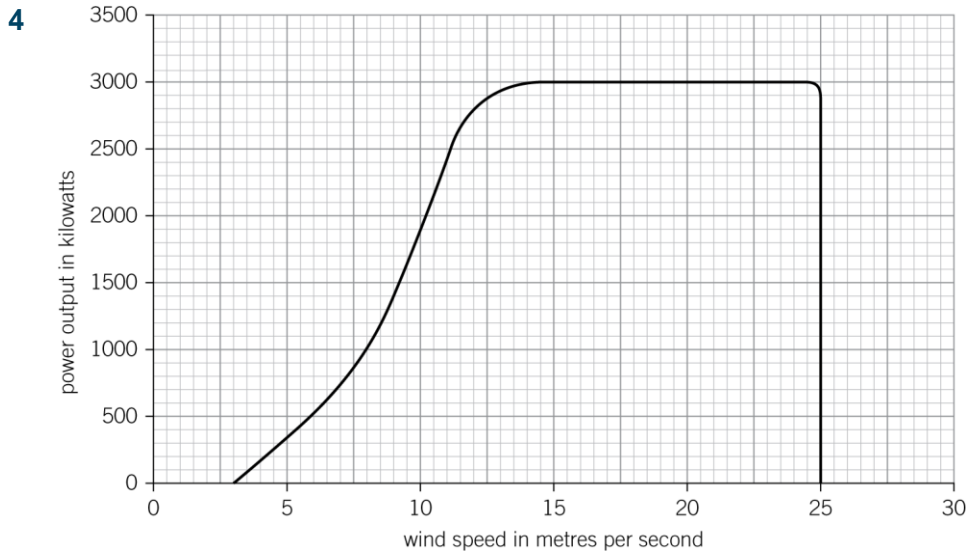
3 In a nuclear power station, 1 tonne of uranium produces 1 600 000 000 kWh of energy. How much uranium would be needed to fuel a 2400 MW nuclear power station for 24 hours? (1 MW = 1000 kW)

Circle the answer you think is correct:

- A 0.000 35 tonnes
- B 0.000 625 tonnes
- C 0.036 tonnes
- D 2.78 tonnes

(1 mark)

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The graph shows how wind speed affects the production of electrical energy from a wind turbine.

In one 5-hour period, the wind turbine transfers 7000 kilowatt-hours of electrical energy.

Use the data in the graph to calculate the average wind speed during this 5-hour period.

.....
.....

(2 marks)

5 A homeowner pays £7600 to have solar panels fitted on the roof of their house. The homeowner expects to save £950 each year from reduced energy bills and from selling the electricity. Assuming these figures to be correct, calculate the payback time for the solar panels.

.....

(1 mark)