

Q1.(2021)

a)

(very high p.d. means) very low currents

which means less (thermal) energy is transferred to surroundings

which increases the efficiency of power transmission

b)

electric field strength is very high

causing the air to become ionised

(the kite / string) conducts charge to the person / earth

c)

straight line passing through the origin

line drawn below existing line for all values

d)

the potential difference across the wires/cable is the same

(but) the resistance of the steel wire is greater (and so less current in the steel)

Q2.(2022)

a)

transformer **X** increases
potential difference

and decreases current

reducing (thermal) energy
transfer to surroundings

or

reducing (thermal) energy
transfer from transmission
cables

increasing the efficiency (of
power transmission)

b)

transformer **Y** decreases the
potential difference

to a safe / safer value

c)

$$3.24 \times 10^{11} = Q \times 230$$

$$Q = \frac{3.24 \times 10^{11}}{230}$$

$$Q = 1\,408\,695\,652 \text{ (C)}$$

$$Q = 1.41 \times 10^9 \text{ (C)}$$

or

$$Q = 1\,410\,000\,000 \text{ (C)}$$

Q3.(2023)

a)

increase

decrease

b)

$$P = I^2 R$$

c)

$$1.60 \times 10^9 = 2000^2 \times R$$

$$R = \frac{1.60 \times 10^9}{2000^2}$$

$$R = 400 \, (\Omega)$$

d)

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

or

$$\text{efficiency} = \frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$$

e)

$$0.992 = \frac{\text{useful energy output}}{34.2}$$

$$\begin{aligned} \text{useful energy output} \\ = 0.992 \times 34.2 \end{aligned}$$

$$\begin{aligned} \text{useful energy output} \\ = 33.9 \, (\text{GJ}) \end{aligned}$$