Key Concepts of Physics by Chapters

1. Physical Quantities, Units and Measurement
   - Memorize 7 base SI unites, prefixes
   - orders of magnitude e.g. Diameter of atom (10^{-10} m), Diameter of Earth (6 x 10^{6} m) Refer to textbook
   - Use appropriate measuring apparatus (vernier calipers, micrometer screw gauge)
   - Pendulum experiment, measurement of diameters of circular objects
   - Vectors diagrams (vectors, resultant vectors), object in equilibrium (closed vector diagram)
   - Improve accuracy by taking more measurements at different points and finding the average, take timing for more oscillations

2. Kinematics
   - Describing of graphs (upward trend/downward trend/horizontal line (no change in y axis), straight line/curve) – at rest, constant, increasing, decreasing speed. Constant, increasing, decreasing acceleration and deceleration.)
   - Use of graphs (actual reading, gradient and area under the graph)
   - Always sketch the graph to solve problems. Do not use distance = speed X time (only constant speed)
   - Memorize definitions of distance, displacement, speed, velocity, acceleration, **uniform speed/velocity, uniform acceleration and non-uniform acceleration**.
   - Uniform = increase at a constant rate.
   - Free fall – an object in the air if without resistance will always be accelerating **downwards** with a value of g.
   - With air resistance, if moving up, then decreasing deceleration. If moving down, decreasing acceleration. (weight is constant, air resistance changes with speed. When speed is high, air resistance is high. Thus changing the resultant force. Resultant force is decreasing, hence acceleration is decreasing.)
   - With resistance, a falling body has an initial acceleration of 10m/s2 but experience decreasing acceleration. Weight is constant, but as speed increase, so is air resistance. Hence resultant force is decreasing. Decreasing till its weight = air resistance therefore **terminal velocity**. **An object with a larger mass will have a higher terminal velocity** as it experience greater acceleration before reaching terminal velocity.

3. Forces
   - Consider net force. Net force = 0, (moving at constant speed / at rest)
   - If there is a net force, then object moves with acceleration / deceleration.
   - Acceleration may be obtained from calculation or gradient of speed time graph.
   - Keywords – increasing, decreasing, constant acceleration, constant velocity and how it affects the resultant force.
   - Factors affecting friction – **independent of surface area**
   - Balanced force diagrams, free body diagrams – normal reaction force perpendicular to surface of contact, friction opposes direction of motion of surface in contact.

4. Mass, Weight and Density.
   - Definition and difference between mass and weight. **Do not be ambiguous. E.g mass is constant, etc.**
   - Define gravitational field strength g as gravitational force per unit mass N/kg.
   - Define inertia. Keywords = **reluctance to change** it state of rest of motion.
   - Convert between g/cm^3 to kg/m^3.
   - **Keywords – mass constant, volume changes, density changes, float or sink.**
   - All objects regardless of mass and size that use the same materials will have the same density.

5. Moment.
   - Define moment of force – **product** of the force and the **perpendicular distance from the pivot** to the **line of action of the force**.
   - Extend the force and use your “L” sign to locate the distance.

    - When in equilibrium, an object will have balanced forces (e.g. upward forces = downward forces) and cw moment = acw moment.
- **Uniform** ruler => **WEIGHT at c.g (usually center for regular objects)**
- Keyword of c.g – **point**, **appears to act**, **any orientation of object**, consider c.g. as a reference point
- **If weight is acting a c.g => neutral equilibrium => will remain at position when turn or displaced since no perpendicular distance from pivot to the line of action of the force => no moment => will not turn.**
- Explain stability using moment cause by the weight of object. Always consider the moment it created using the pivot and the weight. If moment due to weight will enable the object to go back to the original position, then STABLE.
- Locating the c.g of object
- **Bigger base area and/or lower c.g => object need to displace more before the c.g is beyond its base and weight will cause…. Not enough to say weight acts within the base, need to explain it is due to the clockwise/anti clockwise moment due the weight which allows the object to go back to original position.**

6. Energy, Work and Power
    - Take note of how acceleration, deceleration and constant velocity affects KE
    - Remember to square root when calculating velocity from KE
    - W.d against gravity = GPE = mgh
    - W.d against friction = Friction x d
    - W.d by engine = engine force x d = Gain in GPE + Gain in KE + loss of energy (friction/air resistance/sound/heat)
    - W.d on object = Gain in GPE + Gain in KE
    - Power efficiency
    - Do not say energy loss due to friction!!! Use “energy loss due to work done against friction”
    - In explaining how conservation of energy is used, e.g. “As the ball moves upwards, GPE increases. As the total energy of the system remains constant, KE decreases, and hence speed decreases.”

7. Pressure
    - Keywords – Force exerted, Area of contact, Pressure difference thus there is a resultant force exerted on the side which has a higher pressure
    - Hydraulic systems – use pressure formula on both sides to be equal as the liquid will distribute the pressure evenly.
        - Liquids are incompressible.
        - When pressure is applied to a trapped body of liquid, the pressure will be transmitted to all other parts of the liquid and is the same throughout the liquid.
        - In hydraulic press, small effort applied on a small piston can lift a larger load on a bigger piston.
        - A1 x d1 = A2 x d2 and F1 x d1 = F2 x d2

        Application: car hydraulic disc brake system
        - when driver steps on brake pedal, pressure on brake is transmitted to large pistons on each side of a large disc on the wheel axle
        - pistons come into contact with disc, disc slows down due to friction ∴car slows down
    - H x density x g => **H is the depth**
    - Conversion of mmHg to Pa
    - Higher altitude = lower atmospheric pressure
    - Factors affecting the height of height difference in liquid of a barometer and manometer
        - Gravity increase, height decrease
        - Density of the liquid increase, height decrease
        - Diameter of tube, no effect
    - Always remember to add air pressure above liquid pressure unless otherwise stated.

8. Temperature

- Memorize the physical properties that can measure temperature
- Responsive, Sensitive and Range
- More senstive = smaller range
- Fixed points are needed to calibrate the thermometer to define the temperature scale.
- Ice point: temperature of pure melting ice at standard atmospheric pressure, assigned a value of 0°C
- Steam point: temperature at which boiling water changes into steam at standard atmospheric pressure, assigned a value of 100 °C
- Describe experiment to calibrate ice and steam point
- Remember to compensate when doing temperature scale problems.
- **Cold junction of thermocouple if in hot region will give negative emf**
- Thermocouple
    - How it works? Two junctions of two difference metals
    - Range?
    - Responsive as metal is a good conductor of heat (do not write sensitive as not stated)

9. Kinetic Model of Matter
    - Solid – closely packed, regular pattern, vibrate about fixed positions, strong intermolecular forces of attraction.
    - Liquid – closely packed but slighly further apart than solid, randomly arranged, **move** and flow pass each other, strong intermolecular forces of attraction.
    - Gas – very far apart, moving randomly in high speeds, weak intermolecular forces of attraction
    - Fix Shape? –Regular pattern?
    - Fix Volume? – forces of attraction to hold particles together?
    - Can Flow? – fix position? forces of attraction to hold particles together?
    - Compressible? – space between particles?
    - Brownian motion – the **invisible air particles** bombarding randomly at high speeds onto the smoke partilces. Uneven collision produces a resultant force thus the smoke particles move.
    - When temperature increase, the speed of particles increase
    - Why gas exert pressure? Gas particles moves at high speed and collide with the walls of the container. The particles exert a force on the walls of the container and thus exerting a pressure.
    - Why pressure on smaller wall is the same? **The average force per unit area exerted by gas particles is the same**.
    - Gas Pressure
        - When Temp ↑, KE ↑, velocity ↑, collide with walls more frequently and vigorously, force exerted on walls ↑, pressure on walls ↑
        - **If Temp ↑, V ↑, P constant, collision with walls more vigourously but less frequently**
        - P-T, V-T and P-V graph (CONVERT TO KELVIN)
        - P1V1 = P2V2
    - When asked to describe the changes, use more/less to compare before and after.

10. Transfer of Thermal Energy
    - Remember to see how the thermal energy is flowing. Identify the warmer body and the cooler body (this is especially helpful in radiation to determine whether the object is absorbing or emitting thermal energy.)
    - Conduction – energy transfer due to **vibration**, **material medium does not flow** (This always takes place regardless conductor or insulator. However, it gets very slow in insulators)
    - If material is Metal – remember to mention electron diffusion in describing the mechanism behind conduction.
    - Water and Air is a good insulator or bad conductor of thermal energy
    - Convention – hot …. Volume expand, mass remains constant……. Thus becomes less dense and rises, cold …. Is more dense and sinks, a convection current is setup to…..
    - Radiation – no medium required, Black Dull Rough good absorber/emitter of infrared radiation
    - Experiments on radiation

11. Thermal Properties of Matter

- Internal energy = KE (temperture) + PE (forces of attraction)
- when temperature rises, kinetic energy of molecules increase. internal energy is the sum of kinetic and potential energies of the molecules ∴internal energy increase

  note:
  - potential energy of molecules relate to the intermolecular forces and intermolecular distance. Weaker intermolecular forces and greater intermolecular distances indicate higher potential energy of molecules
- Define heat capacity, specific heat capacity, latent heat of fusion and vaporization
- Take of the units of the capacity when doing calculation J**Kg**$^{-1}$K^{-1} or J**g**$^{-1}$K^{-1} or **M**JKg^{-1}K^{-1}
- Concept:
  - Electrical Energy -> Thermal Energy,
  - Thermal energy loss = Thermal energy gain
- Describe melting and boiling – latent heat of … is use to break/form intermolecular forces of attaction, the particles moves further/closer to behave like ….. particles
- **During boiling and evaporation, energy is required to overcome atmospheric pressure**
- Heating and Cooling graphs
  - Why is the gradient of the graphs decreasing?
  - Why temperature remain constant?
  - Why it takes a longer time to boil than to melt
  - Why it takes a longer time to heat a liquid than solid
  - How the the atmospheric pressure affects boiling? B.p increase, time taken shorter
- **Evaporation – more energetic particles on the surface able to overcome the forces of attraction between the particles and the air pressure to escape into the surrounding thus leaving behind the less energetic particles in the liquid. Average KE of liquid decrease, thus temperature drops.**
- When temperature is high, rate of evaporation increases because chances of having particles with higher energy at the surface is **HIGHER.** Thus, more can escape into the atmosphere.
- Factors affecting evaporation – relate to temperature or amount of particles in surrounding.
- Latent heat is the energy absorbed/released during a change in state
  - when latent heat is absorbed during melting, potential energy of the molecules increase, molecules are less closely packed and can slide against one another.
  - when latent heat is absorbed during boiling, potential energy of the molecules increase, molecules are randomly arranged and move freely.
  - Remember boiling needs more energy because need to push against atmosphere.
- **During change of state, PE increase as energy required to break intermolecular forces of attraction while KE remain the same as temperature remain constant.**

12. Light

- Reflection diagrams (multiple mirrors)
- Determine whether can see image in mirror
- Properties of a image in mirror. If question is 3 marks, mention type of images and describe the images. (virtual/real, inverted/upright, diminished/same size/magnified, image same side as object? Image distance? Measurement of image?)
- Height of object that can be seen – Similar triangles technique
- Concave and convex mirrors
- Refraction diagrams (2 rules)
- Definition of n is based on c/v not sin i/ sin r
- n = sin i / sin r = c/v = **real depth / apparent depth** = 1/sinc
- the optically denser the medium the more bending effect it has
- Weak internal reflection during refraction (weak internally reflected ray)
- TIR
  - Define critical angle
  - **If i = c , TIR has not happened**
  - Applications – SLR cameras and Fibre optics

    - Optical fibre made up of thin glass or plastic fibres that transmit light over long distances through total internal reflection
    - Core (inside) of optical fibre has high refractive index coated with another material of lower refractive index (cladding)
    - Even when fibre is bent, light rays entering the fibre will still undergo TIR
    - Advantages:
    - In telecommunications, optical fibres carry more information over long distances than copper wires; less signal loss than wires
    - In medical industry, used in endoscope which enable Dr to see organs inside human body because of flexibility
- Diverging lens diagrams
- Explain how a lens works using refraction
- 6 cases
    - As object moves nearer to lens, image moves further and become larger
    - All ray converge along focal plane
    - Applications – LCD Projector, Long/Short sightedness
    - If object between axis, draw double rays from top and bottom of object

13. Waves

- **Common characteristic – transfer energy from one point to another without the physical transfer of the material between the two points**
- Keywords – vibration, propagation, transfer of energy through vibrations, direction of vibration and direction of wave travel
- Transverse and longitudinal waves and examples
- Displacement-distance (find wavelength), displacement-time graphs (find period)
- Waves production in ripple tank, spherical and straight dipper, wavefronts
    - **How to use a ripple tank to measure wavelength? (must use camera take photo, scaling and measuring multiple wavefronts and take average)**
- Define wavefronts
- Reflection and refraction of waves
    - During refraction, the frequency is the same, the velocity and wavelength changes (SSS)
    - Velocity only changes when medium change.
    - Frequency usually remains unchanged as it depends on source
    - If dipper frequency increases, f of waves increase
    - If dipper strength increase, amplitude increase

14. EM Waves

- **Memorize frequency and wavelengths**
- **Electrically neutral, frequencies remain the same.**
- **Keywords – ionization, penertration, absorbed, reflection and refraction**
    - **X-rays:** high frequency, high energy, highly ionizing, highly penetrative, absorbed by bones little reflected
    - Gamma: highly ionize and kill cells (both healthy and cancerous), highly penetrative, absorbed and little reflected
- Applications
- Absorbtion of lower energy (lower frequency) electromagnetic waves result in temperature rise (heating)
- Note: infra-red is absorbed at surface of food only while microwave involves penetration into the food
- Similarity: the thermal energy is then transferred to the rest of the food by conduction
- Higher energy (high frequency) electromagnetic waves e.g X-ray and gamma rays causes ionization (because of their high energy, able to ionize atoms, molecules and living matter)
- Ionization causes damage to living cells and tissue:
- damage proteins, nucleic acids in cells
- damage to chromosomes
- may cause abnormal cell division leading to cancer of blood (leukaemia)

15. Sound

- **Production of Sound – a form of energy, vibration**
- **Propagation of sound - vibration, propagation, compression and rarefraction**
- Pressure – distance graph
- Bell jar experiement, Speed of Sound (how to improve accuracy?) why rubber band is used?
- Echoes - **REFLECTION**
    - Echo location
    - Ultrasound – Definition
    - Reflection experiment
    - Basic equation is total distance = speed X time. (for echo questions, the total distance = 2 X the distance between the detector and source)
- **Pitch and Loudness.**
- Relate to graphs (what is the vertical axis? What is the horizontal axis?)

16. Static Electricity

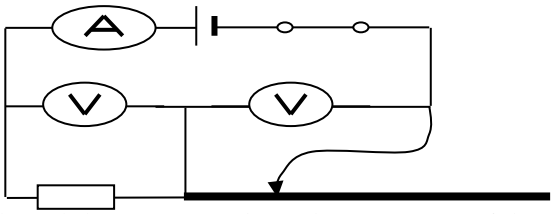
- Use electrons instead of negative charges.
- **Always explain using movement of electrons**
- Keywords – like charges repel, unlike charges attract, negatives charges are transferred, charging by friction (insulators or conductors with insulated stands), charging by induction (conductors only), neutralize (only if already charged), attracted/repel due to induction, discharge by earthing, charges flow in conductors.
- Electric fields
- Applications
- If explain attraction between neutral object and charged object, force of attraction is larger than force of repulsion, therefore attract. If between 2 oppositely charged objects, why force of attraction is stronger, it is because there is no repulsive force.

17. Current and Electricity

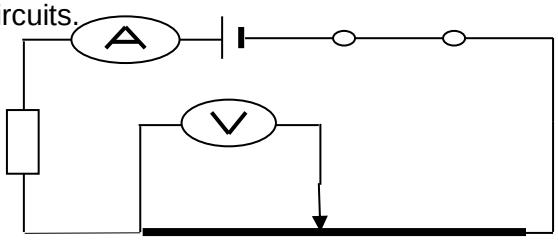
- **Define current, p.d, e.m.f and explain differences**
- **Be familiar with formulas.**
- **Q=It, V=W/Q, R=pl/A**
- Experiment to find resistance of unknown resistor
- State ohms law, V-I or I-V graphs of resistor, filament lamp, thermistor, diode.

18. DC Circuits

- Electric circuits symbols LED, LDR, Thermistor
- Use the basic series and // circuits rules to simply problems. Zoom in to any conductor whenever 2 variables are known (V,I,R). If required, find effective resistance.
- Potentiometer or potential divider => V is proportional to R. When in doubt, use test values to explain effects of change in a variable. Be careful of // or series circuits.



When slider moves to the right, resistance of the circuit ↑, current in circuit ↓, V_1 ↓, V_2 ↑



When slider moves to the right, <u>resistance of the circuit</u> does NOT change, current in circuit does NOT change, V ↑ because the resstance that it is connected across ↑, R= pl/A

- Thermistors and LDRs
- Describe CRO and reading of waveforms

19. Practical Electricity

- Heating elements in kettles/ovens/heaters made of NICHROME
    - high resistivity
    - able to withstand high temperatures
- Tungsten is used in filament lamp
    - high resistivity
    - able to withstand high temperature
    - filament very thin (large cross sectional area) ∴high resistance so when current flows, tungsten gets very hot and generates light
- Note: inert gases in the bulb ensure that tungsten doesn't burn at high temperature
- Brightness of bulbs
    - **Rated current, voltage and power is the maximum brightness. It is also use to find the resistance of the filament bulb.**
    - Use test values to compare brightness (Strongly encouraged unless otherwise specified)
- Damaged insulation - Electric shock
- Too thin wires – Electric fires (thin wires => R increase => overheats)
- Overloading - Electric fire (current increase, overheats)
- Damp conditions – Electric shock
- Fuse – melts and breaks the circuit when current exceeds rating so as to prevent a surge in current from damaging appliance.
- live wire (brown) delivers electrical energy to the appliance and is at high voltage (usually 240V)
- neutral wire (blue) completes the circuit by forming a path for the current back to the supply (at 0V)
- earth wire (green and yellow) is a low resistance wire connected to the metal casing of the appliance (at 0V)
- **Earth Wire – to provide a low resistance path from current to flow when appliance becomes "live". Fuse will melts and breaks circuit (Earth wire is to cause fuse to "blow")**
- Double insulation with plastic casing = no need earth wire
- **Fuse (switch/circuit breaker) is connected in live wire so that the appliance will be disconnected from high voltage supply after the (fuse has melted/ switch is off / circuit breaker has open the circuit).** In the event of an electrical fault where the live wire touches the metal casing, a user who touches the metal casing will not get an electric shock. Current on live = current on neutral
- Current on earth = 0 A if normal

20. Magnetism

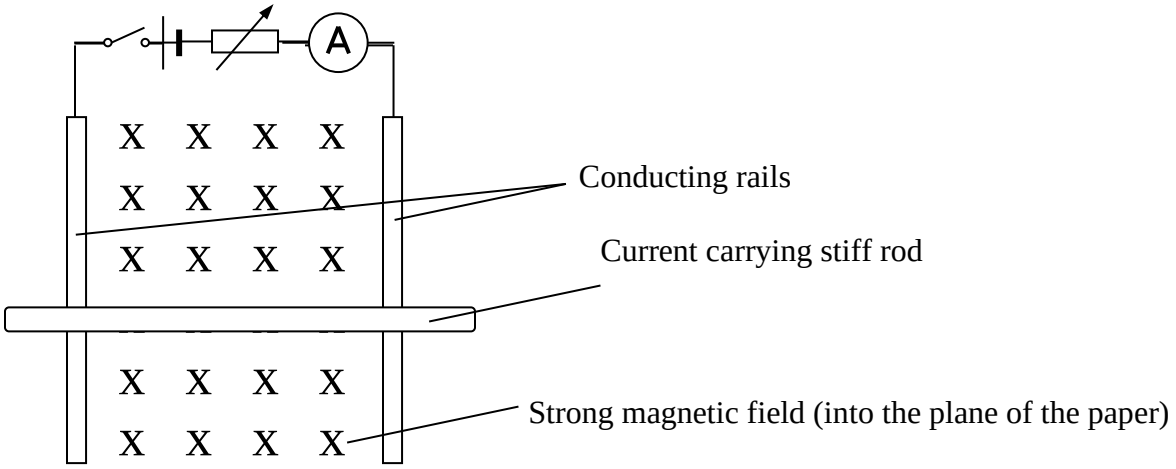
- Keywords – like poles repel, unlike poles attract, magnetize, demagnetize, magnetic materials (iron, steel, nickel, cobalt), magnetic induction always happens before attraction/repulsion, concentrate magnetic fields therefore become stronger magnet, permanent magnet gains and loses its magnetism slowly, electromagnetic gains and loses it magnetism quickly and it's a strong magnet.
- **Magnetic Induction occurs and a opposite pole is induced on the end nearer to it. As opposite poles attract, the magnetic material is attracted to the magnet.**
- Experiment to investigate poles or strength of magnet
- Experiment on Magnetization and Demagnetization
- Draw Magnetic fields including cases of shielding.
- Experiment to distinguish between permanent and temporary magnets

21. Electromagnetism

- A current carrying conductor will produces a magnetic field around it. If straight wire or solenoid, use right hand grip rule.
- Application – circuit breakers, magnetic relays, electric bells
    - Important key point: Only when the current exceeds a certain value, the solenoid/coil becomes a ***strong enough*** **electromagnet to induce** and attract the soft iron armature
- Explain why force is induced.
    - When a current carrying conductor is placed in a magnetic field, a force will be induced in the conductor.

- This is due to the interaction between the magnetic field of the conductor and the external magnetic field.
- Uneven magnetic field
- Force in the direction of stronger field to weaker field.

- **Explain direction of force. (Not why force is produced)**
  - Using Fleming's Left hand rule, the index finger representing the magnetic field points
  - The direction of the force is due to the cancellation of magnetic fields and strengthening of magnetic fields in some regions.
- Experiment to demonstration force on a current carrying conductor.



- **Draw the effective magnetic field between the conductor and the magnets.**
- Electron flowing in a magnetic field, current direction **is opposite**
- Explain D.C motor
  - **Circuit has a d.c source**
  - Current carrying coil in a magnetic field => force induced on both sides of the coil. The force creates a moment about the axle and thus the coil turns.
  - **Split ring commutator reverses the direction of current in the coil every half turn (or whenever the commutator changes contact from one brush to the other) so that the coil can rotate continuously in the same direction**
  - **Soft iron cylinder concentrate magnetic field lines thereby increasing magnetic field strength and increases turning effect for a given current in the coil**
  - **radial field keeps pair of forces almost constant as coil turns**
  - **What happens if slip-ring used?**
  - To increase speed,
    - Increase current
    - Increase number of coils
    - Insert soft-iron core between the coils.

22. Electromagnetic Induction
  - Explain why is there induced e.m.f due to change in magnetic flux
- Explain direction of induced e.m.f
  - Using **Lenz law**, the induced e.m.f is always such that its magnetic effect opposes the motion or change producing it. (GENERAL CASE)
    - Explain why a copper foil slows down when oscillates between a magnetic field
    - Explain why a magnet slows down when it gets closer to a coil of wire
  - Or use Fleming's Right Hand rule for straight conductor such as A.C generator.
- How to increase the size of the e.m.f?

    - Use Faraday's law
        - Increase the rate of change in magnetic flux. – Increase no. of turns in the coil, increase speed, stronger magnet
- Explain A.C Generator
    - The circuit will have a load. Axle will have to turned.
    - The coil rotate within a magnetic field => this cause a change in the magnetic flux in the coil => e.m.f and thus a current in induced in the coil.
    - Why A.C? Allows continuous transmission of current to the electrical load / external circuit. The slip-ring commutator reverses the current flowing into the load of the circuit.
    - What if split-ring used?
    - To increase e.m.f,
        - Increase rotating speed – frequency increase, amplitude doubles
        - Increase number of coils – amplitude increase
        - Insert soft-iron core between the coils. – amplitude increase
- Know the difference between MAGNETIC INDUCTION (between magnetic material and magnet, thus attraction), MAGNETISATION (stroking/electrical methods to form permanent magnet), ELECTROMAGNETISATION (wire carrying current move in magnetic field FLHR), applications where current magnetises a iron core and magnetic field is strong enough to …….), MAGNETIC INDUCTION (Fleming and Lenz law to explain why INDUCED current is produced and explains the direction.)
- Transformer
    - A.c source in primary coil produces a constantly changing magnetic field in the primary coil. The soft iron core concentrates the magnetic field which cause a change in the magnetic flux in the secondary coil. E.m.f is induced in the secondary coil.
    - Assuming no energy is lost, power at input = power at output. IpVp=IsVs
    - Using the turns ratio, Ns/Np=Is/Ip=Vp/Vs
    - However, in reality, transformer is not 100%. How to improve efficiency of transformer? Why not 100% efficient? (due to thermal energy loss, transformer gets very hot)
    - **Rated current, voltage and power is the maximum brightness. It is also used to find the resistance of the filament bulb.**
    - Use test values to compare brightness (Strongly encouraged unless otherwise specified)

- There is energy loss in cables due to the heating effect of **current**
- Advantage of high voltage transmission:
    - At high voltage, the transmission current is low. According to P = (I transmission)^{2}R, the energy loss in cables will be reduced. (P transmission=I transmission X V transmission, p transmission is usually fixed. To get small I transmission, V transmission will have to be high.)

e.m.f – work done by the source in driving a unit charge round a complete circuit.
emf of 2V – *work done by the source in driving 1C of charge round a complete circuit is 2J.*
current – rate of flow of electric charge through a given cross section of a conductor.
current of 2A – *2C of charge flows through a conductor in 1 second.*
potential difference – work done to drive a unit charge across a component or between two points.
Pd of 2V – *2J of work done to drive 1C of charge across a component or between two points.*
Wavelength – shortest distance between any two points in a wave that are in phase
Wavelength of 2m – *the distance between any two points in a wave that are in phase is 2m.*
Frequency – no. of complete waves produced per second.
Frequency of 2Hz – *2 complete waves are produced in 1 second.*
specific latent heat – amount of thermal energy required to change the state of 1 kg of a substance, without a change in temperature
specific latent heat of fusion of 340 kJ/kg – *340 kJ of thermal energy is required to change 1 kg of the solid to liquid or liquid to solid, without any change in temperature*
specific heat capacity – amount of thermal energy required to change the temperature of 1 kg of a substance by 1K or 1 °C
specific heat capacity of 4200 J/kg/°C – *4200J of thermal energy required to change the temperature of 1 kg of a substance by 1K or 1 ℃*

pressure is defined as force acting per unit area.
Pressure of 2Pa – *2N of force acts over an area of 1m^2*
Power – rate of work done
work done – work done by a constant force on an object is given by the product of the force and the distance moved by the object in the direction of the force.
moment of force – is the product of the force and the perpendicular distance from the pivot to the line of action of the force.
Force – is a push or pull that one object exerts on another. It produces or tends to produce motion, and stops or tends to stop motion.
Acceleration – rate of change of velocity
Speed – distance moved per unit time
Density – of a substance is defined as its mass per unit volume.
Period – time taken for one point on the wave to make one oscillation OR time taken to produce one complete wave.
Weight – is the amount of gravitational force acting on a body.
N – the Newton is defined as the force that will produce an acceleration of 1ms-2 on a mass of 1 kg.
J – 1J is defined as the work done by a force of 1N which moves an object through a distance of 1m in the direction of the force.
kW h – 1kWh is the amount of electrical energy used by a 1kW device in one hour.
W – 1W is defined as the rate of work done of 1J per second.
Pa – 1 Pa is defined as the pressure exerted by a 1N force over an area of 1m2.
V – 1 V is the potential difference across a component when 1J of work is done to drive 1C of charge across the component.

Answering structured questions/application

1. Read the structured question carefully.
2. Determine the chapter that is used. (there can be more than 1 way /different chapters used to explain a phenomenon)
3. Look at the marks. That will give you a hint how much/depth your answer have to be. Unlikely 1 mark for 1 word answer. Usually 1 mark 1 point.
4. When explaining, state what is constant and what is different. Use formulas
   E.g. sound travelling through from air into a solid….. speed increases, however frequency remains unchanged. Thus, using v=fλ, wavelength increases.
4. When explaining terminal velocity
   e.g. as the object falls, weight is constant, however, air resistance increases due to the increasing speed.
   Thus, net force decreases, using F=ma, with constant mass, F decreases and acceleration decreases.
   When weight = air resistance, net force = 0 and hence object moves at constant speed.