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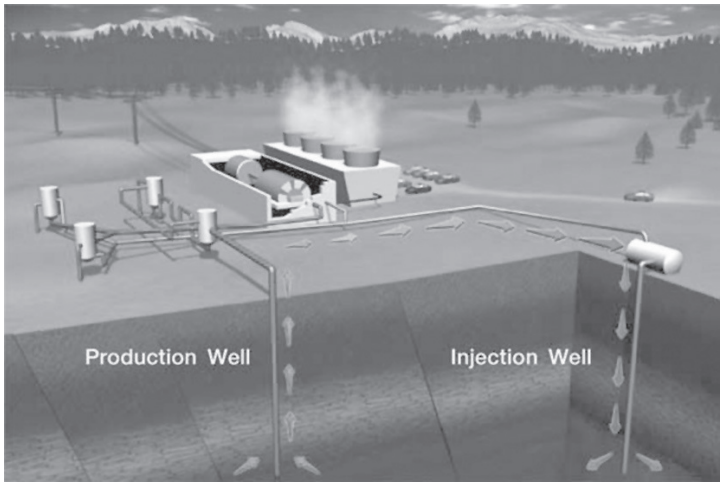
3. A geothermal power plant uses the heat in the earth to help produce electricity.



(*a*) Calculate the heat energy absorbed by 100 litres of water which is pumped into the earth at 10 °C and comes out as steam at 240 °C. (1 litre of water has a mass of 1 kg.)

3 2 1 0

(*b*) For every 15 MJ of heat energy that comes from the ground, the power plant produces 5·34 MJ of electricity.

(i) Calculate the efficiency of the power plant.

2 1 0

(ii) Explain why the power plant will not be 100% efficient.

1 0

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5. A car manufacturer has produced an electric sports car.

The car's batteries are charged for 20 minutes from a 120 V supply providing 7 A.

(*a*) Calculate the electrical energy supplied.

3 2 1 0

The batteries provide 23 kW but the electric motor only produces 17·8 kW of useful output power.

(*b*) (i) Calculate the efficiency of the electric motor.

2 1 0

(ii) Explain why the electric motor is not 100% efficient.

2 1 0