6 A wind turbine generates electricity for the National Grid.

(a) The useful energy transfer in the wind turbine is

(1)

☒ **A** chemical energy to electrical energy

☒ **B** gravitational potential energy to electrical energy

☒ **C** kinetic energy to electrical energy

☒ **D** sound energy to electrical energy

(b) The generator in the wind turbine transfers 39 MJ of energy in 1 minute.

The generator current is 490 A.

(i) Calculate the output voltage of the generator.

(3)

Voltage = ... V

(ii) The generator output voltage is then increased to 132 kV for transmission.

Explain why electrical energy is transmitted using very high voltages.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

QUESTION 6 CONTINUES ON THE NEXT PAGE

(c) The generator provides a direct current (d.c.).

This d.c. is changed to an alternating current (a.c.).

The frequency of the alternating current is 50 Hz.

(i) Explain the meaning of **50 Hz alternating current**.

(2)

(ii) Explain why the d.c. from the generator must be changed to a.c. before it is transmitted.

(2)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS