THE UNITED REPUBLIC OF TANZANIA

PRESIDENT'S OFFICE

REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

THE CITY OF DODOMA

FORM IV PRE-NATIONAL EXAMINATION 2025

031-PHYSICS MARKING SCHEME

1.

(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
D	C	A	C	C	D	C	A	A	B

(@ 01 mark)

2.

(i)	(ii)	(iii)	(iv)	(v)	(vi)
B	C	D	A	C	F

(@ 01 mark)

3. (a) **Similarities**

(i) Both consists convex lens which focus an inverted image. In camera focused onto film while human eye focused on retina.

(ii) Both adjust the quantity of light entering. In camera it's done with aperture while in human eyes it's done with iris.

(iii) Both capture the image through an important element, retina for human eyes and film in a camera. **(Any two 02 marks)**

Differences

(i) Lens focus; In camera the lens moves closer or further in human eye by changing its shape.

(ii) Sensitivity to light; the film in camera is always sensitive to light but the retina in human eye is not **(Any two 02 marks)**

(b) From $\frac{1}{f}=\frac{1}{u}+\frac{1}{v}$ **(01 mark)**

$$\frac{1}{5}=\frac{1}{u}+\frac{1}{20}$$

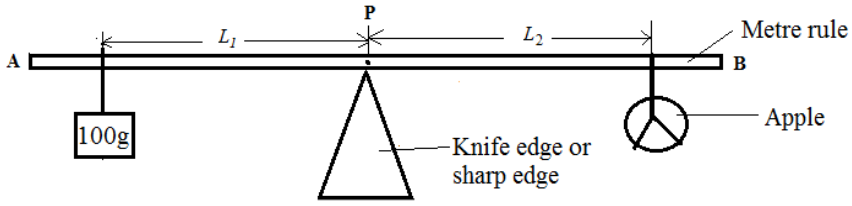
$$\frac{1}{u}=\frac{1}{5}-\frac{1}{20}=\frac{4-1}{20}=\frac{3}{20}$$ **(01 mark)**

$$u=\frac{20}{3}cm$$ **(01 mark)**

Magnification $=\frac{v}{u}=\frac{20}{20}\times 3=3$ **(02 marks)**

4. (a) By using principle of moments **(01 mark)**

Consider the diagram shows arrangements of the apparatus;-



(01 mark)

Mass of the apple is obtained from;-

Anticlockwise moments = Clockwise moments **(01 mark)**

$$100g\times L_1=M_{apple}\times L_2$$

$$M_{apple}=100g\times\frac{L_1}{L_2}$$ **(01 mark)**

(b) From; $v_{AB}=v_A-v_B$ **(02 marks)**

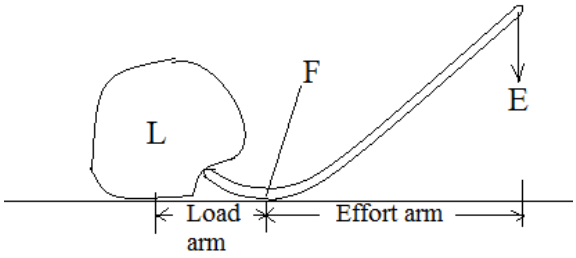
$=80-45$ **(01 mark)**

$=35km/h$ **(02 marks)**

5. (a) First class levers occurs when the fulcrum is between load and effort

Examples are crowbar, a pair of scissors

Taking a crowbar **(01 mark)**



(02 marks)

The mechanical advantage is given as;-

$$M.A = \frac{Effort\ arm}{Load\ arm}$$ **(01 mark)**

(b) From the diagram, simple machine B is inclined plane

$$Efficiency = \frac{M.A}{V.R} \times 100\%$$ **(01 mark)**

But $$M.A = \frac{L}{E} = \frac{2000N}{500N} = 4$$ **(01 mark)**

Since $c = \sqrt{a^2 + b^2} = \sqrt{4.9^2 + 1^2} = 5m$ **(01 mark)**

$$V.R = \frac{Effort\ distance}{Load\ distance} = \frac{c}{b} = \frac{5m}{1m} = 5$$ **(01 mark)**

$$Efficiency = \frac{4}{5} \times 100\% = 80\%$$ **(01 mark)**

6. (a) (i) By using magnetic field

Cathode rays are deflected by magnetic field but X ray does not

(ii) By using electric field

Cathode rays are deflected toward anode when placed in electric field while X ray does not.

(iii) By checking penetrating power

X rays has high penetrating power

(iv) By using paddle-wheel discharge tube

Cathode rays cause the paddle wheel to rotate while X-ray does not.

(Any two @ 02 marks)

(b) Initial count rate of the mixture $=160+160=320$ count rate per second

Consider count rate A_t after a time taken t

$$\frac{A_t}{A_o}=\left(\frac{1}{2}\right)^n$$ **(01 mark)**

For P after 8 hours; $n=\frac{t}{T_{\frac{1}{2}}}=\frac{8}{2}=4$

$$A_t=160\times\left(\frac{1}{2}\right)^4=\frac{160}{16}=10$$ Count rate per second **(01 mark)**

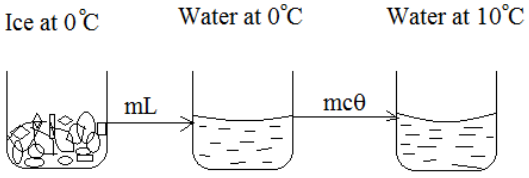
For Q after 8 hours; $n=\frac{t}{T_{\frac{1}{2}}}=\frac{8}{4}=2$

$$A_t=160\times\left(\frac{1}{2}\right)^2=\frac{160}{4}=40$$ Count rate per second **(01 mark)**

Count rate for the mixture $=10+40=50$ Count rate per second **(02 marks)**

7. (a) This is because in a pressure cooker there is large pressure compared in an open saucepan. From pressure law Pressure is directly proportional to the temperature. Increasing the pressure increase the temperature so it will cook faster. **(04 marks)**

(b) Consider the diagram representing the process of heat absorbed

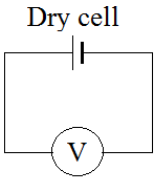


From $Q=mL+mc\theta$ **(02 marks)**

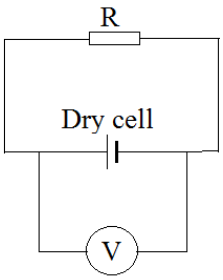
$$Q=0.5\times330000+0.5\times4200\times(10-0)$$ **(01 mark)**

$$=186000J$$ **(02 marks)**

8. (a) This is due to the presence of internal resistance of a cell, some of the volts is lost due to current flowing through internal resistance of the dry cell as shown below;-



The voltmeter reads high voltage since no current flows through



The voltmeter reads less voltage since some voltage lost through internal resistance due to current flows **(04 marks)**

(b) Consider the Kilowatt-hours for those appliances

4 Bulbs $4 \times 100 = 400W$

2 Bulbs $2 \times 75 = 150W$

TV $= 300W$

`Heater $= 1500W$

Total Watts $= 400W + 150W + 300W + 1500W = 2350W = 2.35kW$ **(01 mark)**

In Kilowatt-hour $= 2.35kW \times 24hr = 56.4kWh$ **(02 marks)**

But $1kWh \rightarrow 357/=$

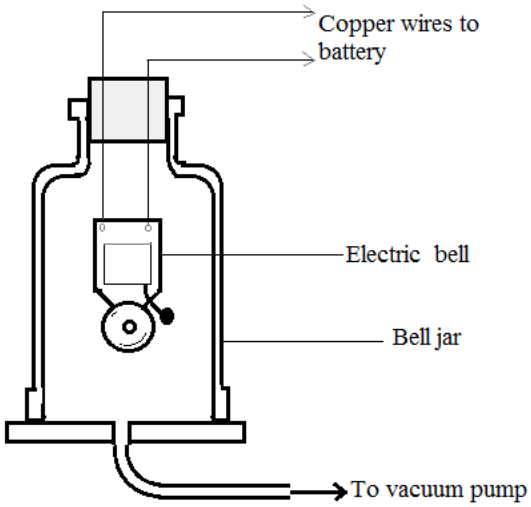
$56.4kWh \rightarrow ?$

$56.4 \times 357 = 20{,}134.8/=$ **(02 marks)**

9. (a) - By changing the length of the wire.
- By changing the tension of the wire.
- By changing the size of the wire. **(Any two points @ 02 marks)**

(b) Experiment

Electric bell and a bell jar is set as shown bellow



(02 marks)

The electric bell is a vibrating source. When there is air in the ball jar the sound of an electric bell is heard to the surroundings **(02 marks)**

When there is no air inside the bell jar after pumped by vacuum pump no sound is heard from the electric bell to the surroundings so sound will not travel through the vacuum. Air is the medium.

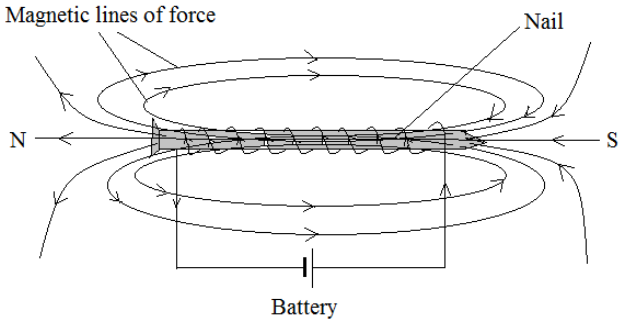
(02 marks)

(c) From $f = \frac{v}{\lambda}$ **(02 marks)**

$$= \frac{330 m/s}{0.5m}$$ **(01 mark)**

$$= 660 Hz$$ **(02 marks)**

10. (a) This can be done by wound insulated wire round the iron nail and connects its terminal to a d.c battery. Using right hand clenched rule the magnetic lines of force can be indicated which indicates magnetic North Pole and South Pole. **(03 marks)**



(02 marks)

(b) - By increasing the number of turns.
- By increasing the magnetic fields strength
- By increasing the rate of rotation of the armature **(@ 02 marks)**

(c) From $\frac{V_s}{N_s} = \frac{V_p}{N_p}$

$$N_s = \frac{V_S N_p}{V_p}$$ **(01 mark)**

$$= \frac{8 \times 4800}{240}$$ **(01 mark)**

$$= 160 turns$$ **(02 marks)**

11. (a) (i) A silicon material is a semiconductor while copper material is a conductor.

(ii) The resistance of the silicon decreases with increase in temperature, while the resistance of copper increases with increase in temperature.

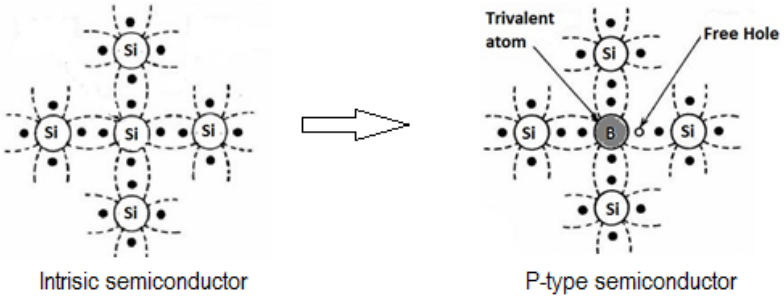
(iii) The current carriers in silicon are both holes and electrons while in copper is only electrons.

(iv) There is a narrow-forbidden gap between conduction band and valence band in silicon while in copper the conduction band and valence band overlaps.

(Any two @02 marks)

(b) When trivalent atom (boron) is added to intrinsic semiconductor will create a shortage of electrons or a hole in a valence band (Since it has only three electrons for sharing instead of four). The impure crystal formed is called **P-type semiconductor**. Since the semiconductor will conduct electricity by using holes as major charge carries in conduction band.

(03 marks)



(03 marks)

(c) Diagram of the single stage common emitter amplifier using NPN transistor **(05 marks)**