

8.1 Energy Density Practice

2020 *[18 marks]*

1. Which of the following energy sources results from the solar energy incident on Earth? *[1 mark]*
- A. Nuclear fission
 - B. Wind energy
 - C. Nuclear fusion
 - D. Geothermal energy

2. Which of the following is a renewable and non-renewable energy source? *[1 mark]*

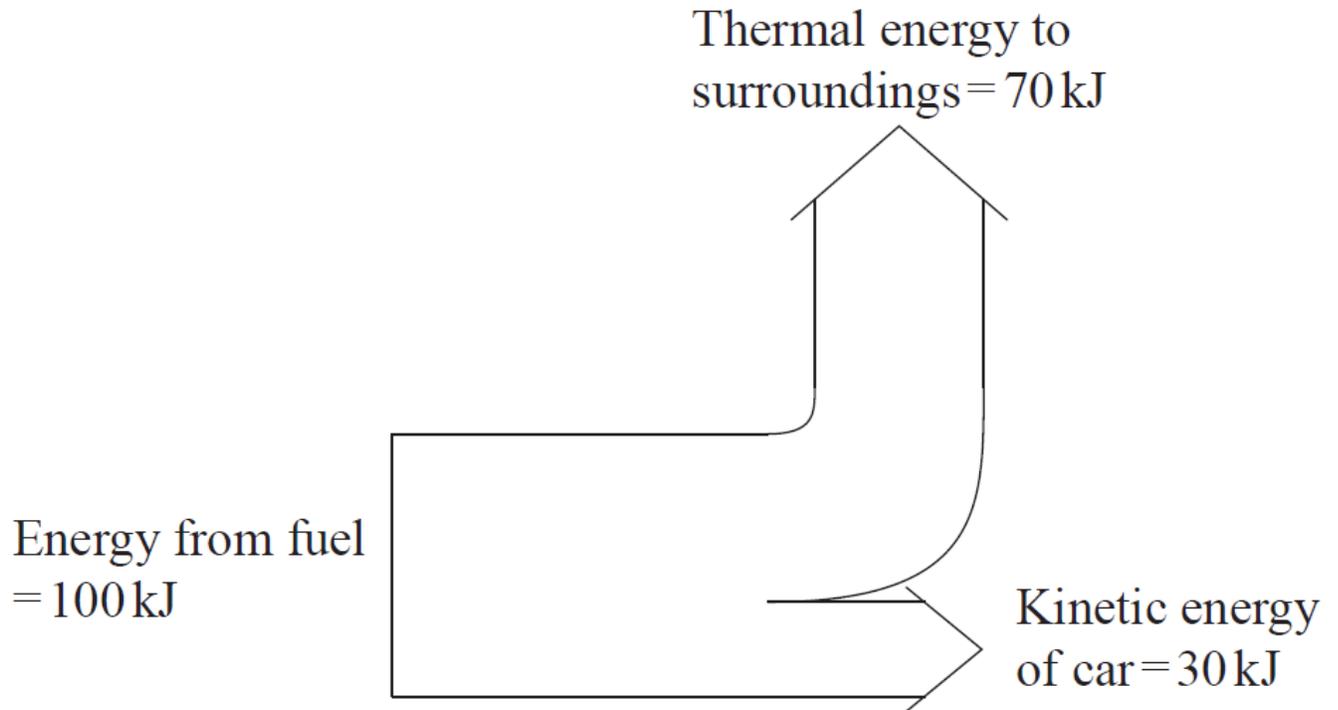
	Renewable	Non-renewable
A.	uranium	coal
B.	tidal	uranium
C.	uranium	biogas
D.	natural gas	biogas

3. The energy source that currently provides the greatest proportion of the world's total energy demand is *[1 mark]*
- A. coal.
 - B. oil.
 - C. natural gas.
 - D. uranium.

4. Which energy resource is renewable? *[1 mark]*
- A. Natural gas
 - B. Uranium
 - C. Biogas
 - D. Coal

5. The original source of the electrical power produced by a wind generator [1 mark] is
- A. the Sun's radiated energy.
 - B. the gravitational energy of the Sun and the Moon.
 - C. nuclear energy stored within atoms in the Earth's atmosphere.
 - D. the Earth's internal energy.

6. The diagram below shows an energy flow diagram (Sankey diagram) for a [1 mark] car.



What is the efficiency of the car?

- A. 30%
- B. 40%
- C. 70%
- D. 100%

This question is in **two** parts. **Part 1** is about a nuclear reactor. **Part 2** is about simple harmonic oscillations.

Part 1 Nuclear reactor

7. The reactor produces 24 MW of power. The efficiency of the reactor is 32 [4 marks] %. In the fission of one uranium-235 nucleus 3.2×10^{-11} J of energy is released.

Determine the mass of uranium-235 that undergoes fission in one year in this reactor.

This question is in **two** parts. **Part 1** is about a lightning discharge. **Part 2** is about fuel for heating.

Part 2 Fuel for heating

- 8a. Define the *energy density* of a fuel. [1 mark]

A room heater burns liquid fuel and the following data are available.

Density of liquid fuel	$= 8.0 \times 10^2 \text{ kg m}^{-3}$
Energy produced by 1 m^3 of liquid fuel	$= 2.7 \times 10^{10} \text{ J}$
Rate at which fuel is consumed	$= 0.13 \text{ g s}^{-1}$
Latent heat of vaporization of the fuel	$= 290 \text{ kJ kg}^{-1}$

- 8b. (i) Use the data to calculate the power output of the room heater, ignoring the power required to convert the liquid fuel into a gas. [5 marks]
- (ii) Show why, in your calculation in (b)(i), the power required to convert the liquid fuel into a gas at its boiling point can be ignored.

- 8c. State, in terms of molecular structure and their motion, **two** differences between a liquid and a gas. [2 marks]

- 1.
- 2.