7 **(a)** State what is meant by *nuclear fission.*

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……..……..…..

……..…… [1]

(b) A possible nuclear fission reaction is given by:

$$^{1}_{0}\mathrm{n} + ^{235}_{92}\mathrm{U} \rightarrow ^{90}_{38}\mathrm{Sr} + ^{143}_{54}\mathrm{Xe} + x\,^{1}_{0}\mathrm{n}$$

(i) State the number of neutrons produced, *x*.

x = …… [1]

(ii) Fig. 7.1 shows the masses of the nuclides.

nuclide	mass / u
U-235	234.993467
Sr-90	89.886883
Xe-143	142.905749
neutron	1.008665

Fig. 7.1

Show that the energy released in the fission reaction is 171 MeV.

[2]

(c) **(i)** A 500 MW nuclear power plant converts the energy released from nuclear fission into electrical energy with an efficiency of 33%.

Calculate the number of uranium-235 nuclei which undergo fission every second to produce this electrical power.

number of fissions per second = …… [2]

(ii) Calculate the mass of uranium-235 that undergoes fission per day in order to sustain the electrical output in **(c)(i)**.

mass of uranium-235 per day = …… kg [2]

(d) Currently, Singapore relies primarily on fossil fuels such as oil and natural gas for its power generation. Singapore is considering moving away from fossil fuels to alternative energy supplies.

Suggest two reasons why nuclear energy could potentially be a suitable alternative energy source for Singapore.

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……..…..

……..…...

…… [2]