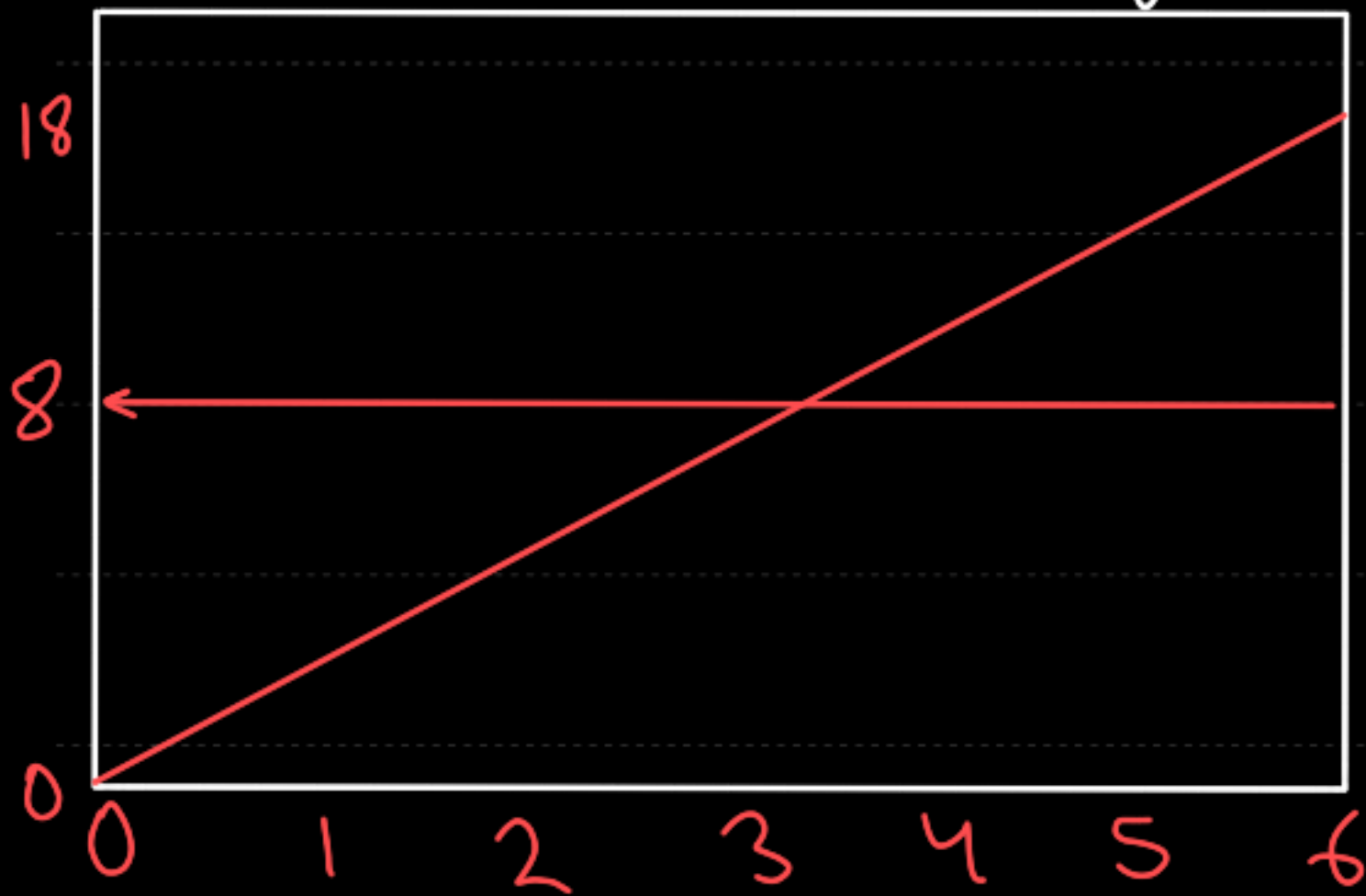


Kinematics

1. Draw the graph

Straight line at $y=8$ for athlete

Constant acceleration from $y=0$ to $y=18$ for cyclist



2. Acceleration of cyclist
 3.0 ms^{-2}

3. State by calculating why athlete travelled further than cyclist at $t=5\text{s}$

Cyclist: $\frac{1}{2} \times 5 \times 15 = 37.5 \sim 38\text{m}$

Athlete: $8 \times 5 = 40\text{m}$

$40\text{m} > 38\text{m}$

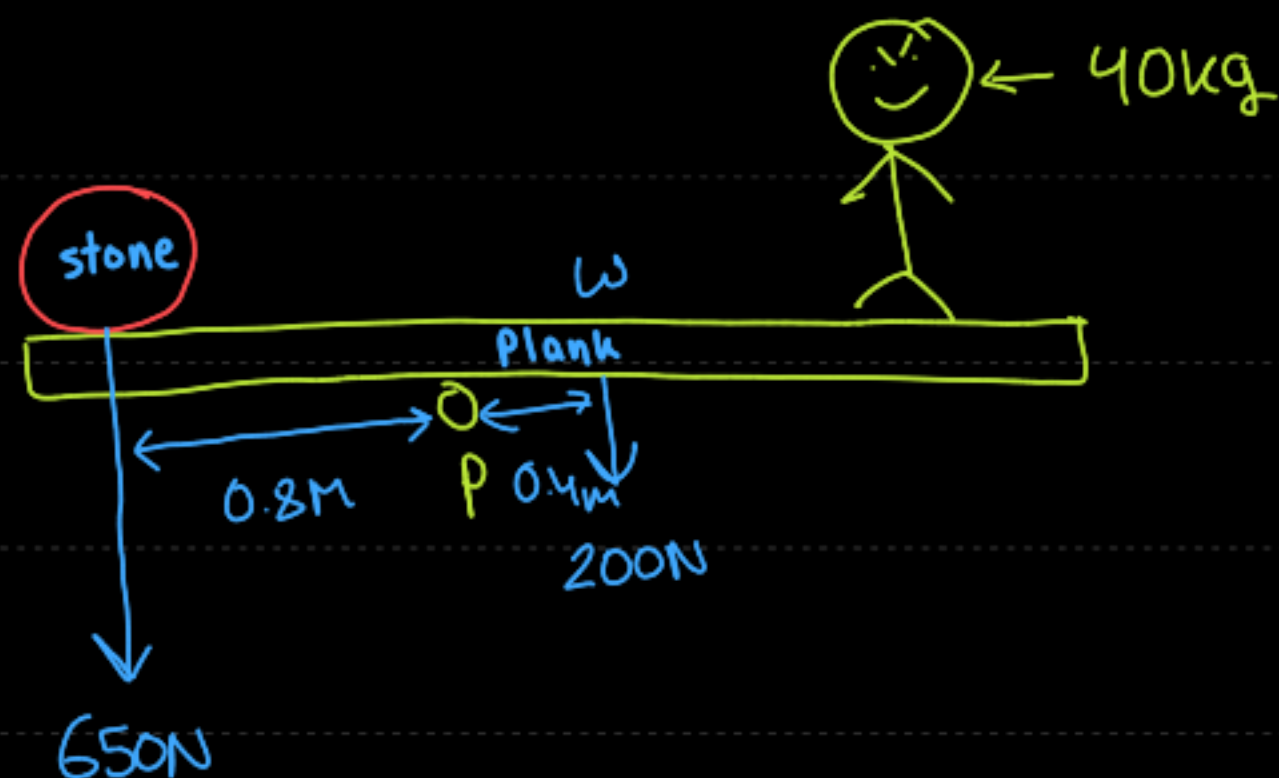
4. State Newton's first law and describe how it applies with athlete

Object is at rest or moves at constant velocity unless acted upon by an external force. Athlete's forward force is equal to drag so resultant force and acceleration is zero. Therefore athlete has constant speed.

Turning effect of forces:

1. State principle of moment.

In equilibrium, total a.c.w. Moment = total c.w. moment



2. Calculate moment of plank upon the pivot

$$W = fd$$

$$= 200 \times 0.40 = 80 \text{ Nm}$$

3. Boy is 40kg, calculate distance of boy till plank trips

$$650 \times 0.8 = 200 \times 0.4 + (40 \times 9.8) \times x$$

$$520 = 80 + 392x$$

$$520 - 80 = 392x$$

$$\frac{440}{392} = x$$

$$x = 1.12 \sim 1.1 \text{ m}$$

Thermal physics

Water of mass 250g is inside a vacuum mug. It cools from 90°C to 75°C in 6.0 hours.
Specific heat capacity of water is 4.2 J/g°C

1. Define specific heat capacity

Amount of energy required to increase per unit temperature of per unit mass.

2. Calculate energy required to cool the water

$$SHC = \frac{E}{m \Delta \theta}$$

$$4.2 = \frac{E}{250 \times (90 - 75)}$$

$$E = 15750$$

$$\sim 1.6 \times 10^4 \text{ J/g}^\circ\text{C}$$

3. Explain why there is less heat loss in vacuum gaps of mug

Vacuum has no particles present so no conduction and convection occurs that requires collision of particles.

4. Describe colour and texture of metal inside vacuum gaps of mug

White/silver shiny surface as it reflects thermal energy back to the mug to reduce cooling effect

Work, energy, Power

1. Output power is 2.5 MW, used for 30 minutes. Calculate energy transferred.

$$E = Pt$$

$$= 2.5 \times 10^6 \times 30 \times 60$$

$$= 4.5 \times 10^9 \text{ J}$$

2. Efficiency is 95%, calculate input power.

$$\frac{2.5}{\eta} \times 100 = 95$$

$$\eta = 2.6 \text{ MW}$$

3. State two factors that affects the pressure at point P

1. Density of liquid. More dense = more pressure

2. Depth of point. More deep = More pressure

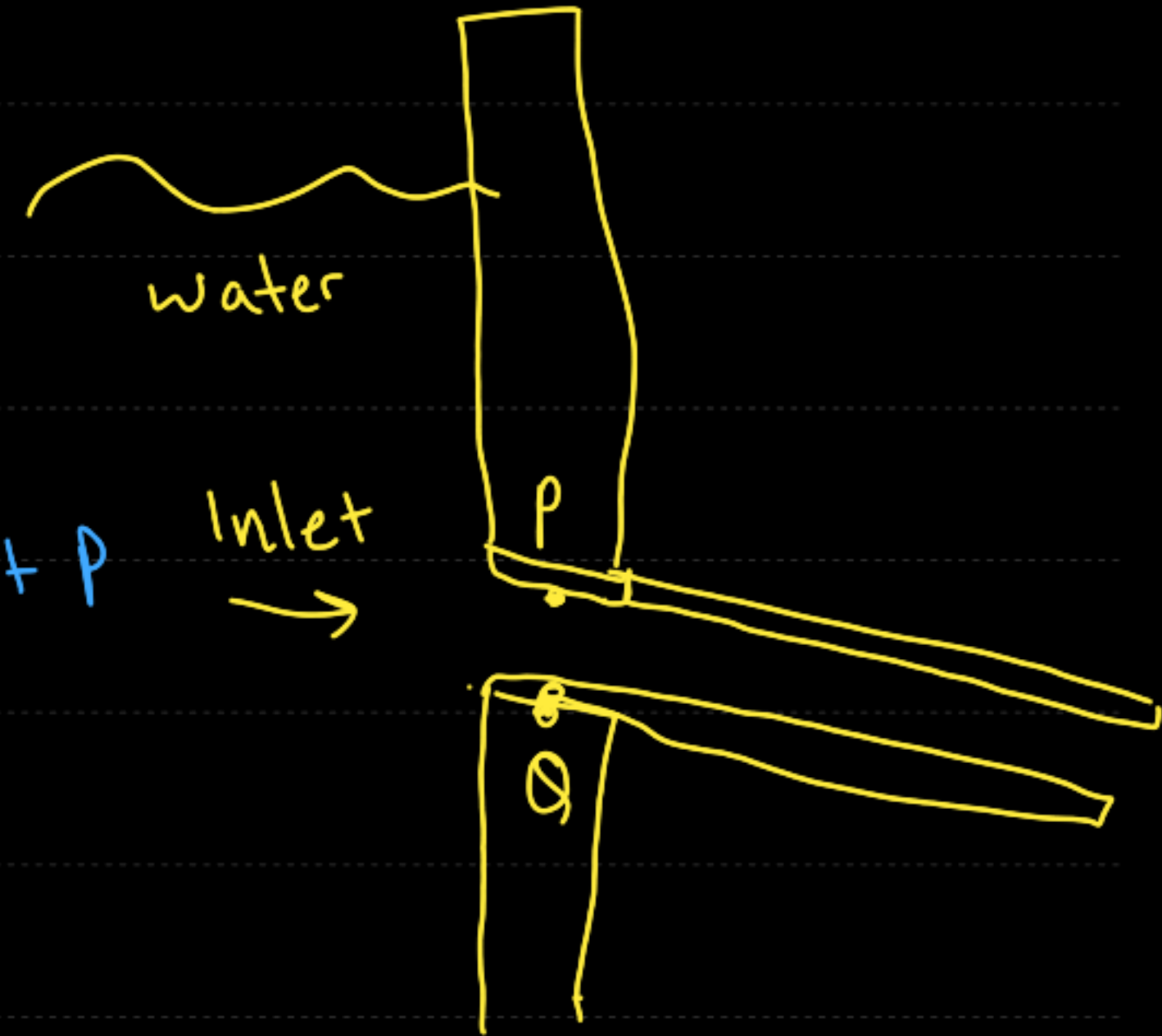
4. State direction of force exerted by water on

P: Upwards

Q: Downwards

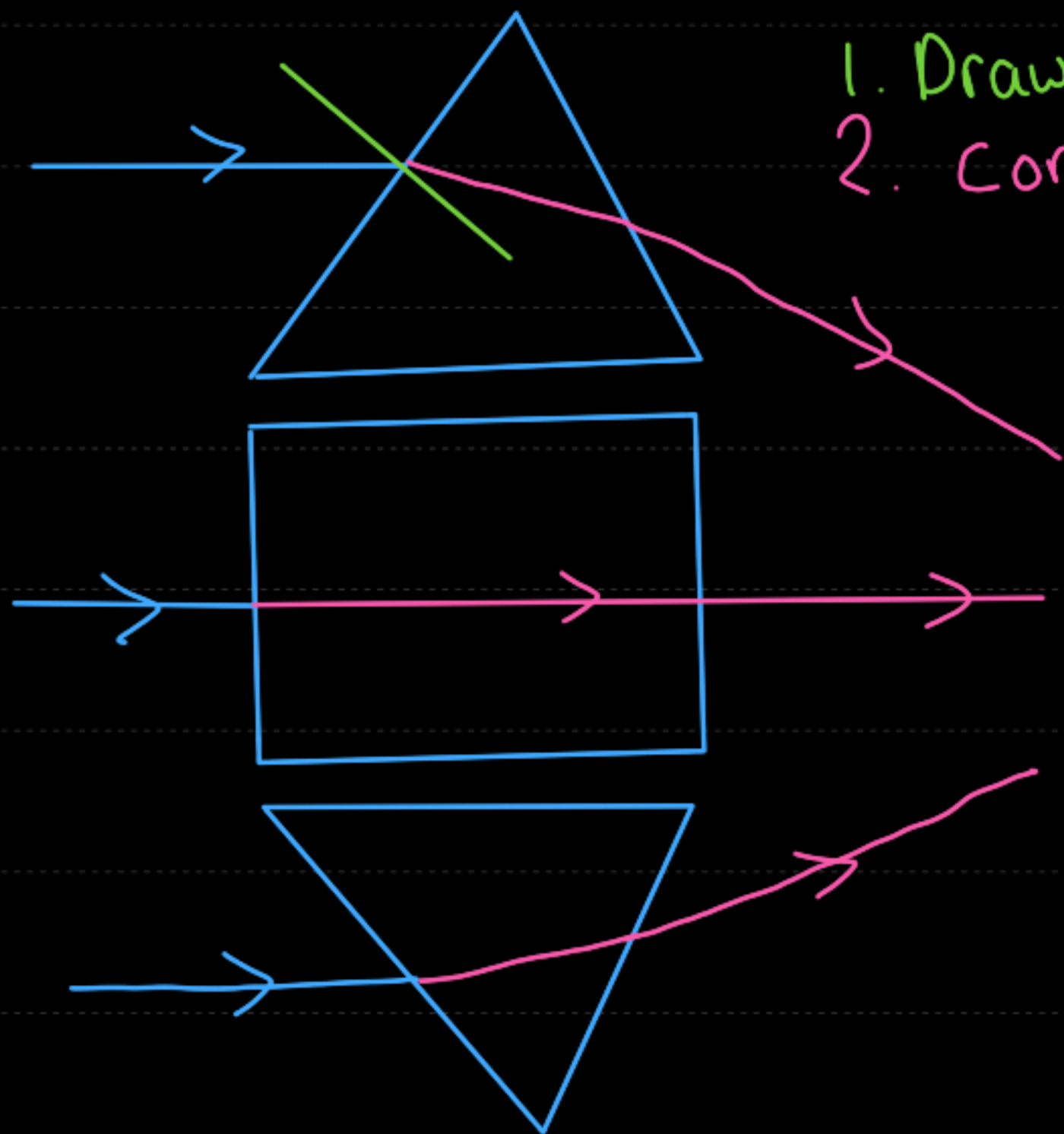
5. State one other renewable energy source

Solar / Wind / Geothermal / etc



Waves

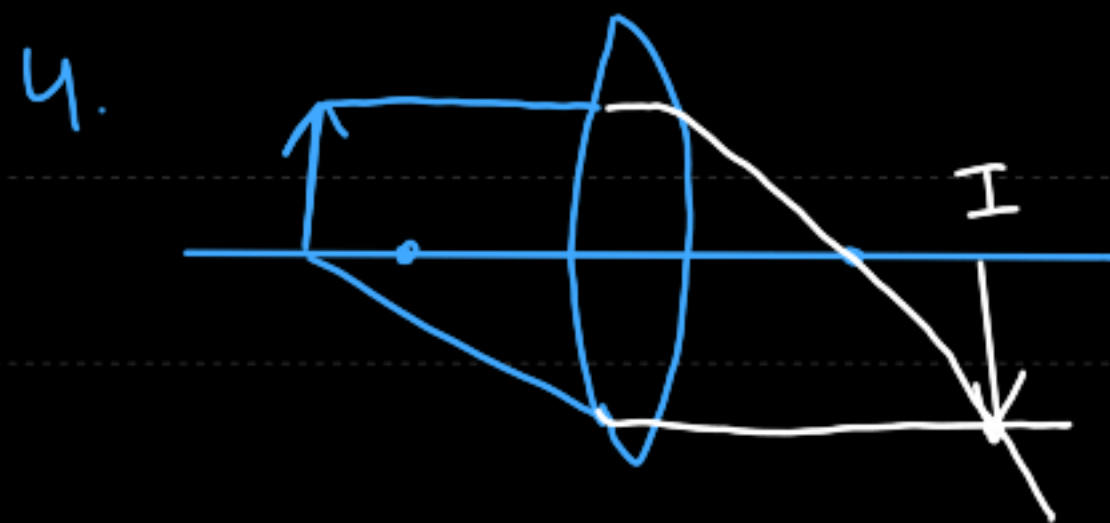
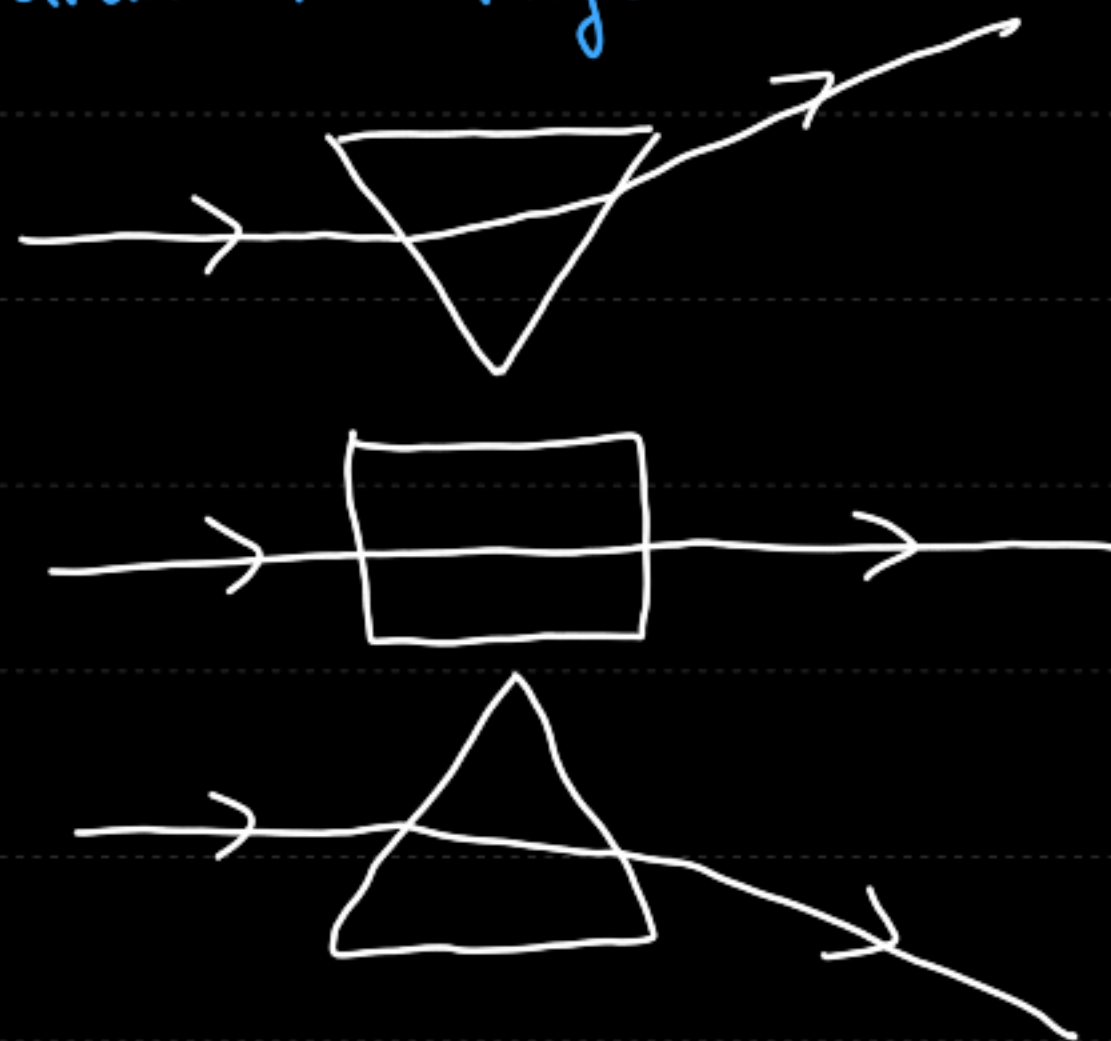
Two prisms and a glass block are arranged as a converging lens



1. Draw a normal on the top prism

2. Continue the rays

3. Rearrange the prisms to a diverging lens and draw the rays.



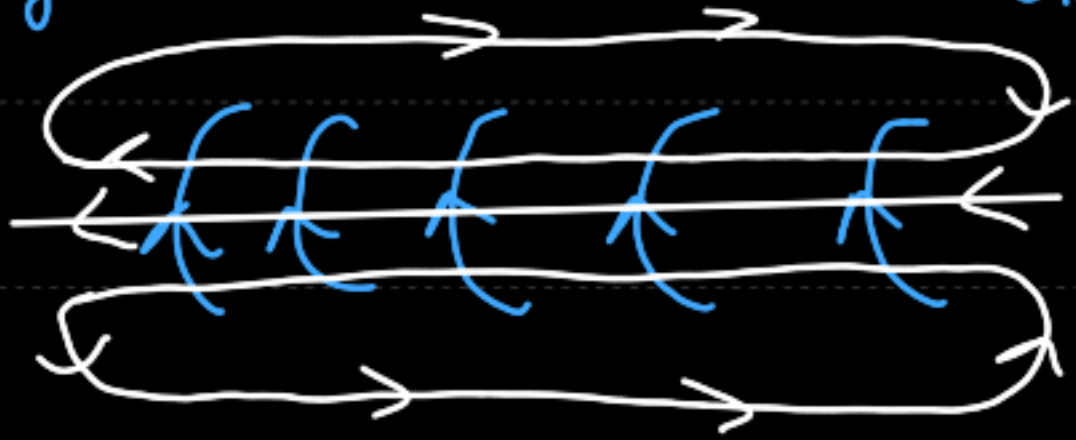
Extend the rays and form the image

5. Electromagnetic spectrum list = State which property changes as it goes to next e.m. radiation

Frequency increases from radio to gamma
Wavelength decreases from radio to gamma

Electricity.

- E.M.F of battery is 6.0 V . PD across LDR is 2.4 V . Resistance of fixed resistor 200Ω .
1. Calculate p.d. of fixed resistor
 $6.0 - 2.4 = 3.6\text{ V}$
 2. Calculate resistance of LDR.
$$I = \frac{3.6}{200} = 0.018\text{ A}$$
$$R = \frac{V}{I} = \frac{2.4}{0.018} = 133.3 \sim 130\Omega$$
 3. Effect of increasing brightness

Resistance in LDR	Decreases
Voltage in LDR	Decreases
Current in LDR	Increases
Current in resistor	Increases
Voltage in resistor	Increases
 4. Magnetic field lines of solenoid

 5. Why current produced in coil as d.c. in solenoid flows.
Current in solenoid induces changing magnetic briefly. Coil cuts changing

Magnetic field and induces e.m.f causing current.

6. What can be done to increase brightness of lamp?

Increase number of turns in coil

Nuclear physics

1. Iodine-131 used to treat cancer. It emits beta particles. State two properties of beta particles that makes it suitable for treatment.

1. It has medium ionising power so it does not harm

2. It has light relative mass

2. Iodine-131 decays to Xenon-131. Describe difference between both isotopes.

Both have same nucleon number but different proton number. Iodine-131 has one less proton than Xenon-131.

3. One isotope has half life of 8 days and another has half life of 8 years. Which one is most suitable to treat cancer?

Half life of 8 days because its long enough to treat cancer and short enough to disintegrate, preventing more harm.

4. Name the device used to measure count rate

Geiger-Muller (GM) tube

5. Average background count rate = 10 counts/min

6. Half life sample count: $90 - 10 = 80$, $80/2 = 40$, $40 + 10 = 50$,

Space physics

1. Draw the path of Halley's comet through X and Y



2. Why does Mercury have a lesser orbital period than Venus?
Greater gravitational force. Higher kinetic energy. Faster velocity. Therefore time taken to orbit is less.

3. Process used to make energy in sun.
Nuclear fusion

4. Explain why sun is a stable star?

Nuclear fusion releases energy that produces outward force. Gravitational field produces inward force. Outward force equals to inward force. No resultant force so sun is stable.

5. Explain what happens when sun nears its end of life?

Helium runs out so expands to a red giant. Contracts to white dwarf. When all energy runs out, it turns to black dwarf.

Hope yall had a great exam!
- Arcadius