Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

Energy from the Sun is released by nuclear fusion.

(a) Complete the sentences.

Nuclear fusion is the joining together of _____.

During nuclear fusion the total mass of the particles _____.

(2)

(b) Nuclear fusion of deuterium is difficult to achieve on Earth because of the high temperature needed.

Electricity is used to increase the temperature of 4.0 g of deuterium by 50 000 000 °C.

specific heat capacity of deuterium = 5200 J/kg °C

Calculate the energy needed to increase the temperature of the deuterium by 50 000 000 °C.

Use the Physics Equations Sheet.

_____

_____

_____

_____

_____

Energy = _____ J

(3)

(c) The idea of obtaining power from nuclear fusion was investigated using models.

The models were tested before starting to build the first commercial nuclear fusion power station.

Suggest **two** reasons why models were tested.

1 _____

_____

_____

2 _____

_____

_____

(2)

(d) Generating electricity using nuclear fusion will have fewer environmental effects than generating electricity using fossil fuels.

Explain **one** environmental effect of generating electricity using fossil fuels.

_____

_____

_____

_____

_____

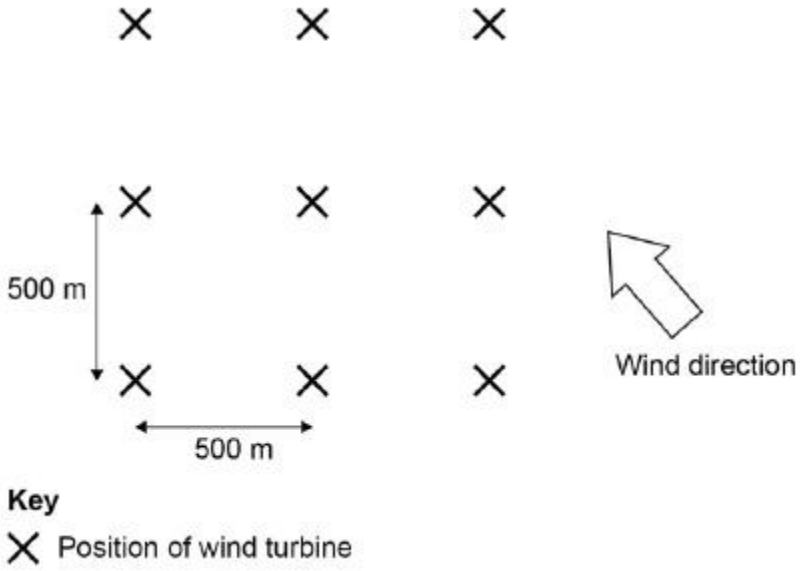
(2)

(Total 9 marks)

Q2.

The wind turbines in a wind farm must have a minimum distance of 500 m between them for maximum efficiency.

The diagram shows the position of nine wind turbines in a wind farm.



(a) Suggest **one** way in which the layout of this wind farm ensures maximum efficiency when the wind direction changes.

_____

_____

_____

(1)

The average mass of air passing through the blades of one wind turbine is 51 000 kg per second.

The density of air is 1.2 kg / m^3

(b) Write down the equation that links density, mass and volume.

_____

(1)

(c) Calculate the volume of air passing through the blades of one wind turbine in one second.

Give the unit.

Give your answer to 2 significant figures.

_____

_____

_____

_____

_____

_____

Volume in one second = _____ Unit _____

(5)

(d) The average power output from one of the wind turbines in the diagram is 1.6×10^6 W

The average power output of a nuclear power station is 2.4×10^9 W

Calculate the number of wind turbines needed to generate power equal to one nuclear power station.

_____

_____

_____

Number of wind turbines = _____

(2)

(e) The UK requires a minimum electrical power of 2.5×10^{10} W at any time.

Give **two** reasons why wind turbines alone are unlikely to be used to meet this requirement.

1. _____

_____

2. _____

_____

(2)

(Total 11 marks)