ITEM **JJEB UCE PHYSICS 535/1 AUGUST 2025 GUIDE** ITEM SCORE

Item One

(a) (i) **Light** is a form of energy radiated outwards from the source and causes a sensation of vision.

1 scr; *definition*

Radius of curvature is the radius of the sphere from which the mirror (reflector) was cut. ***Or***, it is the radius of the sphere of which the reflector forms part.

1 scr; *definition*

(ii) The angle of incidence is equal to the angle of reflection.

1 scr; *law*

The incident ray, the reflected ray, and the normal at the point of incidence all lie in the same plane.

1 scr; *law*

(b) (i) The saucepan must be placed at the principal focus.

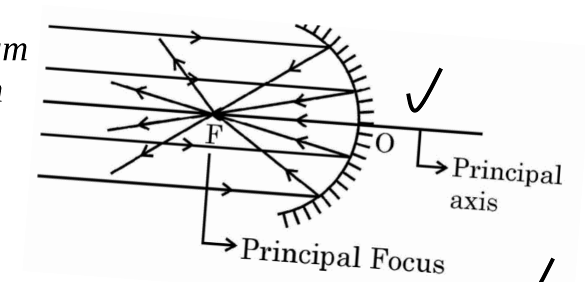
1 scr; *for principal focus*

The focal length (f) is half the radius of curvature (R); $f = \frac{R}{2}$. Given R=160 cm, then $f = \frac{160}{2}$ and so, f = 80 cm. Therefore, the saucepan should be placed **80 cm from the mirror** for rays to converge effectively at the focus, where heating is most intense due to energy concentration.

1 scr; for f = 80cm

1scr; *for conclusion*

(ii) *Parallel beam from the sun*



1 scr; *for ray diagram*

1 scr; *for parallel beam and object position*

Rays of light from the sun are treated as <u>parallel beam since the sun is seen as an object (source of light) at infinity.</u>

As the parallel beam strikes the reflector (of a narrow aperture), all the rays are <u>considered to be paraxial rays and so converge to the principal focus</u> of the reflector with high intensity, <u>creating a large amount of heat energy</u> enough to boil the food.

1 scr; *for small aperture and paraxial rays.*

1 scr *for intensity and position of convergence.*

- It is used as a reflector of light in reflecting telescopes for viewing distant objects especially in astronomy.
- It is used as a reflecting mirror behind a projector lamp in the projection lantern to reflects back all the rays of light that fall on it

2 scrs. 1 scr @ *application*

since the projector lamp is place at the center of curvature of the mirror. ➢ It is used as a reflector of light in flash light lamps for example on city streets, flash lamps on a car etc. ➢ A concave mirror is used as a reflector of light in torches, car head lamps, search light lamps to produce a parallel beam of light. ➢ It is used as a magnifying mirror for dentists. ➢ It is used as a shaving or makeup mirror in homes, saloons etc.	
(c) (i) Using $v = f\lambda$, where; $v = 144\ \text{kmh}^{-1} = 40ms^{-1}$, $\lambda = 3cm = 0.03m$, => $40 = f \times 0.03$ and so, $f \approx 1333Hz$. Therefore, there are approximately 1333 waves per second that reach the shore per second.	**1scr**; *exprsn;* **1 scr;** *substn* **1 scr;** *concln*
(ii) <u>Strong concrete walls are built</u> in the sea near the harbour. When strong waves rush towards the harbour, the <u>walls reflect some of the waves and diffract few waves</u> through the opening in the walls. These protects the structures from strong waves.	**1scr;** *concrete wall.* **1 scr;** *reflection & diffraction*
(iii) At night, layers of air near the <u>ground are cooler than that above it</u>. Sound <u>travels faster in warm air</u> than in cool air. Therefore, more sound is <u>refracted towards the ground</u> instead of disappearing into the upper layers of air, making the person to hear sound louder at night, <u>unlike day time where layers of air near the ground are hotter</u> than that above it.	**1scr;** *temp diff in air.* **1scr;** *speed of travel in air.* **1scr;** *refraction* **1scr;** *day time* **<u>TOTAL= 22pts</u>**

Item two

(a) (i) Radioactivity is the random and spontaneous disintegration of an unstable nucleus into a stable nucleus with the emission of radiations and energy.	**1scr;** *definition*
(ii) ${}^{x}_{92}Y \rightarrow {}^{234}_{88}Z + b({}^{4}_{2}He) + 4({}^{0}_{-1}e)$ => $x = 234 + 4b$ and $92 = 88 + 2b - 4$ giving, $b = 4$. Thus, $x = 234 + 4 \cdot 4 = 250$	**1scr;** *exprsns* **1scr;** *value of x*

(iii)

Feature	Alpha (α) Particle	Beta (β) Particle
Nature	It is a helium nucleus	It is an electron
Charge	Positively charged	Negatively charged
Ionizing Power	Higher than beta	Lower than alpha
Penetration Power	Lower than alpha	Higher than alpha
Deflectionin in an electric field	Towards the negatively charged plate.	Toward positively charged plate.

3 scrs; *3 diffs; @diff* **1scr.**

(b) (i) Given:

Initial mass, M_0 =125 g
Total time taken for decay = 6 hours
Remaining mass after decay, M = 7.8125 g

Using the halving sequence:

$$125\text{ g} \xrightarrow{T_{1/2}} 62.5\text{ g} \xrightarrow{T_{1/2}} 31.25\text{ g} \xrightarrow{T_{1/2}} 15.625\text{ g} \xrightarrow{T_{1/2}} 7.8125\text{ g}$$

1scr; *sequence*

This takes four half-lives, so

$$4T_{1/2} = 6 \text{ hours} \implies T_{1/2} = 1.5 \text{ hours}$$

1scr; *half-life*

But, $M = \left(\frac{1}{2}\right)^x M_0$, where:

1scr; *exprsn*

M = remaining mass
M_0 = initial mass = 125 g
x = number of half-lives passed

But also, $x = \frac{\text{Elapsed Time}}{T_{1/2}}$, where $T_{1/2}$ is half-life

1scr; *exprsn*

$$=> \; x = \frac{5.25}{1.5} = 3.5 \text{ half} - \text{lives}$$

1scr; *substn*

Thus, $M = \left(\frac{1}{2}\right)^{3.5} \times 125$ $=> M = 11.049\ g$

1scr; *solun*

Since the remaining mass after 5.25 hours is 11.049 g, which is more than 10.6 g, the mine will **not be shut down.**

1scr; *conclsn*

	(ii)	The affected area of the arm is placed between the photographic film and the X-ray tube window. The X-ray tube is switched on to direct X-rays onto the affected area. Soft tissues of the arm allow X-rays to pass through, blackening those parts of the film. Bones are denser and absorb X-rays, appearing white on the film. A fracture allows some X-rays to pass through the broken part, appearing as a dark line on the white bone area on the film and so, the affected part of the borne is identified.	**1scr;** *postn of the arm* **1scr;** *switching on X-ray tube* **1scr;** *X-rays through tissue* **1scr;** *X-rays through bornes* **1scr;** *appearance of fracture on film.*
(c)	(i)	**Agricultural uses of radioactivity**	
		➢ Gamma rays kill bacteria, molds, and yeasts in fresh produce and food products, extending shelf life. ➢ Induced mutations using radiation help create new plant varieties with desirable traits such as disease resistance, high yield and adaptability to harsh climates. ➢ Radioisotopes trace nutrient absorption in plants to improve fertilizer usage and crop nutrition. ➢ Sterile insect technique, where male insect eggs are sterilized using gamma radiation and released to reduce pest populations	**1scr;** *any use*
		Archaeological uses of radioactivity	
		➢ Carbon-14 dating, used to estimate the age of organic remains after death by measuring the remaining carbon-14 isotope in bones, wood, or charcoal. ➢ Uranium-Lead dating, used for dating much older materials beyond the range of carbon-14, such as rocks and minerals. Uranium decays to lead over millions to billions of years, providing accurate dating for geological and archaeological samples.	**1scr;** *any use*
	(ii)	Use of protective clothing and respiratory equipment which prevents inhalation or direct contact with radioactive dust or particles during handling.	**2scrs;** *any two @ precaution* **1scr**

Minimizing exposure time reducing the time spent near radioactive sources minimizes dose received.

Store or carry radioactive materials in containers made from thick lead or other dense shielding materials to block radiation effectively.

TOTAL=22Pts

Avoiding exposure of food to radioactive environments, and avoid eating in contaminated areas to prevent internal contamination

Item three

(a) (i) A **light year** is the distance travelled by light in one year, while an **astronomical unit** is the average distance between the earth and the sun.

2scrs;1scr *@definition*

(ii) **Parent A:**

The rise and fall of water level is termed as tides which are caused by the gravitational forces of the moon and sun on the earth's water bodies.

1scr; *forces*

The moon's gravity pulls the water towards it, creating a bulge (high tide) on the side of the earth facing it.

1scr; *moon's pull*

On the side of the earth opposite to the moon, the earth-moon rotation around a common center creates centrifugal force which causes another bulge (high tide).

1scr; *centrifugal force*

As the earth spins, its different locations pass through these bulges, experiencing high and low tides.

1scr; *spin for diff locations*

Parent B:

When a person makes a call, the phone sends microwave signals to a geostationary satellite orbiting the earth in the space.

1scr; *signals to satellite*

The satellite then amplifies the signals since they are weak and retransmits the signals to the receiver's phone in the USA connected to the global communications network.

1scr; *amplification*
1scr; *retransmission*

When the other person speaks, the message travels in the similar process, enabling global calls.

1scr; *message reversal*

(b)	Stars begin their lives as <u>a vast, cold cloud of gas</u> (mainly hydrogen and helium) and <u>dust known as nebulae</u>. ✓ A gravitational force triggered by <u>shockwaves</u> ✓ from nearby supernovae, solar winds, or galactic collisions causes regions within the nebula to <u>collapse inwards</u>. ✓ As the cloud fragments collapse, it <u>spins faster causing its central core to heat up</u> due to gravitational energy conversion, <u>forming a protostar</u>. ✓ When the core temperature <u>becomes ✓ high enough</u> (about 10 million Kelvin), <u>nuclear fusion starts</u> where hydrogen fuses into helium nuclei. This releases enormous energy, creating outward pressure that perfectly balances inward gravity, hence <u>stabilizing ✓ the star</u>. This is the 90% of the star's life and our sun is in this phase. When hydrogen fuel runs low, the core contracts, heats up causing <u>the outer layers to expand ✓ and cool</u>, turning the star into a red giant or a red-supergiant. Helium and heavier elements start fusing in the core, ending as <u>white dwarfs, neutron stars, or black holes</u>. ✓	**1scr;** *nebulae* **1scr;** *origin of gravity* **1scr;** *cloud collapse* **1scr;** *protostar* **1scr;** *fusion* **1scr;** *pressure balance and stabilization* **1scr;** *cooling core* **1scr;** *end products*
(c)	(i) Let, $\rho_s =$ density of the Sun $\quad M_e =$ mass of the Earth $\rho_e =$ density of the Earth $\quad V_s =$ volume of the Sun $M_s =$ mass of the Sun $\quad V_e =$ volume of the Earth By definition of density, $\rho = \frac{M}{V}$ ✓, then; $\rho_s = \frac{M_s}{V_s}$ But; $M_s = 3.30 \times 10^5 M_e$ and $R_s = 109R_e$ ✓ Assuming the sun and the earth are taken as perfect spheres, from $V = \frac{4}{3}\pi R^3$, then $V_s = \frac{4}{3}\pi(109R_e)^3 = 109^3 \times \frac{4}{3}\pi R_e^3 = 109^3 V_e$, since $V_e = \frac{4}{3}\pi R_e^3$. Thus; $V_s = 109^3 V_e$ ✓ This implies that; $\rho_s = \frac{3.30 \times 10^5 M_e}{109^3 V_e}$ ✓ and so, $\rho_s = \frac{3.30 \times 10^5}{109^3} \times \rho_e$, since the factor $\frac{M_e}{V_e}$ is the density of the earth, $\rho_e = 5500 \text{ kg m}^{-3}$. Therefore, $\rho_s = \frac{3.3 \times 10^5}{109^3} \times 5500$, $\therefore\ \rho_s \approx 1402 \text{ kg m}^{-3}$ ✓.	 **1scr;** *exprsn for density* **1scr;** *mass & radius of the sun* **1scr;** *volume of the sun* **1scr;** *substn* **1scr;** *density of the sun*

(ii) ➢ Understanding our place in the universe ➢ Protecting technology and space infrastructure (e.g., from solar flares and space weather). ➢ Advancing fundamental science and technology, leading to innovations. ➢ Understanding Earth's climate and environment, using satellite and space observations to monitor global systems.	**3 scrs; 1scr; @** *use* **TOTAL=26Pts**

Item four

(a) (i) Acceleration refers to the rate of change of velocity with respect to time. — **1scr;** *definition*

(ii) Part I (acceleration): $a = \dfrac{275 - 0}{2 - 0} = 137.5\,\mathrm{km/h^2}$

Part II (deceleration): $a = \dfrac{0 - 275}{5 - 2} = -91.67\,\mathrm{km/h^2}$

Part II (acceleration): $a = \dfrac{150 - 0}{2} = 75\,\mathrm{km/h^2}$

Part IV (deceleration): $a = \dfrac{0 - 150}{10 - 8} = -75\,\mathrm{km/h^2}$

The car accelerates uniformly from rest to a velocity of 275 km h^{-1} in 2 hours at a rate of 137.5 km h^{-2}.
It then decelerates uniformly to rest from the velocity of 275 km h^{-1} in 3 hours at a rate of 91.67 km h^{-2}.
The car **rests** for 1 hour.
After which the car accelerates uniformly again from rest to a velocity of 150 km h^{-1} in 2 hours at a rate of 75 km h^{-2}.
It then finally decelerates uniformly from the velocity of 150 km h^{-1} to rest in 2 hours at a rate of 75 km h^{-2}.

5 scrs; 1scr; @ *part of motion*

(b) $\text{Average velocity} = \dfrac{\text{Total displacement}}{\text{Total time taken}}$ — **1scr;** *exprsn*

But, Total displacement = Total area under the graph.

$A_1 = \dfrac{1}{2} \times 2 \times 275 + \dfrac{1}{2} \times 3 \times 275 = 275 + 412.5 = 687.5\,\mathrm{km}$ — **1scr;** *area, A_1*

$A_2 = \dfrac{1}{2} \times 2 \times 150 + \dfrac{1}{2} \times 2 \times 150 = 150 + 150 = 300\,\mathrm{km}$ — **1scr;** *area, A_2*

$\text{Total displacement} = 687.5 + 300 = 987.5\,\mathrm{km}$ — **1scr;** *total displacement*

Total time taken = $2 + 3 + 1(\text{rest}) + 2 + 2 = 10\,\text{hours}$ — **1scr;** *total time*

Thus, $\text{Average velocity} = \dfrac{987.5}{10}$ = 98.75 km h^{-1}. — **1scr;** *ave. velo.*

Therefore, since the average speed is 98.75 km h^{-1}, which is outside the recommended range of 72 km h^{-1} to 96 km h^{-1}.

1scr; *conclusion*

Total amount paid = 987.5 × 2000 = Ugx.1975000.

1scr; *fine paid*

(c) (i) **Work** is the product of force and the distance moved in the direction of the force while **power** is the rate at which work is done.
Work is measured in joules (J) while **power** is measured in watts (W).

2scrs; 1scr; *diff.*

(ii) Given; mass m = 68 kg; height h = 89×4 = 356 cm, h = 3.56 m; acceleration due to gravity, g = 10 m s^{-2} and time t = 2 min =2×60 = 120 s.

Work done; W is given by:

$$W = mgh = 68 \times 9.8 \times 3.56 = 2420.8\ \text{J}$$

Power expended is $P = \dfrac{W}{t} = \dfrac{2420.8}{120} = 20.173\ \text{W}$

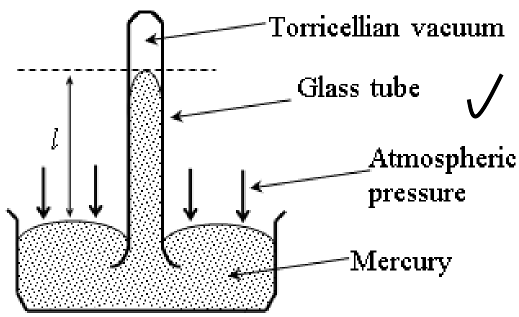
1scr; *height in metres*
1scr; *total time*
2scrs; *exprsns*
2scrs; *substns*
2scrs; *soluns*

<u>TOTAL=24Pts</u>

Item five

(a) Materials needed

- glass tube.
- Mercury.
- glass bowl.
- metre rule.



1scr; *diagram with at least two parts well labeled*

A thick-walled glass tube closed at one end is filled with mercury and <u>inverted several times</u> with a finger covering its open end. This is to remove air bubbles in the mercury.

1scr; *inversions of the tube*

The tube is then <u>completely filled with mercury</u> and with the finger still covering its open end, the tube is gently inverted into a bowl containing mercury.

1scr; *filling of tube*

The <u>figure is removed from the open end</u> and the mercury is left to settle.

1scr; *removing figure*

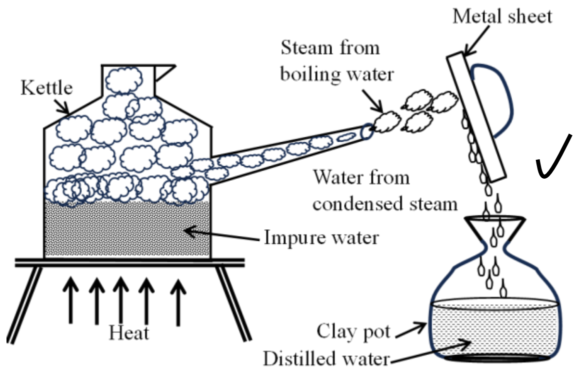
The length, l of the mercury column in the glass tube above the surface of mercury in the bowl is <u>measured using a metre</u> rule and recorded.

1scr; *length*

If the <u>length is above 740 mm, the farmers should</u> cultivate land. However, if it is <u>below 740mm, they should not</u> cultivate land.

1scr; *conclusion*

(b) (i)



The impure water is poured into the kettle and then it is heated to boiling, producing steam. The steam is directed through the kettle spout onto an inclined metal sheet next to the mouth of a clay pot.
The metal sheet absorbs heat from the steam, causing the steam to condense into pure water droplets.
These droplets fall into the clay pot, collecting distilled water safe for drinking, while impurities remain in the kettle.

1scr; *diagram with at least two parts well labeled*

1scr; *heating water*

1scr; *direction of steam*

1scr; *use of sheet*
1scr; *conclusion*

(ii) Water molecules from banana fibers absorb latent heat from hot air in the room. Water molecules with higher kinetic energy overcome intermolecular forces and escape from the liquid surface into the air as vapor. As heat energy is absorbed, the temperature of air and the nearby surfaces decreases, causing a cooling effect in the room.

1scr; *use of fiber*

1scr; *molecular escape*
1scr; *cooling effect*

(c) The amount of heat, Q required to vaporize 2 kg of water for drinking from 60 ^{o}C is given by

$$Q = mL_v + mc\Delta\theta$$

1scr; *exprsn*

where:

m = 2 kg
c = 4200 J kg^{-1} K^{-1}
$\Delta\theta$ = 100 ^{o}C−60 ^{o}C = 40 ^{o}C

Thus, $4.55\times10^6 = 2L_v + (2\times4200\times40)$ **1scr;** *substn*

Therefore, $L_v = \dfrac{4.55\times10^6 - 336000}{2} = 2.107\times10^6 \text{ J kg}^{-1}$ **1scr;** *solun*

(d) (i) Pressure, $\boldsymbol{P = \rho g h}$; where: ρ = 1000 kg m^{-3} (density of water), g = 10 m s^{-2} and P =1 5000 Pa **1scr;** *exprsn*

=> $15000 = 1000 \times 10 \times h$ **1scr;** *substn*

Therefore, $h = \dfrac{15000}{1000\times10} = 1.5\text{ m}$, which is the required height. **1scr;** *solun*

(ii) The piston of the hand pump is pulled upwards, the volume inside the pump cylinder increases, hence creating a partial vacuum inside the pipe of the pump. Atmospheric pressure the pump pushes down on the surface of the ground water. Because the pressure inside the pump's pipe is lower than the atmospheric pressure, the higher external pressure forces water up into the pipe and then out through the spout when the piston is pushed down. This water is then pushed into the elevated storage tank which acts as a reservoir.

1scr; *creation of partial pressure*

1scr; *action of Atm pressure*

1scr; *pressure diff*

1scr; *conclusion*

(iii) *Planting trees to reduce heat waves* that reduces urban heat island effects and so improving air quality.

2scrs;
1scr; *@use*

Installing solar-powered pumps for drawing water. This utilizes renewable energy, reducing dependence on fossil fuels while ensuring water access for storage and community use.

Constructing houses with ceiling boards and clay tile roofs. This improves thermal insulation in homes, reducing indoor temperatures and enhancing comfort during heat waves.

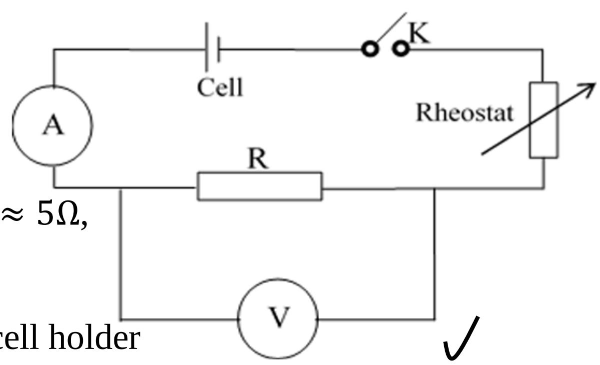
Installing water purification systems to help treat water for drinking, reducing the risk of waterborne diseases and improving public health in communities.

TOTAL=26Pts

Item six

(a) (i)

Materials needed



- connecting wires,
- 1standard resistor R ≈ 5Ω,
- 1voltmeter
- 1ammeter
- a fresh dry cell in a cell holder
- 1switch, K, and
- 1rheostat

1scr; *circuit diagram*

Switch, K is closed for current to flow and the rheostat is adjusted to some given value of current, ***I*** as seen from the ammeter. The voltmeter reading, ***V*** is noted. The experiment is repeated for different values of ***I*** obtained by adjusting the rheostat and the results are tabulated.
A graph of V against I is plotted which gives a straight line through the origin. This implies that that $V \propto I$.
This indicates that the current flowing through the electrical devices is directly proportional to the voltage across the devices.

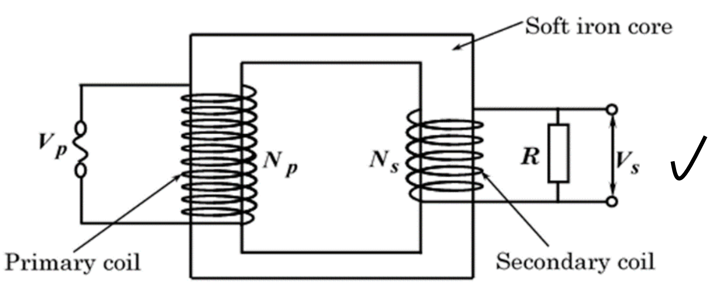
1scr; *K and I*
1scr; *V*
1scr; *repeat*
1scr; *graph*
1scr; *variation*
1scr; *conclusion*

(ii) When power is switched on, an electric field is setup in the wires.
The electrons in the wire are accelerated by the field thus gaining kinetic energy (K.E).
As the electrons move in the wire, they collide with the atoms vibrating about their fixed mean positions and lose some of their kinetic energy to the atoms.
The atoms then vibrate rapidly with larger amplitudes and as atoms rub against each other, heat energy is produced
This increases the temperature of the wires, making them hot.

1scr; *elec. field*
1scr; *accn*
1scr; *collision & loss of K.E*
1scr; *friction & heat prodctn*
1scr; *conclusion*

(b) The device used for lowering the voltage is called a *step-down transformer*.

1scr; *name*



1scr; *diagram*

The a.c voltage on primary coil creates a changing magnetic field in the soft iron core. This changing field induces voltage in the secondary coil via electromagnetic induction (Faraday's Law). Voltage in the secondary coil is directly proportional to the number of turns: $\frac{V_s}{V_p} = \frac{N_s}{N_p}$. Since the secondary coil has fewer turns, the voltage decreases (stepped down).

1scr; *changing flux*
1scr; *induced emf*
1scr; *proportionality*
1scr; *conclusion*

(c) (i) The statement means that, the fridge operates safely at a maximum current of 7.5 A when connected to a 240V voltage supply. — **1scr;** *statement*

alternatively;

Power, $P=IV$ and so, $P = (7.5 \times 240) = 1800$ W, which means that, the fridge consumes 1800 J of energy per second when connected to a 240 V power source.

(ii) Cost = Power (in kW) × Total Time (hrs) × Unit Cost — **1scr;** *exprssn*

Fridge:
Voltage: V = 240V, Current I = 7.5A
Power: $P = IV = 7.5 \times 240 = 1800\text{W} = 1.8\text{kWP}$
Time: 12 hours per day for 30 days:
Cost = $1.8 \times 12 \times 30 \times y = 108y$, where y = unit cost — **1scr;** *cost*

Bulb:
Power: $P = I^2R = 4^2 \times 5 = 80\text{W} = 0.08\text{kW}$
Time: 12 hours per day for 30 days:
Cost = $8 \times 0.08 \times 12 \times 30 \times y = 230.4y$ — **1scr;** *cost*

Phones:
Voltage V = 240V, Current I = 4500 mA = 4.5 A
Power: $P = IV = 4.5 \times 240 = 1080\text{W} = 1.08\text{kW}$
Time: 1.5 hours per day for 30 days; 3 phones.
Cost = $3 \times 1.08 \times 1.5 \times 30 \times y = 145.8y$ — **1scr;** *cost*

Thus; $108y + 230.4y + 145.8y = 121050$ — **1scr;** *substn*

$=> \quad y = \frac{121050}{484.2} \quad \therefore \quad y = Ugx\ 250.$

Therefore, each unit of electricity costs Ugx 250. — **1scr;** *conclusion*

(d) **Wires:** *Red or brown* (*live*)**;** Carries current to the appliance, *Blue or black* (*neutral*)**;** Completes the circuit, *Yellow or green* (*earth*)**;** Path for stray current for safety.
Switch: Connects or disconnects the circuit for control and safety.
Fuse: In a circuit breaker or plug of an extension cable, melts when the current exceeds the rated value, protecting appliances from overcurrent.
Sockets: Power points fixed on the walls to supply electricity to appliances.

2scrs; at least 2 components, @ **1scr;**

For wires, even if the learner talks about one colour of wire, give the score

TOTAL=27Pts

<u>Item seven</u>

(a) (i) *<u>Switch</u>*: K_5 — **1scr;** *switch*

<u>Appliances</u>: <u>phone, flat iron, and radio</u>. — **1scr;** *appliances*

<u>Solution</u>: The appliances must all be <u>arranged in parallel.</u> This ensures that each appliance receives the full mains voltage, 240 V, allows independent control of each appliance and prevents one appliance from affecting the operation of others. — **1scr;** *solution*

(ii) Given: $V_{TV} = 240V$, $R_{TV} = 20\Omega$

Using **Ohm's Law:** $I = \frac{V}{R}$ Thus, $I_{TV} = \frac{240V}{20\Omega} = 12A$

Therefore, the current through the TV is 12A.

1scr; *exprssn*
1scr; *substn*
1scr; *solution*
1scr; *conclusion*

(b) (i) When current flows through the cable, electrons moving in the cable <u>collide with vibrating atoms</u> in the cable and <u>lose some of their kinetic energy</u> to the atoms. Atoms gain more energy and vibrate with <u>larger amplitudes and frequencies.</u> As atoms rub against each other, <u>heat energy is generated</u> and is lost to the surroundings, making the power the cables weaker.

1scr; *collision*
1scr; *loss of K.E*

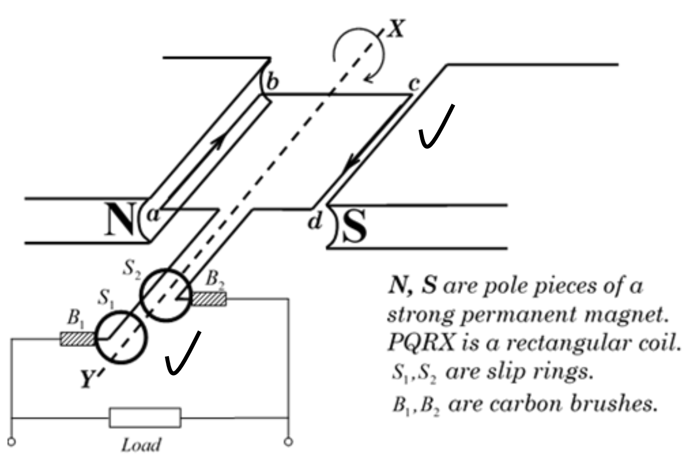
1scr; *increase in amplitude*

1scr; *gen. of heat*

(ii) Power <u>delivered is P = IV.</u> High voltage (V) delivered results into small current, I flowing.
<u>Power lost</u> in long distance cables is in form of heat <u>given by $P = I^{-2}R$.</u> With no change in resistance of the cables, as the current decreases<u>, power lost becomes small</u> and so, power delivered reaches its <u>destination with little loss.</u>

1scr; *reason for small current*
1scr; *exprssn for power loss*
1scr; *little power lost*

(c)



2 scrs; *diagram*

When the coil is rotated about the axis XY, the magnetic flux linking the coil changes. Side ***a b*** moves upwards while ***c d*** downwards. ✓

An e.m.f is therefore induced ✓ in the coil in the direction ***a b c d***. ✓ The induced current flows through the load from brush B_2 to B_1 .

When the plane of the coil is in vertical position, the coil doesn't cut the magnetic flux and so, no current flows in the coil. The coil continues to rotate due to its inertia. ✓

As side ***a b*** starts to move downwards and ***c d*** upwards, from the vertical position, the coil cuts the magnetic field flux, current is induced in the coil which increases to maximum when the coil is horizontal again. ✓

The induced current changes the direction and flows through the load from brush B_1 to B_2. ✓

The process is repeated and the current through the load reverses the direction every half cycle when the plane of the coil passes the vertical position, hence an ***alternating current*** (A.C). ✓

1scr; *movement of sides*
1scr; *induction of emf.*
1scr; *direction of induced current*

1scr; *inertia as cause of continued rotation*

1scr; *change of current direction*

1scr; *direction of flow*

1scr; *conclusion*

TOTAL=23Pts

NB: (i) The **weights** were not allocated for each number. Let the ***criteria*** depend on the choice of the centers.
(ii) **JJEB** wishes the best to all our **esteemed candidates**.

END