

Mark scheme for Support Worksheet – Topic 7, Worksheet 1

- 1 A source of energy (a fuel) which is being depleted faster than it can be generated and so it will run out. [1]
- 2 A fuel is a source of energy. [1]
- 3 Renewable: wind, Non-renewable: coal. [1]
- 4 Energy density of a fuel is the amount of energy that can be obtained/extracted from a unit mass of the fuel. [1]
- 5 A typical efficiency is 45%. [1]
- 6 In an active solar device, solar energy is converted into thermal energy; whereas in a photovoltaic system solar energy is converted into electrical energy. [2]
- 7 About 10% at the moment. [1]
- 8 It is kinetic energy of the products. [1]
- 9
 - a The moderator is there to slow down the neutrons produced in the fission reactions to a sufficiently low speed so they can be used to fission other nuclei. [1]
 - b The control rods are used to control the rate of the reactions and hence the rate of energy production. [1]
- 10 Power produced must be $\frac{85 \times 10^6}{0.65} = 130.8 \times 10^6 \text{ W}$; This must be $P = \frac{mgh}{t} = \frac{m}{t} gh$;
and so $\frac{m}{t} = \frac{P}{gh} = \frac{130.8 \times 10^6}{9.8 \times 58} = 2.3 \times 10^5 \text{ kg s}^{-1}$ [3]
- 11 From $P = \frac{1}{2} \rho A v^3$ we get an increase by $2^3 = 8$; i.e. a power of $25 \times 8 = 200 \text{ kW}$ [2]
- 12 The ratio of the reflected intensity to the incident intensity. [1]
- 13 The power radiated per unit area is proportional to the fourth power of the kelvin surface temperature. [1]
- 14 Emissivity is the ratio of the power radiated per unit area by a body to the power radiated per unit area by a black body at the same temperature. [1]
- 15 Carbon dioxide; water vapour. [2]
- 16 In the greenhouse effect, some of the infrared radiation from the Earth's surface gets absorbed by the greenhouse in the atmosphere and then gets reradiated in all directions; including back down to the Earth's surface warming the Earth's surface. [2]
- 17 From $\sigma T^4 = 245 \text{ W m}^{-2}$ we get $T = \sqrt[4]{\frac{245}{5.67 \times 10^{-8}}} = 256.4 \approx 256 \text{ K}$; this is too small
an average Earth temperature/the greenhouse effect is neglected in this calculation. [2]



- 18** Floating ice will not result in any change in water level but land-based ice will. [1]

The reason is that the floating ice experiences an upward force equal to its weight of course but also equal to the weight of the displaced water. So when the ice melts its weight stays the same and so will occupy as much volume as the displaced water.

[1]