NDUBUISI DAVID KELECHI

15/ENG01/008

CHEMICAL ENGINEERING

CHE574

1.

a. With adequate mathematical relations, explain the various forms of energy.

The two basic types of energy are

- Kinetic energy: the energy of moving objects.

  $kinetic\ energy = \frac{1}{2}\ x\ m\ x\ v_i^2$

  Where m = mass

  V_i = velocity
- Potential energy: energy that can be stored

  $potential\ energy = mxgxh$

  Where m = mass

  g = acceleration due to gravity

  h = height

The other forms of energy are classified under the two of them and they include[1]

i. Thermal energy: Thermal energy (also called heat energy) is produced when a rise in temperature causes atoms and molecules to move faster and collide with each other.
ii. Chemical energy: Chemical energy is energy stored in the bonds of chemical compounds, like atoms and molecules. This energy is released when a chemical reaction takes place.
iii. Electrical Energy: this is caused by moving electric charges called electrons. The faster the charges move the more electrical energy they carry.
iv. Nuclear energy: Nuclear energy comes from the nucleus of atoms**.** The energy is released by nuclear fusion (nuclei are fused together) or nuclear fission (nuclei are split apart).
v. Light energy: Light energy is a form of electromagnetic radiation. Light consists of photons, which are produced when an object's atoms heat up.
vi. Sound energy: Sound is the movement of energy through a substance – like air or water – and is caused by vibrations. Solids, liquids and gases transmit sound as waves**.**
vii. Gravitational energy: It is the potential energy stored by an object because of its higher position compared to a lower position. (e.g. if it's further away or closer to the ground). Gravitational energy is energy associated with gravity

viii. Motion energy: also known as mechanical energy – is the energy stored in moving objects. As the object moves faster, more energy is stored. Motion energy is the sum of potential and kinetic energy in an object that is used to do work.

b. **Distinguish between sustainable energy and resources and non-sustainable energy and resources**

A sustainable source of energy is one that is renewable and environmentally benign. It is a practice of using energy in a way that meets the needs of the present without compromising the ability of future generations to meet their own needs.[2] Technologies that promote sustainable energy include renewable energy sources such as

- Hydroelectricity
- Solar energy
- Wind energy
- Wave energy
- Geothermal energy
- Tidal energy

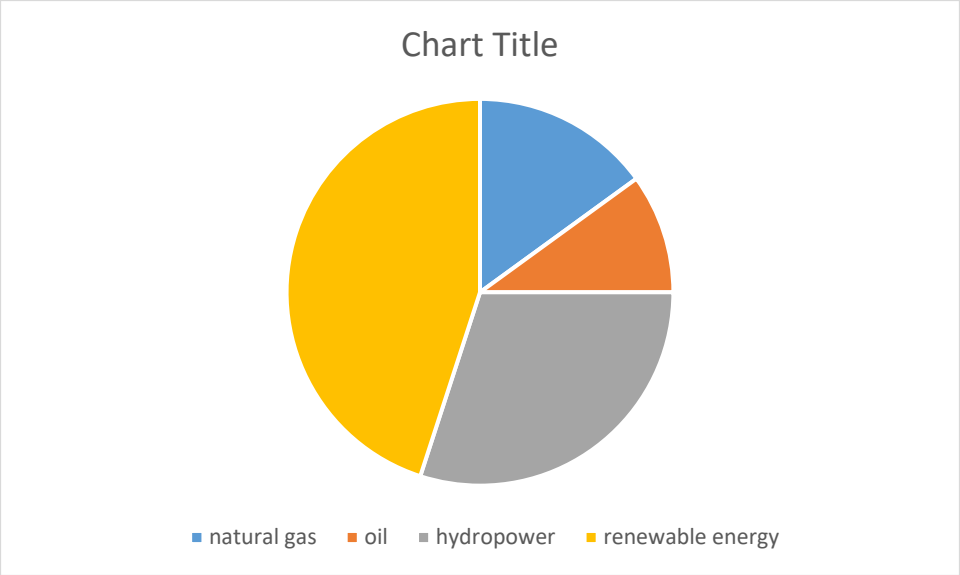
Non sustainable energy is a form of energy which is declined and not maintained for the future generation. It can refer to non-renewable energy. Non renewable energy sources include

- Coal
- Oil
- Natural gas

2.

With the aid of appropriate pie chart or bar chart briefly discuss the typical energy resource mix for sustainable energy development and provide your own view the case for the Nigerian environment.

The main areas of energy utilization in Nigeria are transportation and conversion of energy resources to electricity for household and industry. Nigeria's energy consumption mix is predominantly oil and for sustainable energy development, renewable source should be dominant while the use of nonrenewable should be reduced[3]



A typical energy resource mix for sustainable development

REFERENCES

[1] "Types of Energy." [Online]. Available: https://www.solarschools.net/knowledge-bank/energy/types.

[2] S. Farooqi, "Sustainable and non sustainable energy," 2016. [Online]. Available: https://www.slideshare.net/Saadfarooqi/sustainable-and-non-sustainable-energy.

[3] C. . Uzoma, C. . Nnaji, and M. Nnaji, "the Role of Energy Mix in Sustainable Development of Nigeria," *Cont. J . Soc. Sci.*, vol. 5, no. 1, pp. 21–29, 2012.

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ASSIGNMENT 3

1. Monitor the average ambient temperature between Monday 17th and Friday 21st of February 2020 and estimate the average thermal energy from the sun reaching land.

2. With the aid of a beautiful ~~enemom~~ diagram: ONLY describe anemometer.

Day	Average Ambient Temperature	
	Day (°C)	Night (°C)
Monday 17/2/2020	35°C	25
Tuesday 18/2/2020	36	25
Wednesday 19/2/2020	35	25
Thursday 20/2/2020	36	25
Friday 21/2/2020	37	25

$$P = \frac{\Delta Q}{\Delta t} \quad - - - - (1)$$

$$P = \frac{K \cdot A \cdot \Delta T}{L} \quad - - - (2)$$

From eqn (1)

$$Q = P \times \Delta t \quad - - - (3)$$

where;

P = rate of energy transfer (Watts)

Q = energy transfer (J)

Δt = change in time (s)

K = thermal conductivity

Assumptions

K_{air} at $35°C - 37°C = 1.4$

$A = 1300,000 m^2$ (area of abuad)

L = average thickness $= 0.991m$

For Monday

$\Delta T = 35 - 25 = 10°C$

Tuesday

$\Delta T = 36 - 25 = 11°C$

Wednesday $\Delta T = 35 - 25 = 10°C$

Thursday

$\Delta T = 36 - 25 = 11°C$

Friday

$\Delta T = 37 - 25 = 12°C$

From eqn (2), substituting the variables

Monday $P = \frac{1.4 \times 1300000 \times 10}{0.991} = 1.83653 \times 10^8 W$

Substituting in eqn (3)

$\Delta t = 6hrs = 6 \times 3600 = 21600s$

$Q = 1.83653 \times 10^8 \times 21600 = 396700MJ$

Tuesday $P = \frac{1.4 \times 1300000 \times 11}{0.991} = 20201816.35W$

$Q = 20201816.35 \times 21600$

$= 436300MJ$

Wednesday

$P = \frac{1.4 \times 1300000 \times 10}{0.991} = 18365287.59W$

$Q = 18365287.59 \times 21600$

$Q = 396700MJ$

Thursday

$$P = \frac{1.4 \times 1300000 \times 11}{0.991} = 20201816.35W$$

$$Q = 20201816.35 \times 21600$$

$$= 436300MJ$$

Friday

$$P = \frac{1.4 \times 1300000 \times 12}{0.991} = 22038345.11W$$

$$Q = 22038345.11W \times 21600 = 476000MJ$$

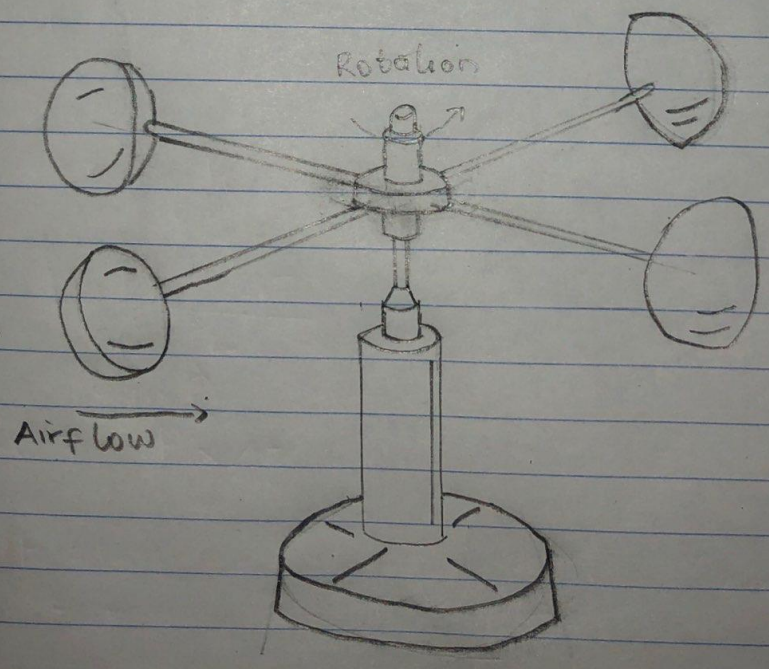
Average =

$$\frac{396700 + 436300 + 396700 + 436300 + 476000}{5}$$

$$= 420460MJ$$

Average Daily thermal energy from the sun reaching ABUAD is 420460MJ

2.



Beautiful Diogram of an Anemometer