

# 8.1 Energy Sources

## Question Paper

Course	DPIB Physics
Section	8. Energy Production
Topic	8.1 Energy Sources
Difficulty	Medium

**Time allowed:** 20  
**Score:** /10  
**Percentage:** /100

### Question 1

Energy density is a property of a substance which is calculated by multiplying its specific energy with which quantity?

- A. Volume
- B. Mass
- C. Volume  $\times$  mass
- D.  $\frac{\text{Mass}}{\text{Volume}}$

[1 mark]

### Question 2

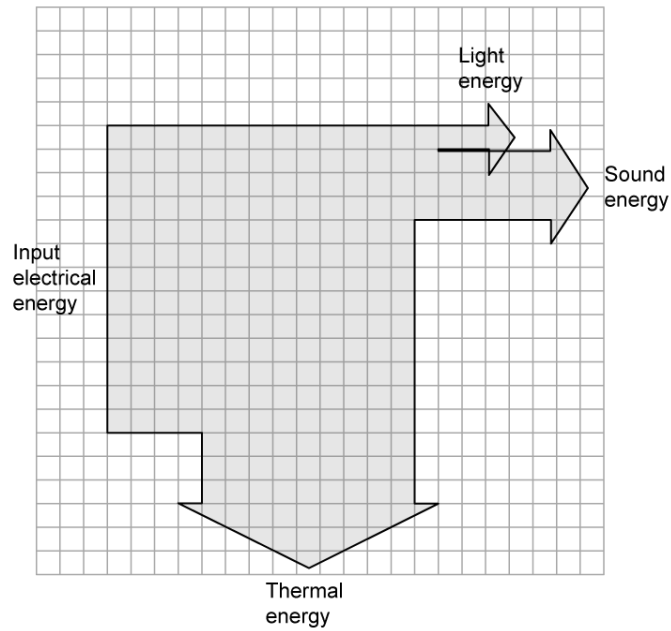
Diesel fuel has a specific energy of about  $4.5 \times 10^7 \text{ J kg}^{-1}$  and an energy density of close to  $3.5 \times 10^{10} \text{ J m}^{-3}$ . Which value is closest to the density of diesel?

- A.  $1.2 \times 10^{-3} \text{ kg m}^{-3}$
- B.  $800 \text{ kg m}^{-3}$
- C.  $3.7 \times 10^{10} \text{ kg m}^{-3}$
- D.  $1.7 \times 10^{18} \text{ kg m}^{-3}$

[1 mark]

### Question 3

The Sankey diagram shows the energy transformations in a laptop computer while a person is watching a film.



What is the efficiency of the laptop?

- A. 3 %
- B. 8 %
- C. 31 %
- D. 69 %

[1 mark]

### Question 4

Possible energy sources used in power stations are

- I. coal
- II. biofuel
- III. nuclear fuel
- IV. water released from natural reservoirs

Which of these are primary sources of energy?

- A. I and II
- B. I, II and IV
- C. III only
- D. I, II, III and IV

[1 mark]

### Question 5

Which line in the table correctly shows a renewable and a non-renewable energy, and a major direct use for both energy sources?

	Renewable	Non-renewable	Direct use of both
A.	geothermal	natural gas	heating homes
B.	nuclear fuel	oil	generating electricity
C.	geothermal	natural gas	transport
D.	solar energy	nuclear fuel	heating homes

[1 mark]

### Question 6

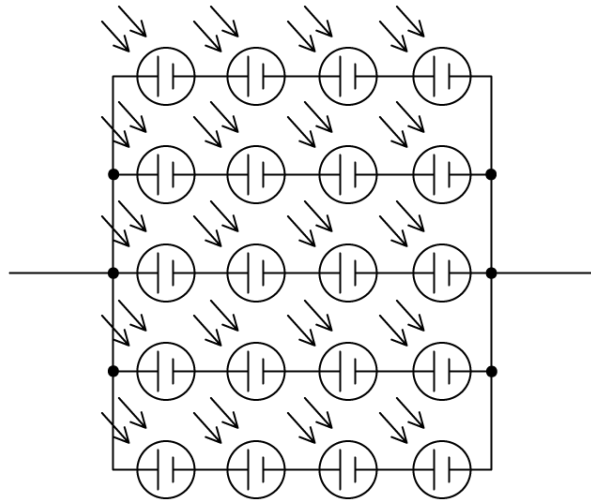
Horizontal-axis wind turbines convert a proportion of the kinetic energy of the wind incident on the propeller into kinetic energy of the rotating blades. The conversion cannot be 100 % because:

- A. Wind is an unreliable energy source
- B. Density and temperature of the air affect speed of rotation
- C. Air molecules would be brought to rest if all the energy was transferred
- D. Momentum of the blades keeps them in motion

[1 mark]

### Question 7

An array of photovoltaic cells is set up so that 20 solar cells are connected together as shown. Each cell has an output of 12 V and 2.5 A.



What is the potential difference and the current output of the array?

	Potential difference / V	Current / A
<b>A.</b>	48	10.0
<b>B.</b>	48	12.5
<b>C.</b>	60	10.0
<b>D.</b>	60	12.5

[1 mark]

### Question 8

What is an advantage of pumped storage systems?

- A. They can be sited in most areas where energy is needed
- B. They are carbon neutral
- C. Electricity can be generated rapidly at times of peak demand
- D. Efficiency is greater than one since energy is being used to run them which would otherwise go to waste

[1 mark]

**Question 9**

A wind turbine has a power output  $P$  when the wind speed is  $v$ . What is the wind speed when the power output is reduced to  $\frac{1}{2}P$  if the efficiency is not affected?

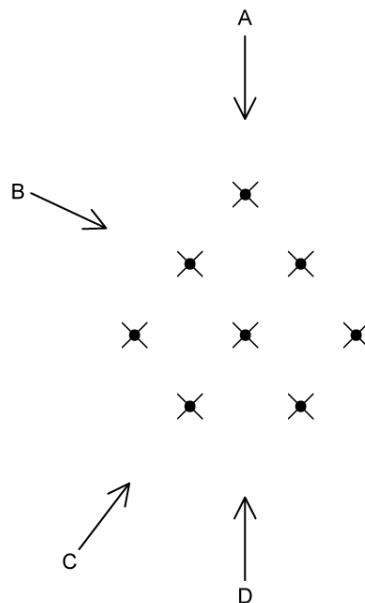
- A.  $\frac{v}{4}$
- B.  $\frac{v}{\sqrt{8}}$
- C.  $\frac{v}{2}$
- D.  $\frac{v}{\sqrt[3]{2}}$

[1 mark]

**Question 10**

An arrangement of wind turbines is shown, with four possible directions of wind.

Which orientation of the turbines to the wind will allow the maximum energy to be generated from this wind farm?



[1 mark]

