OCR
Oxford Cambridge and RSA

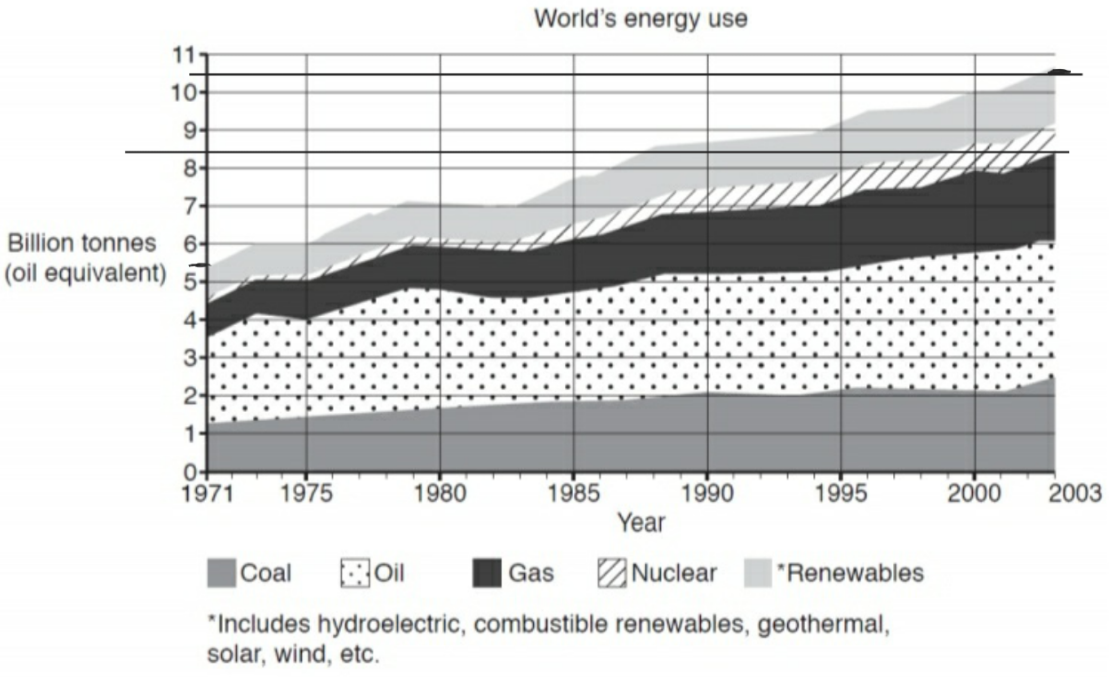
GCSE Physics A (Gateway)

J249/04 Physics A P5-P8 and P9 (Higher Tier)

Question Set 1

1 The graph shows how the World's energy use has changed from the year 1971 to the year 2003.

It also shows the amount of different energy sources used.



(a) **(i)** Approximately how much did the total World's energy use increase from the year 1971 to the year 2003?

10.5 − 5.5

= 5

Answer = ... 5 ..... billion tonnes (oil equivalent)

[1]

(ii) Which energy source had the **greatest** use in the year 2003?

Oil

[1]

(iii) The total energy use in the year 2003 was 10.6 billion tonnes (oil equivalent).

Approximately what percentage of this amount was due to fossil fuel use?

Fossil fuels

- Gas
- oil
- Coal

8.4

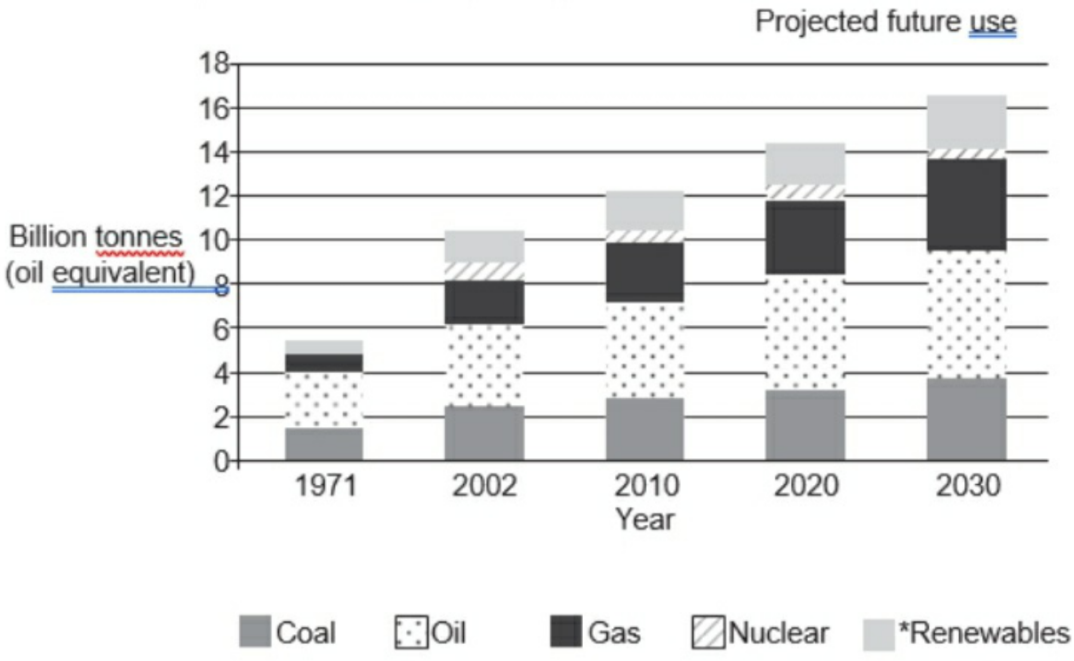
$\frac{8.4}{10.6} \times 100 = 79.2\%$

Answer = ... ≃ 79 ..... %

[2]

(b) Scientists are researching the World's energy use for the future.

The graph shows some of their research.



*Includes hydroelectric, geothermal, solar, wind etc.

(i) The future demand for fossil fuels is expected to increase.

Give two reasons why scientists are worried about this increase in demand.

[2]

- Fossil fuels are a finite resource ∴ they are worried that we may run out in the future ∴ cannot reach future demands
- Fossil fuels release greenhouse gases when burned. This contributes to climate change. Increasing demand will make climate change worse.

(ii) In the UK the government is closing coal fired power stations and planning for new nuclear power stations to be built.

Suggest why the government wants more nuclear power stations.

[2]

As they do not contribute to climate change as they do release any greenhouse gases. Nuclear power stations are more energy efficient

(c) Power stations in the UK generate electricity at 25 kV a.c.

The voltage is then increased to 400 kV a.c. and distributed by power lines.

(i) Write down the full name of the device used to **increase** the voltage.

Step up transformer **[1]**

(ii) Why is it important to increase the voltage in these power lines?

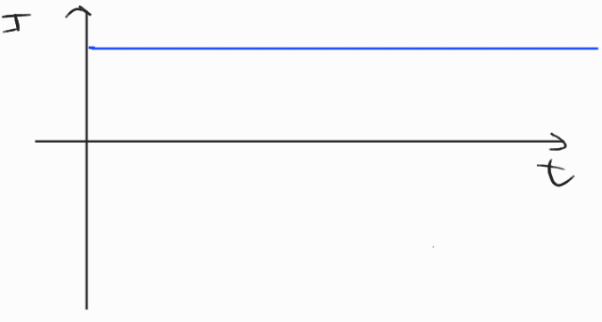
As it means less power loss when travelling thraugh the power lines. **[1]**

(iii) The high voltages across the power lines are reduced to 230 V a.c. for use in the home.

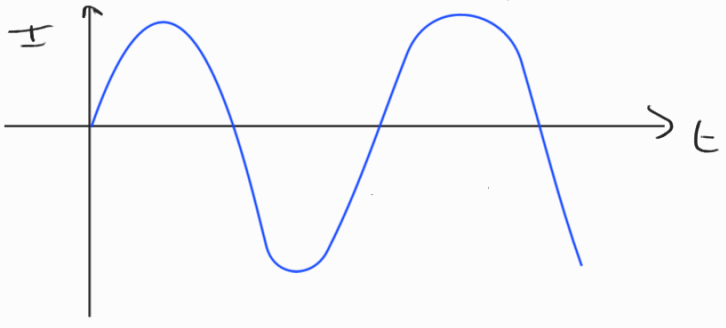
A phone charger changes the 230 V a.c. to a 5 V d.c.

Explain the difference between d.c. and a.c.

In a.c, the current changes direction periodically, while in d.c, the current's direction is constant. **[2]**



DC



AC

(d) A domestic wind turbine has a power rating which varies from 1.0 kW to 3.0 kW.

(i) The domestic wind turbine has an electrical resistance of 23 Ω.

It generates a current of 11 A on a windy day.

Calculate the **power** output in kW of the turbine on this day.

$P = I^2 R$

$= 11^2 \times 23$

$= 2783\,W$

$= 2.783\,kW = 2.8\,kW$ (2sf)

Answer = 2.8 kW

[4]

(ii) Suggest why the manufacturer gives a range for the power rating of the wind turbine.

As wind power can vary. It is not constant

[1]

(iii) Using just **one** domestic wind turbine may be an unreliable source of power for a house.

State a reason why.

As it may not be windy on a particular day.

[1]

or

The wind may not be blowing in the correct direction for the turbines to move.

Total Marks for Question Set 1: 18

Equations in physics

(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance

change in thermal energy = mass × specific heat capacity × change in temperature

thermal energy for a change in state = mass × specific latent heat

energy transferred in stretching = 0.5 × spring constant × (extension)^2

potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil

Higher tier only –

force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length