2.5 Generation of Electricity Homework Questions

Q1. Electricity can be generated from different energy sources.

(a) Examples of energy sources are:

gas wind oil solar wave hydro coal

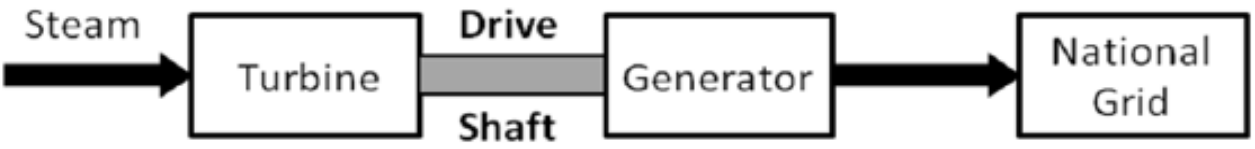
These energy sources can be classified as renewable or non-renewable.

Complete the table below to show which of these energy sources are renewable and which are non-renewable.

Renewable	*Non-renewable*

2

(b) Steam is often used in a power plant to generate electricity. The steam rotates a turbine which spins a generator to produce electricity which is fed into the National Grid as shown in the simplified diagram below:



What is the energy change in the generator? 1

(c) Drax power station is a coal-fired power station that can generate a power of 3960 megawatts.

Cruachan power station is a pumped hydro-electric scheme that can generate a power of 440 megawatts.

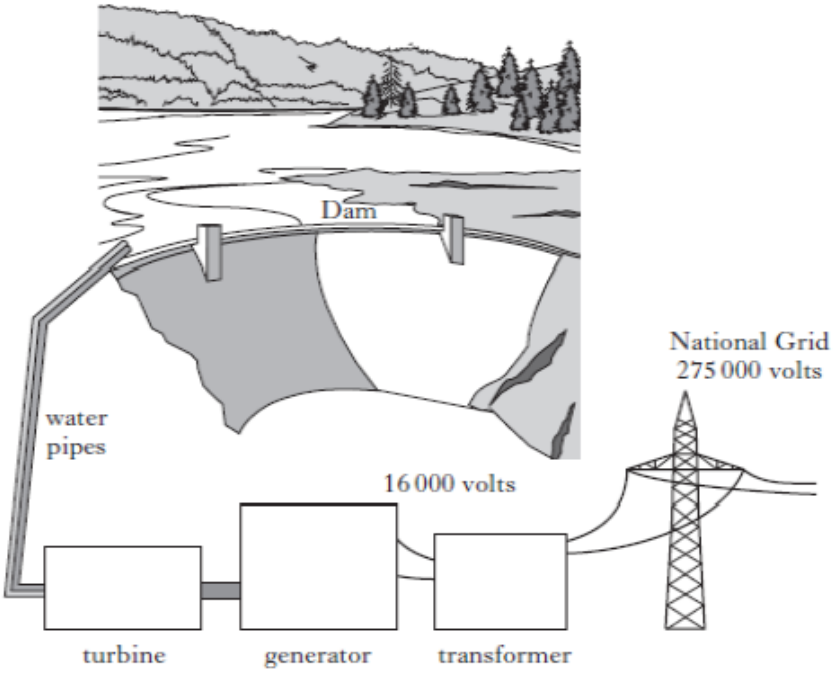
(i) How many pumped hydro-electric schemes would be required to generate the same power as a Drax power station? **2**

(ii) The pumped hydro-electric scheme uses water at the rate of 200 kilograms per second. The scheme can run continuously for 22 hours.

Calculate the mass of water that would pass through the scheme in this time.

3

Q2. A hydroelectric power station uses water stored in a dam to generate electricity.



(a) State one advantage and one disadvantage of hydroelectricity.

2

(b) State the energy transformation that takes place in the water pipes.

1

(c) The power station generates electricity at 16 000 volts. Electricity is then transmitted across the country at 275 000 volts using the National grid.

(i) What type of transformer alters the voltage of the electricity before it enters the National Grid.

1

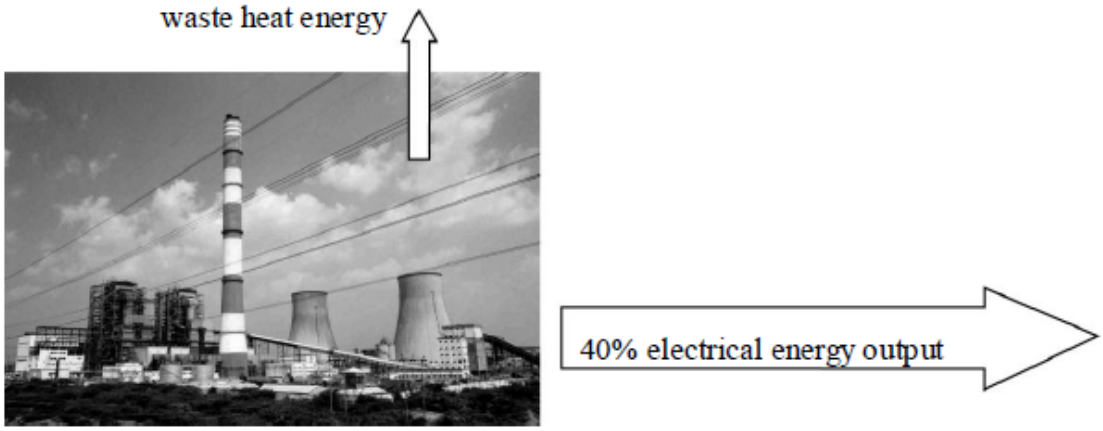
(ii) Why is electrical power transmitted at a very high voltage across the country.

1

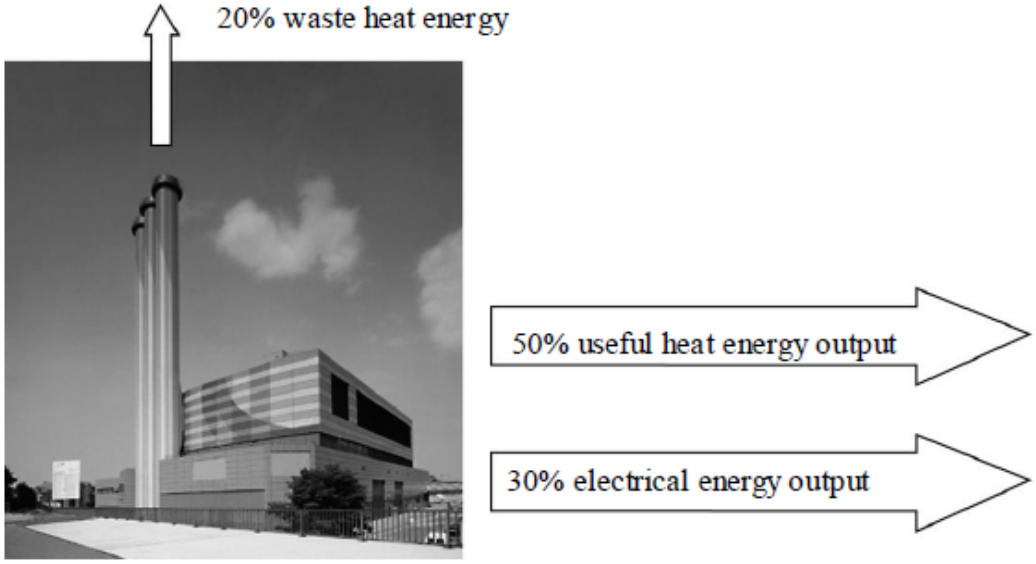
(d) Name another renewable source that uses water for the generation of electricity.

1

Q3 A thermal power station burns Fossil Fuels and has an efficiency of 40%. A combined heat and power station burns biomass and is more efficient; it uses heat to produce hot water for homes as well as generating electrical energy. The energy output for each power station is shown in the diagram below:



Thermal power station



Combined heat and power station

(a) (i) State one fossil fuel that might be burned in the **thermal power station.** **1**

(ii) State one source of biomass that might be burned in the **combined heat and power station.** **2**

(b) (i) Calculate the percentage of waste heat for the **thermal power station.** **3**

(ii) Calculate the total percentage useful energy output of the **combined heat and power station.** **2**

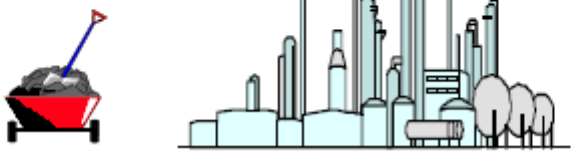
Q4 Electricity is often transported long distances from power stations, where it is generated, to towns and cities, where it is needed. Typically, electricity is carried in overhead power lines. However, in recent years, there has been increasing calls for electricity cables to be buried under the ground.

(a) State two areas where electricity transmission cables might be buried underground. **1**

(b) Give two advantages of overhead power lines compared to underground cables. **2**

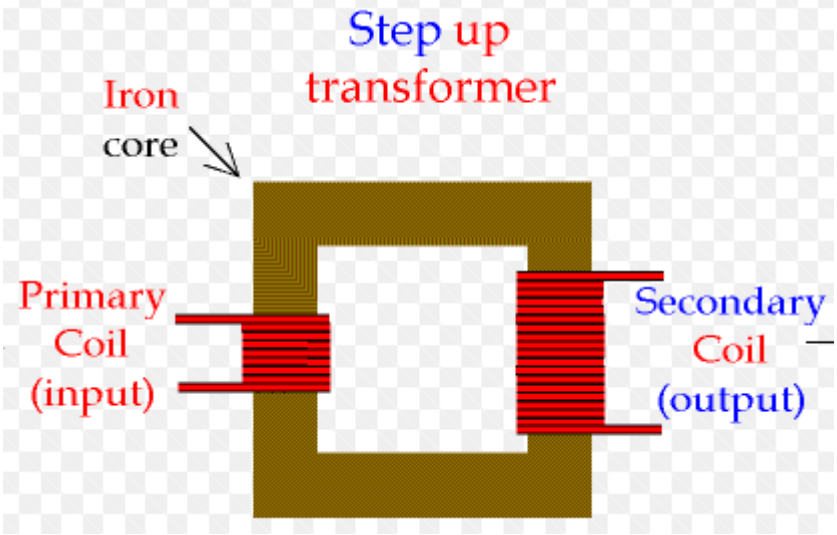
Give two advantages of underground cables compared to overhead power lines. **2**

Q5 A coal fired power station has a power output of 200 MW. The power produced by the boiler is 340 MW. Calculate the efficiency of the power station.



3

Q6



Calculate the number of turns on the secondary coil of the transformer given the following information:

Np = 150, Ns =?

Vp = 6V, Vs = 40V (3)

Total Marks Available = 33