1. Name a property of light that shows it is a transverse wave. (1mk)

Polarization.

2. State THREE differences between light waves and sound waves.(3mk)

✓ Light wave are ~~longitudinal~~ transverse	sound is a longitudinal wave
✓ Light is an electromagnetic wave	sound is a mechanical wave
~~Sound~~ Light moves only in a straight line	- sound can be bend over obstacles.

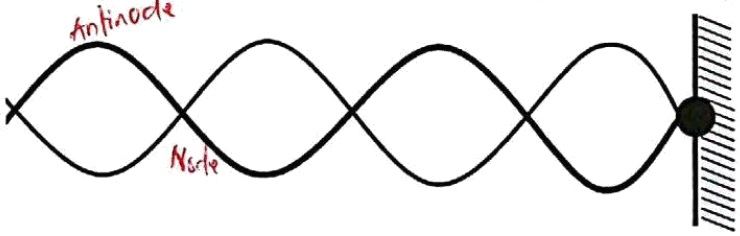
3. Explain why radio wave signals are easier to receive than TV waves signals in a place surrounded by hills. (2mk)

They have a longer wavelength than radio waves so they can easily go over obstacles.

4. When a sound wave travels from a dense to a less dense gas, its velocity changes. What wave property does this observation show? Explain your answer. (3mk)

✓ Refraction of sound.
✓ Refraction is caused by change in velocity which leads to change in direction.

5. The figure below shows a transverse stationary wave along a string.



i) Label the nodes and antinodes. (1mk)

ii) If the distance between an antinode and a node is **0.08m**, determine the wavelength of the wave of the stationary wave (2mk)

$\lambda = 0.08 \times 4 = 0.32m$

iii) State one factor which does not change as water waves move from shallow to deep end (1mk)

frequency

iv) What is meant by the term interference as applied to waves. (1mk)

A phenomenon that occurs when two waves merge

v) Explain the meaning of coherent source of wave. (1mk)

These are waves of similar frequency and having constant phase difference.

6. An electric heater is found to have a resistance of **950Ω** when operating normally on a **240V** mains. Find the power rating of the heater. (2mk)

$P = V^2/R = \frac{240^2}{950}$

$= 60.63 W$

7. An electric bulb rated **40W** is operating on **240V** mains. Determine the resistance of its filament (3mk)

$P = V^2/R$

$40 = \frac{240^2}{R}$

$R = \frac{240^2}{40}$

$R = 1440 \Omega$

8. When a current of **2A** flows in a resistor for **10** minutes, **15kJ** of electrical energy is dissipated. Determine the voltage across the resistor.(3mk)

$E = VIt$

$\frac{15000}{1200} = \frac{V \times 2 \times 600}{1200}$

$V = 12.5\ V$

9. An electric bulb with a filament of resistance **480Ω** is connected to a **240V** mains supply. Determine the energy dissipated in **2 minutes**. **(3mk)**

$R = 480\ \Omega$
$V = 240\ V$
$t = 2\ min = 120\ s$

$E = \frac{V^2}{R}t$

$= \frac{240^2}{480} \times 120$

$E = 14400\ J$

10. Two electric heaters A and B rated 1000 W and 2500 W respectively are connected in parallel across a 240 mains supply. Calculate the ratio R_A: R_B of their resistances. (3mks)

$R_A = \frac{V^2}{P_A} = \frac{240^2}{1000} = 57.6$

$R_A = \frac{V^2}{P_B} = \frac{240^2}{2500} = 23.04$

$R_A : R_B = 57.6 : 23.04$

$R_A : R_B = 5 : 2$

11. Two capacitors of capacitance **2μF** and **1μF** are connected in parallel. A p.d of 3V is applied across them. Find the energy stored in the combination. (3mk)

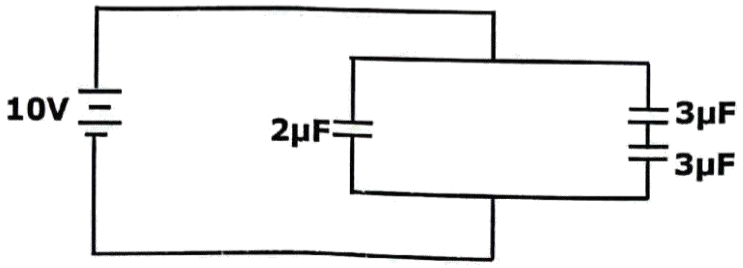
$E = \frac{1}{2}CV^2$

$= \frac{1}{2} \times 3 \times 3^2 \times 10^{-6}$

$E = 13.5\ J$

$E = 1.35 \times 10^{-5}\ J$

12. The fig. shows an arrangement of capacitors connected to a 10v. D.C supply determine:-



i) The charge stored in the 2μF capacitor. (2mk)

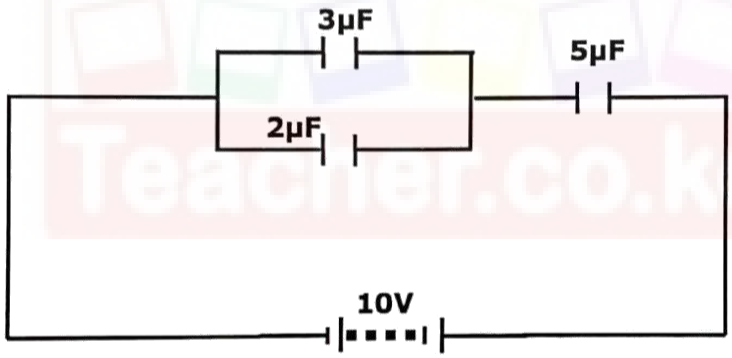
$Q = CV$

$= 2 \times 10 = 20\mu C$

ii) The total capacitance of the arrangement. (2mk)

$C_T = \left(\frac{3 \times 3}{3+3}\right) + 2 = 3.5\mu F$

13. Figure shows a circuit diagram with three capacitors.



(i) Determine the effective capacitance. (3mk)

$C_T = \frac{(3+2)5}{10} = 2.5\mu F$

(3mk)

(ii) Find the charge on the **3μF**

$Q = CV$

$= 10 \times 2.5$

$= 25\mu C$

$V = Q/C$

$= \frac{25}{5} = 5V$

$10 - 5 = 5V$

$Q = CV = 3 \times 5 = 15\mu C$

14. A crane lifts a load of **500 kg** through a vertical distance of **2m** in **8 s** determine

i) Work done by the crane (2mk)

$Wd = mgh$

$= 500 \times 10 \times 2 = 10,000 J$

ii) Power developed by the crane (2mk)

$P = E/t = \frac{10,000}{8} = 1,250 J/s$

iii) Efficiency of the crane given that its operated by all electric motor rated **2kW** (2mk)

$\eta = \frac{P_{out}}{P_{input}} \times 100 \quad \frac{1250}{2000} \times 100 = 62.5\%$

b) State two effects which contribute to the efficiency being less than 100% (2mk)

✓ The machine carries its own weight.

✓ friction between moving parts.