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## S.4 Physics 535/1 SCORING GUIDE

### SECTION A.

#### ITEM I

(a) (i) John was unable to see near objects clearly because he was suffering from an eye defect called long sightedness ✓ <sup>(e1)</sup> ~~Hypertropia / Distant objects~~ (part) He can see distant objects clearly, but near objects are blurred because their images are formed behind the retina. ✓ <sup>(e1)</sup> ~~Accept any diagram involving the object~~

This defect is caused by either too long focal length of the eye lens <sup>(e1)</sup> or too short eye ball. ✓

This problem is corrected by (John) using <sup>(concave)</sup> ~~(convex)~~ Spectacles containing converging lens ✓ which <sup>(e1)</sup> increase the convergence of the light rays and brings it to focus on ~~the~~ retina. ✓ <sup>(e1)</sup> (5) ~~the~~ <sup>Refer back to</sup>

(ii) The repeated sounds are called echoes. ✓ They are produced as a result of sound waves from the source in an empty hall travel through the air in the hall, hit the walls ✓ and then bounce back again to the person's ears. ✓ <sup>(e1)</sup>

However when the hall is full of students the sound waves, produced from the source undergoes multiple reflection ✓ from the students and so it overlaps with the original sound produced hence

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## S.4 Physics 535/1 SCORING GUIDE

### SECTION A.

#### ITEM I

- (a) (i) John was unable to see near objects clearly because he was suffering from an eye defect called long sightedness ✓ <sup>(01)</sup> Hypermetropia / Distant objects far.  
He can see distant objects clearly, but near objects are blurred because their image are formed behind the retina. ✓ <sup>(01)</sup> Accept any diagram indicating the defect.  
This defect is caused by either too long focal length of the eye lens <sup>(01)</sup> or too short eye ball. ✓  
This problem is corrected by (John) using <sup>(convex lens)</sup> spectacles containing converging lens ✓ which <sup>(01)</sup> increase the convergence of the light rays and brings it to focus on the retina. ✓ <sup>(01)</sup> Reverberation ✓ <sup>(01)</sup>

- (ii) The repeated sounds are called echoes. ✓ <sup>(01)</sup>  
They are produced as a result of sound waves from the source in an empty hall travel through the air in the hall, hit the walls ✓ and then bounce back again to the person's ears. ✓ <sup>(01)</sup>  
However when the hall is full of students the sound waves produced from the source undergoes multiple reflection ✓ from the students and so it overlaps with the original sound produced hence

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(Time limit) (a)

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the listener is not able to distinguish between the original sound and the echo.

These repeated sounds in the hall can be prevented by using special acoustic materials such as sound absorbing panels, curtains and carpets to reduce echo and reverberation. ✓ *say too (true)* (4)

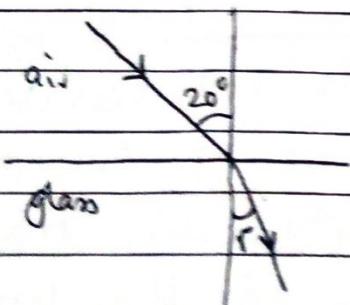
This ensures that the audience can enjoy clear and immersive sound without significant echo effects.

(b) (i) The phenomenon is called refraction of light.

Laws of refraction of light:

- The incident ray, the normal and refracted ray at the point of incidence all lie on the same plane.
- For any two particular media, the ratio of the sine of angle of incidence to sine of angle of refraction is constant.

(ii)



$$n_a \sin 20^\circ = n_g \sin r$$

$$1 \times 0.3420 = 1.5 \times \sin r$$

$$\sin r = 0.228$$

$$r = \sin^{-1}(0.228)$$

✓ (Answer, Unit)

$$r = 13.18^\circ \text{ accept } 13.2^\circ$$

Accept one d.p.

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## ITEM 2:

(a) One of the properties of radioactive substances is, they emit radiations which affect photographic plates and their masses decrease as a result of these emissions. ✓ (01)

(2)

(c) - It should be held with forceps or a pair of tongs and not with bare hands. ✓ (01)

- The mineral should be stored in a lead box when not in use ✓ (01)

- A person working with this mineral should put on gloves and lead coat. ✓ (Inkjet) (01)

- Avoid eating, drinking or smoking while working with the mineral since it could be consumed and cause adverse effects to the operator. ✓ (01)

(4)

(d) Dangers associated with radiations from radioactive substances -

- Radiation burns that is redness and sores on the skin

- Leukemia or Blood Cancer ✓

- Sterility (Inability to reproduce) ✓

- Blindness (Damage of eye sight)

- Mutation

Accept any 2 (2 scores)

(2)

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### ITEM 2:

(a) One of the properties of radioactive substances is, they emit radiations which affect photographic plates and their masses decrease as a result of these emissions. ✓ (2)

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- Avoid eating, drinking or smoking while working with the mineral since it could be consumed and cause adverse effects to the operator. ✓ (1)

(d) Dangers associated with radiations from radioactive substances -

- Radiation burns that is redness and sores on the skin
- Leukemia or Blood Cancer ✓
- Sterility (Inability to reproduce) ✓ (2)
- Blindness (Damage of eye sight)
- Mutation

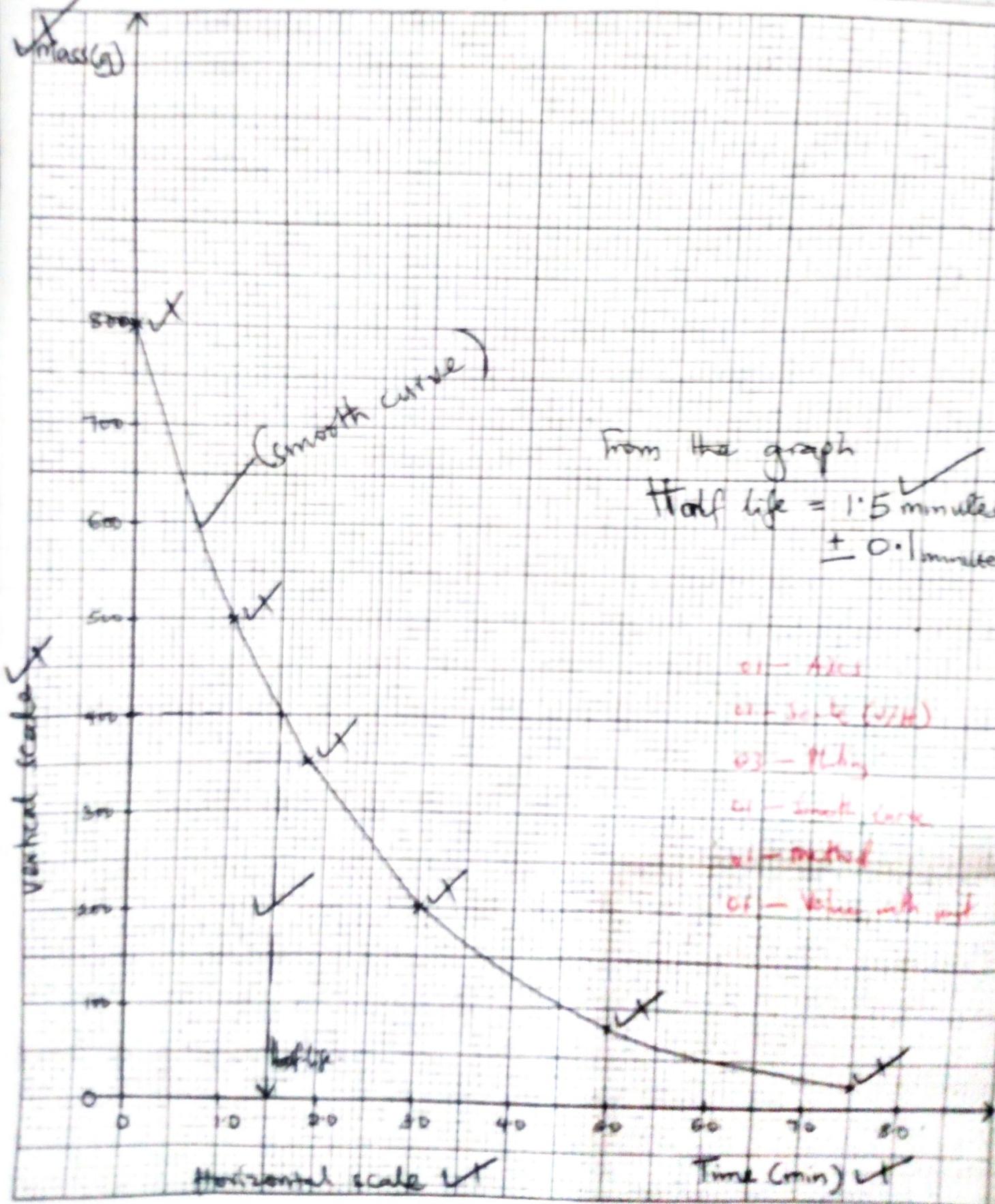
Accept any 2 (2marks)

Signature

## ITEM 2 (b)

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Paper code



### ITEM 3

(a) Different seasons at the same time of the year is caused by tilting of the ~~earth~~ <sup>(exam)</sup> about its own axis and rotation of the earth around the sun.

Side tilted towards the sun experiences summer (dry season - sunny) <sup>days</sup> While side tilted away experiences winter season (rainy days) <sup>days</sup> ✓ ~~✓~~

Rotation either takes the earth near the sun or far from the sun resulting into <sup>4</sup> change of season ✓

Therefore seasons can be different in different parts of the earth depending on the tilt and rotation of the earth.

(b) The possibility of day in one place and night in another. This is caused by the rotation of the earth about its axis (spinning). <sup>(ex)</sup> ✓

A point directly facing the sun will experience day while the one on the other side of the earth will experience darkness (night).

As the earth rotates the point ceases to be directly under the sun hence becoming dark. At that time, the other side of the earth will be experiencing day time. <sup>(ex)</sup> ✓



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(c) Images are picked by cameras ✓ and changed to a frequency <sup>of signals</sup> ✓ suitable for satellite transmission.

The signals are transmitted from a ground based satellite dish (station transmitter) ✓ to a satellite in a geostationary orbit ✓

The signals are then amplified ✓ to another frequency and re-transmitted to satellite dishes on the earth's surface at T.V stations ✓

The received signals are decoded by a <sup>4</sup> decoder and then sent to the television for display. ✓

(d) The earth is able to support life because it has <sup>natural</sup> suitable temperature ✓ for living organisms along with the presence of oxygen ✓ and water that is required for the survival of all life forms.

The earth has the right distance from the sun, it is protected from harmful solar radiation by its magnetic field. ✓ It is also kept warm by an insulating atmosphere and it has <sup>it</sup> the right chemical ingredients for life.

Any four (4) scores

(16)

Signature

**SECTION B**

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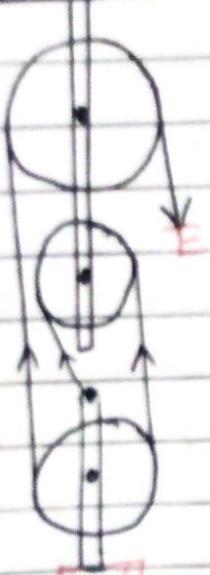
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ITEM 4:

- (a) 1<sup>st</sup> class lever: Hammer, Hoe ~~any four~~  
2<sup>nd</sup> class lever: Wheel ~~barrow~~  
3<sup>rd</sup> class lever: Spade

(4)

(b)



Arrangement of pulleys |  
Starting point of the string |  
Correct direction of  
arrows showing tension |  
in the string

(3)

(3)

$$(c) \eta = \frac{M \cdot A}{V \cdot R} \times 100\% ; \quad 80 = \frac{M \cdot A}{3} \times 100 ; \quad M \cdot A = 2.4$$

$$M \cdot A = \frac{L}{E} ; \quad 2.4 = \frac{12 \times 10}{E} ; \quad E = 50 \text{ N}$$

(5)

(d) - Some energy is wasted in lifting useless loads e.g strings and movable block

- Some energy is lost in overcoming friction between the pulley and the string

Efficiency could be increased by lubricating the movable parts of the pulley system and also using light strings and a light movable block

, overcoming heat and sound

(16)

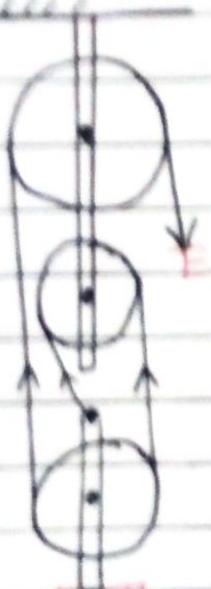
ITEM 4:

(a) 1<sup>st</sup> class lever: Hammer, Hoe ~~any four~~ Any four  
correctly given2<sup>nd</sup> class lever: Wheel ~~barrow~~ barrow given3<sup>rd</sup> class lever: Spade each score

(4)

(4)

(b)



Arrangement of pulleys |  
Starting point of the string |  
Correct direction of arrows showing tension |  
in the string

(3)

(3)

$$(c) \eta = \frac{M \cdot A}{V \cdot R} \times 100\% ; \quad S.D. = \frac{M \cdot A}{3} \times 100 ; \quad M \cdot A = 2 \cdot 4$$

$$M \cdot A = \frac{L}{E}, \quad 2 \cdot 4 = \frac{12 \times 10}{E}; \quad E = 50 N$$

(d) - Some energy is wasted in lifting useless loads e.g. strings and movable block

- Some energy is lost in overcoming friction between the pulley and the string

Efficiency could be increased by lubricating the movable parts of the pulley system and also using light strings and a light movable block

, reducing heat and sound

(16)

## ITEM 5:

(a) Heat given out = Heat gained by Gold  
by hot water + basin

Let  $\theta$  = temperature of the mixture.

$$\text{Heat given out} = m_1 C_w (70 - \theta) \quad \checkmark$$

$$= 2 \times 4200 (70 - \theta)$$

$$= 588000 - 8400 \theta \quad \checkmark$$

(a)

$$\begin{aligned}\text{Heat gained} &= m_1 C_w (\theta - 15) + m_2 C_b (\theta - 15) \quad \checkmark \\ &= 3 \times 4200 (\theta - 15) + 3 \times 400 (\theta - 15) \quad \checkmark \\ &= 12600 \theta - 189000 + 1200 \theta - 18000 \quad \text{(b)} \\ &= 13800 \theta - 207000 \quad \checkmark\end{aligned}$$

(b)

$$\text{But } 588000 - 8400 \theta = 13800 \theta - 207000 \quad \checkmark$$

(a)

$$\frac{795000}{22200} = \frac{22200 \theta}{22200} \quad \checkmark$$

(6)

$$\theta = 35.81^\circ \text{C} \quad \checkmark$$

(a)

Since  $35.81^\circ \text{C}$  lies between  $35^\circ \text{C}$  and  $40^\circ \text{C}$ ,  
therefore the water was suitable for bathing the baby.

b)  $4200 \text{ J kg}^{-1} \text{ K}^{-1}$  means that One kilogram  
water requires 4200 J of heat energy to have  
its temperature rise by 1 K

(a)

(2)

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(c) water has a ~~high~~ heat capacity compared with other liquids ✓ (1)

water absorbs heat easily but changes temperature very slowly. ✓ (1)

water is not volatile ~~as~~ as compared to other liquids ✓ (can easily vaporise)

water is readily available in large quantities and very low costs as compared to other liquids. ✓ (1)

(d) Black surfaces are good absorbers of heat and also are good emitters [radiators] of heat ✓ (1)

The small metal wires are used as cooling fins because metals are good conductors of heat. Small metal wires absorb heat from the engine readily due to their large surface area to volume ratio and radiates heat at a high rate as compared to large metal wires. ✓ (1)

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## ITEM 6:

- (a) Cost of running a flat iron =  $\frac{1500 \times 5 \times 797}{1000} \checkmark$   
 $= 5977.5 = \checkmark$
- Cost of running a cooker =  $\frac{2500 \times 4 \times 7 \times 797}{1000} \checkmark$   
 $= 55790 = \checkmark$
- Cost of running 4 lamps =  $\frac{4 \times 20 \times 13 \times 7 \times 797}{1000} \checkmark$   
 $= 5802.16 = \checkmark$
- Cost of running electric fence =  $\frac{2200 \times 10 \times 7 \times 797}{1000} \checkmark$   
 $= 122738 = \checkmark$
- Total cost = 190,307.66 = ✓

His budget on electricity would not cater for electricity bills for one week. ✓

He needs a top up of sh 190307.66 - 50000 ✓ (8)  
 $= 140307.66 = \checkmark$

- (b) The sockets should be connected in such a way that they are parallel to the power line in order to supply a constant voltage for all appliances. ✓ (2)

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(C) Lower resistance means less power is converted to heat and lost to the surrounding environment and more of the supplied power gets to its intended destination ✓

low resistance wires increase the flow of current

- (d)
- switch to LED lighting ✓
  - switch off lights and electrical appliances when not using them ✓
  - use of appliances with a high energy rating ✓
  - use of intelligent lighting control systems

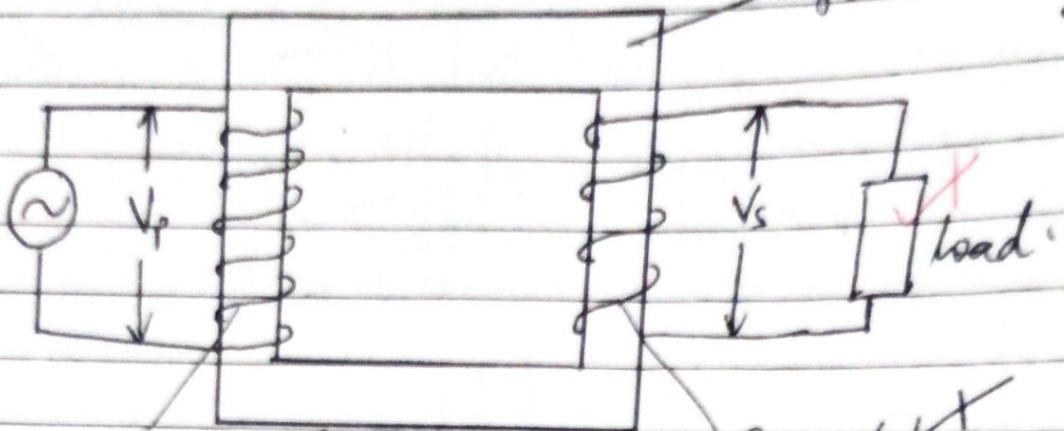
(light sensor)

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## ITEM 7:

(a)

primary (more turns)  
coilsecondary (fewer turns)  
coil

The technician prescribed a step down transformer.  
Mode of operation

When an alternating voltage  $V_p$  is applied to the primary coil, alternating current flows through the primary coil.

The alternate current creates a changing magnetic flux in the primary coil which links up with the secondary coil.

An emf  $V_s$  is induced in the secondary coil due to the changing magnetic flux.

Since the number of <sup>turns</sup> in the primary coil are more than the number of turns in the secondary coil, therefore  $V_s$  is less than  $V_p$ .

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$$(b) \frac{V_p}{V_s} = \frac{N_p}{N_s} \checkmark$$

$$\frac{240}{120} = \frac{3000}{N_s} \checkmark$$

$$N_s = 1500 \text{ turns.} \checkmark$$

(3)

(c) Copper has a high electrical conductivity, enabling the smooth flow of electric current with minimal resistance.  $\checkmark$  (2)

(d) By using (low resistance) thick copper wires  $\checkmark$  on primary coil and ~~stainless copper wires in secondary coil~~  
 By using a laminated soft iron core.  $\checkmark$   
 By using an E-shaped iron core so that all the flux in the primary coil links up to the secondary coil.  $\checkmark$  (4)

- Using soft iron core with overall
- Wind one coil on top of the other.

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