2021 ASSESSMENT MATERIALS

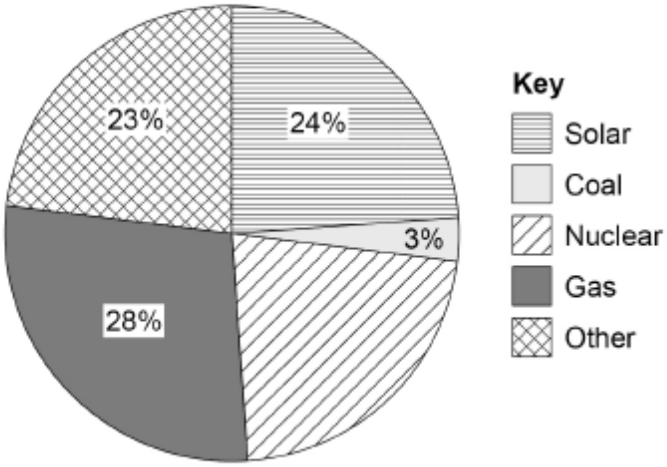
GCSE
PHYSICS

Physics Test 1: Energy (Foundation)

Total number of marks: 33

0 5 **Figure 6** shows how different energy resources were used in the United Kingdom (UK) to generate electricity on one day in June 2018.

Figure 6



0 5 . 1 The UK government plans to stop using coal-fired power stations by 2025.

Explain **one** environmental problem caused when electricity is generated by burning coal.

Produce excessive quantities of CO_2 leading to global warming. **[2 marks]**

0 5 . 2 Give **two** renewable energy resources that could make up the 'Other' energy resources in **Figure 6**.

[2 marks]

1 Hydropower

2 Geothermal

0 5 . 3 Determine the percentage of electricity generated in nuclear power stations that day.

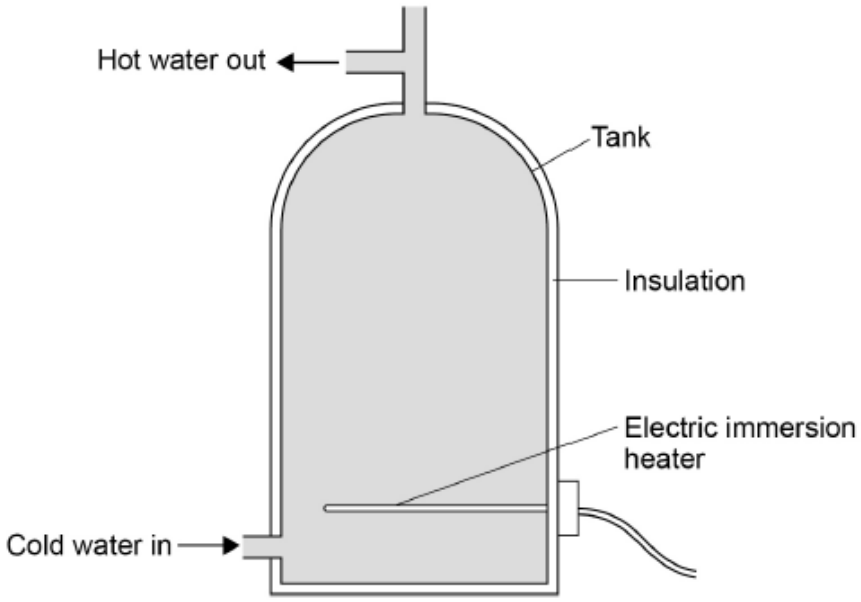
Use data from **Figure 6**.

$100 - (3+24+23+28)$ **[2 marks]**

Percentage of electricity generated in nuclear power stations = 22 %

0 8 **Figure 10** shows a hot water tank made of copper.

Figure 10



0 8 . 2 The tank is insulated. When the water is hot, the immersion heater switches off.

Complete the sentences.

[2 marks]

Compared to a tank with no insulation, the rate of energy transfer from the water in an insulated tank is lower .

This means that the water in the insulated tank stays hot for longer.

0 8 . 4 During one morning, a total of 4 070 000 J of energy is transferred from the electric immersion heater.

4 030 000 J of energy are transferred to the water.

Calculate the proportion of the total energy transferred to the water.

$\frac{4030000}{4070000} = \frac{403}{407} = 0.9901 \approx 0.990$ or 99%

[2 marks]

Proportion of total energy = 0.990 / 99%

0 8 . 5 Write down the equation that links energy transferred, power and time.

[1 mark]

$$\text{Power} = \frac{\text{Energy transferred}}{\text{time}}$$

0 8 . 6 The power output of the immersion heater is 5000 W.

Calculate the time taken for the immersion heater to transfer 4 070 000 J of energy.

Give the unit. $5000 = \frac{4070000}{t}$

[4 marks]

Time = 8/4 Unit S

0 6 An electric car has a motor that is powered by a battery.

A diesel car has an engine that is powered by diesel fuel.

0 6 . 1 **Table 2** compares an electric car and a diesel car.

Table 2

Power source	Maximum acceleration in m/s^2	Mass of power source in kg	Range in km	Maximum power output in kW
Battery	4.8	420	220	200
Diesel fuel	3.2	51	1120	120

Give **two** advantages of the diesel car compared with the electric car in **Table 2**.

[2 marks]

1 The mass of the power source is less.

2 Range is higher

0 6 . 2 The mass of the battery in the electric car is 420 kg

The total mass of the electric car is 1610 kg

Calculate the mass of the battery as a percentage of the total mass of the electric car.

[2 marks]

$\frac{420}{1610} \times 100 = 26.08 \approx 26.1$

Percentage of total mass = 26.1 %

0 6 . 3 Designers of electric car batteries want to increase the amount of energy that can be stored in a battery.

Suggest **two** reasons why.

[2 marks]

1 To increase range, which may appeal to the customer.

2 To increase maximum power output to improve the performance of the car.

Figure 8 shows an electric car being recharged.

Figure 8

0 6 . 4 Write down the equation which links energy transferred, power and time.

[1 mark]

$$\text{Power} = \frac{\text{Energy transferred}}{\text{time}}$$

0 6 . 5 The charger has a power output of 7000 W

Calculate the time taken to transfer 420 000 J of energy to the car battery.

[3 marks]

$$7000 = \frac{420000}{t}$$

Time = 60 s

1 0 **Figure 19** shows a tennis ball thrown vertically into the air.

Figure 19

At position **C**, the ball has just left the tennis player's hand at a speed of 5.0 m/s

The tennis ball has a mass of 0.058 kg

1 0 . 1 Write down the equation that links kinetic energy, mass and speed.

[1 mark]

$KE = \frac{1}{2} mv^2$

KE = kinetic energy
M = mass
V = speed.

10.2 Calculate the kinetic energy of the tennis ball at position **C**.

[2 marks]

$\frac{1}{2} mv^2$

$= \frac{1}{2} \times 0.058 \times (5)^2$

Kinetic energy = 0.725 J

10.3 At position **A** the tennis ball is at maximum height.

What is the gravitational potential energy of the tennis ball at position **A**?

Ignore the effect of air resistance.

[1 mark]

0.725 J

At position **B** the tennis ball has 0.38 J of gravitational potential energy.

10.4 Write down the equation that links gravitational field strength, gravitational potential energy, height and mass.

[1 mark]

GPE = mgh.

10.5 Calculate the height of the tennis ball above the tennis player's hand when at position **B**.

gravitational field strength = 9.8 N/kg

[3 marks]

$0.38 = 0.58 \times 9.8 \times h$

$h = 0.6685$

≈ 0.669

Height = 0.669 m